Humboldt Bay National Wildlife Refuge Complex

Comprehensive Conservation Plan and Final Environmental Assessment

Prepared By:

U.S. Fish and Wildlife Service
Pacific Southwest Region
Refuge Planning
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

and

Humboldt Bay National Wildlife Refuge Complex
1020 Ranch Road
Loleta, California 95551-9633

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Regional Director, Pacific Southwest Region

Implementation of this Comprehensive Conservation Plan and alternative management actions/programs have been assessed consistent with the requirements of the National Environmental Policy Act (42 USC 4321 et seq.)

Abbreviations and Acronyms

ADA	Americans with Disabilities Act
AFWO	Arcata Fish and Wildlife Office
AQMD	Air Quality Management District
Bay	Humboldt Bay
BCC	Birds of Conservation Concern
BCR	Bird Conservation Regions
BIDEH	Biological Integrity, Diversity and Environmental Health (601 FW3)
BLM	Bureau of Land Management
BMC	Birds of Management Concern
BMP	Best Management Practices
CCC	California Conservation Corps
CCP	Comprehensive Conservation Plan
CCS	California Current System
CDF	California Department of Forestry and Fire Protection (also, CAL FIRE)
CDFG	California Department of Fish and Game
CDPH	California Department of Public Health
CEQ	Council on Environmental Quality
CESA	California Endangered Species Act
CLMA	Cooperative Land Management Agreement
CNDDB	California Natural Diversity Database
CNLM	Center for Natural Lands Management
CNPS	California Native Plant Society
CWA	California Waterfowl Association
DOI	U.S. Department of the Interior
DPS	Distinct Population Segment
DU	Ducks Unlimited
EA	Environmental Assessment
EDPA	Eureka Dunes Protected Area
EE/I	Environmental Education/Interpretation
EO	Executive Order
ES	Endangered Species
ESA	Endangered Species Act of 1973, as amended
ESU	Evolutionary Significant Unit (applied to ESA listed fish)
FBM	Freshwater and Brackish Marsh
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FOD	Friends of the Dunes
FHBNWR	Friends of the Humboldt Bay National Wildlife Refuge
FTE	Full Time Employee
GIS	Geographic Information System
HACCP	Hazard Analysis and Critical Control Point Plan
HBEP	Humboldt Bay Ecosystem Program
HBHRCD	Humboldt Bay Harbor, Recreation and Conservation District
HBMP	Humboldt Bay Management Plan
HBWAC	Humboldt Bay Watershed Advisory Committee
HFAC	Humboldt Fish Action Council
IFA	Interjurisdictional Fisheries Act of 1986
HSU	Humboldt State University
IIU	Indian Island Unit

Improvement Act	National Wildlife Refuge System Improvement Act of 1997
IPM	Integrated Pest Management
LPP	Land Protection Planning
MBTA	Migratory Bird Treaty Act
MCSD	Manila Community Services District
MDCMA	Ma-le'l Dunes Cooperative Management Agreement
MLPA	Marine Life Protected Area
MMPA	Marine Mammal Protection Act of 1972
MOU	Memorandum of Understanding
MSDS	Material Safety Data Sheet
NCIC	North Coastal Information Center of the California Historical Resources Information System
NCRWQCB	North Coast Regional Water Quality Control Board
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration (NOAA Fisheries Service)
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
PCFWWRA	Pacific Coast Fish Wildlife and Wetlands Restoration Association
PCJV	Pacific Coast Joint Venture
PDO	Pacific Decadal Oscillation
PIF	Partners in Flight
Porter-Cologne	State Porter-Cologne Water Quality Act
PRBO	Point Reyes Bird Observatory
PVA	Population Viability Assessment
RCAA	Redwood Community Action Agency
Refuge System	The National Wildlife Refuge System
RNA	Research Natural Area
ROW	Right of way
SCC	State Coastal Conservancy
SCEP	Student Career Employment Program
SEFI	Southeast Farallon Island
Service	U.S. Fish and Wildlife Service (also, USFWS
SFBNWRC	San Francisco Bay NWR Complex
SHC	Strategic Habitat Conservation
SHPO	(California) State Historic Preservation Office
SIU	Sand Island Unit
SLAMM	Sea Level Affecting Marsh Management)
SSC	Species of Special Concern
SWFSC	Southwest Fisheries Science Center
TNC	The Nature Conservancy
TS	Threatened Species
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service (also, Service)
USGS	U.S. Geological Survey
WMA	Weed Management Area
WNV	West Nile Virus
WSHRN	Western Hemisphere Shorebird Reserve Network
YCC	Youth Conservation Corps

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1. Introduction

1.1 Introduction

Humboldt Bay National Wildlife Refuge Complex (Complex), which includes Humboldt Bay National Wildlife Refuge (NWR) and Castle Rock NWR, is located on the northern coast of California.

Humboldt Bay NWR is located in the vicinity of Eureka and Arcata with refuge units distributed around Humboldt Bay, the largest bay between San Francisco Bay and Coos Bay, Oregon. In 1971, Humboldt Bay NWR was established to conserve coastal habitats for a great diversity of animals and plants, especially migratory birds. Years later Humboldt Bay NWR added the Lanphere and Ma-le'l Dunes Units to help conserve the most pristine remaining dune ecosystem on the west coast of the United States.

The Humboldt Bay NWR authorized boundary consists of 9,502 acres (3,379 acres owned in fee title) of freshwater, brackish, and salt marsh; agricultural wetlands; intertidal mudflats; eelgrass beds; and some of the most pristine dune habitats in the western United States.

Castle Rock NWR is a 14-acre nearshore island located in Del Norte County, California, less than a mile northwest of Crescent City. The island is primarily rock with sparse vegetation. Castle Rock NWR hosts one of the largest and most diverse assemblages of breeding seabirds on the Pacific coast, provides a critical roost for thousands of Aleutian cackling geese (*Branta hutchinsii leucopareia*) prior to their transoceanic migration, and provides resting sites for seals and sea-lions.

1.2. Purpose and Need for the Comprehensive Conservation Plan

The U.S. Fish and Wildlife Service (Service) prepared this Comprehensive Conservation Plan (CCP) to guide management of fish, wildlife, plants, other natural resources, and visitor uses on the Humboldt Bay NWR Complex for the next 15 years. The National Wildlife Refuge System Improvement Act of 1997 (16 United States Code [USC] 668dd-668ee) (Improvement Act) requires that all refuges be managed in accordance with an approved CCP by 2012. Under the 1997 Improvement Act, the National Wildlife Refuge System (Refuge System) is to be consistently directed and managed to fulfill the specific purpose(s) for which each refuge was established and the Refuge System mission. The CCP planning process helps the Service achieve the individual refuge's purposes and the Refuge System mission by identifying specific goals, objectives, and strategies to implement on each refuge.

1.3. U.S. Fish and Wildlife Service and National Wildlife Refuge System

1.3.1. U.S. Fish and Wildlife Service Responsibilities

The U.S. Fish and Wildlife Service is the primary Federal agency responsible for conserving, protecting, and enhancing the Nation's fish, wildlife, and plant populations, and their habitats, for the continuing benefit of the American people. Although the Service shares this responsibility with other Federal, tribal, State, local, and private entities, the Service has specific responsibilities for migratory birds, threatened and endangered species, interjurisdictional fish, and certain marine mammals. These groups of species are collectively referred to as Federal Trust Species. The Service also manages the Refuge System and National Fish Hatcheries, enforces Federal wildlife laws and international treaties related to importing and exporting wildlife, assists State fish and wildlife programs, and helps other countries develop wildlife conservation programs.

1.3.2. The National Wildlife Refuge System

The National Wildlife Refuge System is the world's largest collection of lands specifically managed for fish and wildlife conservation. Unlike other Federal lands that are managed under a multiple-use mandate (National Forests and lands administered by the U.S. Bureau of Land Management [BLM]), the Refuge System is managed primarily for the benefit of fish, wildlife, and plant resources and their habitats. The Refuge System consists of more than 545 units that provide nearly 95 million acres of

important habitat for native plants and many species of mammals, birds, and fish, including threatened and endangered species.

National Wildlife Refuge System Mission and Goals

The mission of the Refuge System is "…to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (1997 Improvement Act).

The goals of the National Wildlife Refuge System are to:

a. *Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.*

b. *Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.*

c. *Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.*

d. *Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).*

e. *Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.*

1.3.3. Refuge Purposes

Lands within the Refuge System are acquired and managed under a variety of legislative acts and administrative orders and authorities. The official purpose or purposes for a refuge are specified in or derived from the law, proclamation, executive order (EO), agreement, public land order, funding source, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit. The purpose of a refuge is defined when it is established or when new land is added to an existing refuge. When an addition to a refuge is acquired under an authority different from the authority used to establish the original refuge, the addition takes on the purposes of the original refuge, but the original refuge does not take on the purposes of the addition. Refuge managers must consider all of the purposes. However, purposes that deal with the conservation, management, and restoration of fish, wildlife, and plants and their habitats take precedent over other purposes in the management and administration of a refuge.

The 1997 Improvement Act directs the Service to manage each refuge to fulfill the mission of the Refuge System, as well as the specific purposes for which that refuge was established. Refuge purposes are the driving force in developing refuge vision statements, goals, objectives, and strategies in the CCP. Refuge purposes are also critical to determining the compatibility of all existing and proposed refuge uses.

Humboldt Bay NWR was established under the authority of the Migratory Bird Conservation Act of 1929, the Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and the Endangered Species Act (ESA) of 1973, as amended.

According to these authorities, Humboldt Bay NWR's purposes are:

"…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"…as Waterfowl Production Areas subject to… all of the provisions of such Act [Migratory Bird Conservation Act]…except the inviolate sanctuary provisions…" 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

"…for the development, advancement, management, conservation, and protection of fish and wildlife resources…" 16 U.S.C. §§ 742f(a)(4) and "…for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude…" 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"…suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species…" 16 U.S.C. §§ 460k-1 and "…the Secretary…may accept and use…real…property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors…" 16

U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"…to conserve (A) fish or wildlife which are listed as endangered species or threatened species ....or (B) plants…" 16 U.S.C. §§ 1534 (Endangered Species Act of 1973, as amended)

Castle Rock National Wildlife Refuge was established under the authority of the Endangered Species Act of 1973, as amended.

According to this authority, Castle Rock NWR's purpose is:

"…to conserve (A) fish or wildlife which are listed as endangered species or threatened species…or (B) plants…" 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

1.3.4. Refuge Vision Statements

Vision Statement for Humboldt Bay National Wildlife Refuge

The Humboldt Bay National Wildlife Refuge conserves and manages some of the most significant historic and restored natural areas in the Humboldt Bay area. The refuge sustains varied and important habitats ranging from estuarine and freshwater wetlands to open grasslands and dynamic dune ecosystems. Humboldt Bay NWR also conserves important plant and animal populations and plays a critical role in preserving biodiversity locally, regionally, and within the Refuge System. Refuge staff applies sound scientific principles and adaptive management strategies to sustain the long-term health and ecological integrity of the Humboldt Bay NWR and the surrounding area.

Refuge habitats link with other public and private lands to support threatened and endangered species in addition to hundreds of species of migratory wildlife within the Pacific Flyway. The refuge provides migration and wintering habitats of sufficient size and quality to assist in maintaining migrating bird populations on the Pacific Flyway, especially Pacific brant, Aleutian cackling geese, and shorebirds.

The staff at the Humboldt Bay NWR works with a broad cross section of tribal, governmental, community, and private partners to promote the ecological integrity of the landscape, ecotourism, and the historic and cultural attractions of the region. The refuge staff, assisted by Friends groups, volunteers, and the public, seeks to provide compatible wildlife-dependent recreational opportunities for the public on refuge lands, expand community outreach, and stimulate area residents and visitors to embrace sustainable stewardship of natural resources.

By pursuing this vision, staff and others at the Humboldt Bay NWR seek to ensure healthy fish, wildlife, and plant resources for people to enjoy today and an enduring legacy for generations to come.

Vision Statement for Castle Rock National Wildlife Refuge

Castle Rock National Wildlife Refuge preserves in perpetuity one of the most important seabird nesting colonies on the Pacific coastline. This 14-acre island continues to be preserved in a natural condition with minimal human intrusion.

Management activities focus on research and monitoring of refuge wildlife and on protection and maintenance of a natural, functioning ecosystem. The U.S. Fish and Wildlife Service coordinates with tribes, other agencies and entities, and the public to ensure the long-term health and viability of native seabird and marine mammal populations.

We work with others to provide wildlife viewing and interpretation at selected locations on the adjacent coastline. Fostering an appreciation for Pacific coast wildlife enriches people in a variety of ways and ensures that this outstanding legacy of wildlife is passed on to future generations.

1.4. Legal and Policy Guidance

Refuges are guided by the purposes of the individual refuge, the mission and goals of the Refuge System, Service policy, laws, and international treaties. Relevant guidance includes the Refuge Recreation Act of 1962; the 1997 Improvement Act; the Endangered Species Act, as amended; selected portions of the Code of Federal Regulations; and the U.S. Fish and Wildlife Service Manual. Refuges are also governed by a variety of other Federal laws, Executive Orders, treaties, interstate compacts, regulations, and policies pertaining to the conservation and protection of natural and cultural resources (see Service Manual 602 FW 1, 1.3).

The 1997 Improvement Act's main components include:

- A strong and singular wildlife conservation mission for the Refuge System.
- A recognition of six priority public uses of the Refuge System (hunting, fishing, wildlife

observation and photography, and environmental education and interpretation).
- A requirement that the Secretary of the Interior maintain the biological integrity, diversity and environmental health of Refuge System lands.
- A new process for determining compatible uses on refuges.
- A requirement for preparing a comprehensive conservation plan for each refuge by 2012.

First and foremost, refuges are managed for fish, wildlife, plants, and their habitats. In addition, units of the Refuge System are legally closed to all public access and use, including economic uses, unless and until they are officially opened through an analytical public process called the ***refuge compatibility process***. All refuge uses are subservient to the Refuge System's primary wildlife management responsibility and they must be determined compatible to be authorized.

The 1997 Improvement Act established the formal process for determining compatibility of uses. A compatibility determination is required for a wildlife-dependent recreational use or any other public use of a refuge. A compatible use is one which, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of refuge purpose(s) or the Refuge System mission. The Service strives to provide wildlife-dependent public uses when compatible. If financial resources are not available to design, operate, and maintain a priority use, the refuge manager will take reasonable steps to obtain outside assistance from the State and other conservation interests.

This CCP contains several compatibility determinations for proposed uses on both refuges in the Complex (Appendix F). These compatibility determinations were open to public comment with the draft CCP and finalized along with the CCP.

This document also includes an environmental assessment (EA) (attached as Appendix E) as required under the National Environmental Policy Act of 1969 (NEPA) (42 USC 4321). The purpose of the EA is to evaluate the environmental effects of the CCP on the quality of the human environment. The EA includes the components listed below.

- A description of the alternatives considered for the CCP.
- Identification and analysis of the potential environmental effects of the proposed management program and the management alternatives.
- Documentation of the involvement of affected State and Federal agencies, appropriate Tribal governments, nonprofit organizations, and members of the public in the CCP process.

The CCP is also accompanied by a revised sport hunting plan (Appendix C), a revised sport fishing plan (Appendix D), a wilderness review (Appendix G), and a visitor services plan (Appendix B).

1.5. Humboldt Bay National Wildlife Refuge Complex

1.5.1. Humboldt Bay National Wildlife Refuge

The Humboldt Bay NWR boundary (Figure 1) contains much of the remaining natural habitats and shoreline areas of Humboldt Bay, including areas that both conserve key habitats for fish, wildlife, and plants, and are aesthetically pleasing landscapes. However, to understand the health of refuge habitat, it is necessary to consider the general health of the bay as a whole, including the condition of lands and waters outside, as well as inside, the refuge.

The bay area contains many species of native and introduced plants and animals. These species and their habitats have complex interrelationships; significant changes in any one habitat type can directly or indirectly affect other habitats and species that use that habitat. Most fish and wildlife species found on Humboldt Bay NWR use areas both inside and outside of refuge boundaries.

Humboldt Bay NWR is important to the overall Refuge System primarily due to the concentrations of migratory waterbirds, conservation of species listed under the Federal ESA that use refuge habitats, and conservation of globally endangered dune habitats.

Migratory birds largely depend upon the bay and surrounding wetland habitats, including the refuge, in the fall, winter, and spring. This is especially true of the Pacific brant (*Branta bernicla nigricans*). Humboldt Bay NWR is currently the southernmost in a chain of National Wildlife Refuges that provide habitat for most of the world's population of Pacific brant.

Humboldt Bay is an area of international significance to many species of migratory birds, which largely depend upon the bay and surrounding wetland habitats, including the refuge, in the fall, winter, and spring. Chief among these are waterfowl, shorebirds, gulls, and terns. Total use-days for all of the bird species have been estimated at 4 million annually for South Bay alone (Nelson 1989). Most of the birds using the bay frequent areas within the existing refuge boundaries on a daily basis.

Figure 1. Watershed ecosystem map.

Over 260 species of birds, including 39 species of shorebirds and 26 species of raptors, have been seen in the vicinity of Humboldt Bay (Yocom and Harris 1975, Ralph et al. 1998). In recognition of the species richness found in the bay, it has been identified as an Important Bird Area by the National Audubon Society. The majority of birds use the Humboldt Bay NWR as a stop-over to rest and replenish energy reserves. Others spend the winter on the refuge and some use it for nesting. The wetlands in and around Humboldt Bay are critical to tens of thousands of shorebirds. As a result, the bay has been designated as a site of International Importance by the Western Hemisphere Shorebird Reserve Network. This is the northernmost area on the Pacific coast where species such as American avocets (*Recurvirostra americana*), long-billed curlews (*Numenius americanus*), marbled godwits (*Limosa fedoa*), and willets (*Tringa semipalmata*) spend the winter in large numbers. They can be seen feeding on the mudflats or skimming over the bay in large eye-catching flocks from late July through April.

Humboldt Bay is a key area for Pacific brant. Humboldt Bay NWR is currently the southernmost in a chain of National Wildlife Refuges that provide habitat for most of the world's population of Pacific brant. These small geese require eelgrass-filled bays during their travels between Arctic wetlands where they nest and coastal lagoons of Baja California and mainland Mexico where they overwinter. In November, most Pacific brant fly nonstop from Izembek Lagoon in Alaska to Mexico in 48 to 60 hours. On their return trip from January through April, as much as 60 percent of the flyway population stops in Humboldt Bay, with as many as 10,000 to 20,000 Pacific brant on Humboldt Bay at one time. The Humboldt Bay area has also recently (as of 2002) become the focal area during late winter and spring for the bulk of the Aleutian cackling goose population.

In addition to birds, Humboldt Bay is also a regionally important spawning and nursery ground for commercial and sport finfish and shellfish, especially oysters. The bay provides habitat for at least 111 species of fish (Barnhart et al. 1992), many of which contribute to sport or commercial fisheries. Both Jacoby Creek and Salmon Creek provide habitat for anadromous salmonids.

Four species listed as endangered under the Federal ESA utilize habitat within the refuge boundary: the Humboldt Bay wallflower (*Erysimum menziesii* ssp. *eurekense*), beach layia (*Layia carnosa*), tidewater goby (*Eucyclogobius newberryi*), and brown pelican (*Pelecanus occidentalis*). Three species listed as threatened under the Federal ESA use habitat within the refuge boundary: Coho salmon (*Oncorhynchus kisutch*), steelhead (*Oncorhynchus mykiss*), and Chinook salmon (*Oncorhynchus tshawytscha*). Three recovered species, the Aleutian cackling goose, bald eagle (*Haliaeetus leucocephalus*), and peregrine falcon (*Falco peregrinus*), also use refuge habitat. In addition, the Humboldt Bay NWR provides habitat for rare plants, globally declined species, and marine mammals.

1.5.2. Castle Rock National Wildlife Refuge

Castle Rock is one of only two islands on the outer coast of California included in the National Wildlife Refuge System. These two islands, Southeast Farallon Island (SEFI) and Castle Rock, are the largest, most important seabird colonies in the state. SEFI has a long continuous history of human occupation. Research and monitoring takes place year round on the island primarily through a cooperative agreement with Point Reyes Bird Observatory (PRBO) Conservation Science. Until recently, Castle Rock had no management plan or long-term monitoring program, so seabird monitoring was accomplished through short-term projects and large-scale cooperative monitoring efforts aimed at selected species.

Like many other "seabird islands" within the Refuge System, Castle Rock is so rich with sensitive wildlife species and fragile habitat that it cannot accommodate direct public access and still fulfill the purposes for which it was established. Only very limited access is allowed for research, monitoring, and management. The original concept for management of the island was to leave it alone with the caveat that direct management may be needed in the future. The dilemma is that some of the island's most sensitive resources cannot be monitored without some level of presence on the island, and without monitoring species status cannot be determined, nor if management might be warranted.

1.6. Humboldt Bay NWR Complex Location

1.6.1. Flyway Setting

The refuge is located within the Pacific Flyway. The Pacific Flyway is used by millions of birds for migration to wintering and breeding grounds. This refuge provides important habitat is a key migratory stopover and/or wintering area for several species of waterfowl and shorebirds including Pacific brant, Aleutian cackling geese, western sandpipers (*Calidris mauri*), dunlin (*Calidris alpina*), marbled

godwits, and long-billed curlews. The north coast of California is one of richest areas in the country in terms of avian diversity. Between 300 and 350 species of birds can be found from just offshore to the first inland ridgeline (Harris 1996, Ralph et al. 1998).

1.6.2. Humboldt Bay NWR Setting

The Humboldt Bay region is composed of diverse ecosystems. The bay area's topography, wetlands, riparian and coastal areas provide a variety of habitats for wildlife and migratory birds.

Humboldt Bay is 14 miles long and from 0.5 to 3.5 miles wide. It comprises three sub-bays, each situated at the end of one or several stream valleys. It is bounded on the east by mountain ridges of the coast range. Humboldt Bay is California's second largest coastal estuarine system.

Humboldt Bay has been drastically changed since the turn of the 19th century (Figure 2). Vast expanses of wetlands around both North and South Bays have been altered by diking, filling, dredging, sedimentation, and mariculture, as well as residential, industrial, and recreational development. Originally, Humboldt Bay and its natural wetlands encompassed more than 27,000 acres, but by 1980 this area had been reduced by 30 percent to ~17,000 acres (Shapiro and Associates 1980). Consequently, there has been a dramatic change in both the quantity and composition of wetlands.

In 1870, when some minor salt marsh conversion had already occurred, there was an estimated 9,500 acres of salt marsh. After completion of the railroad around the margin of the bay, salt marsh was reduced by 90 percent. The current estimate of the area of salt marsh remaining around the Bay is 970 acres.

1.6.3. Historic Conditions of Humboldt Bay NWR

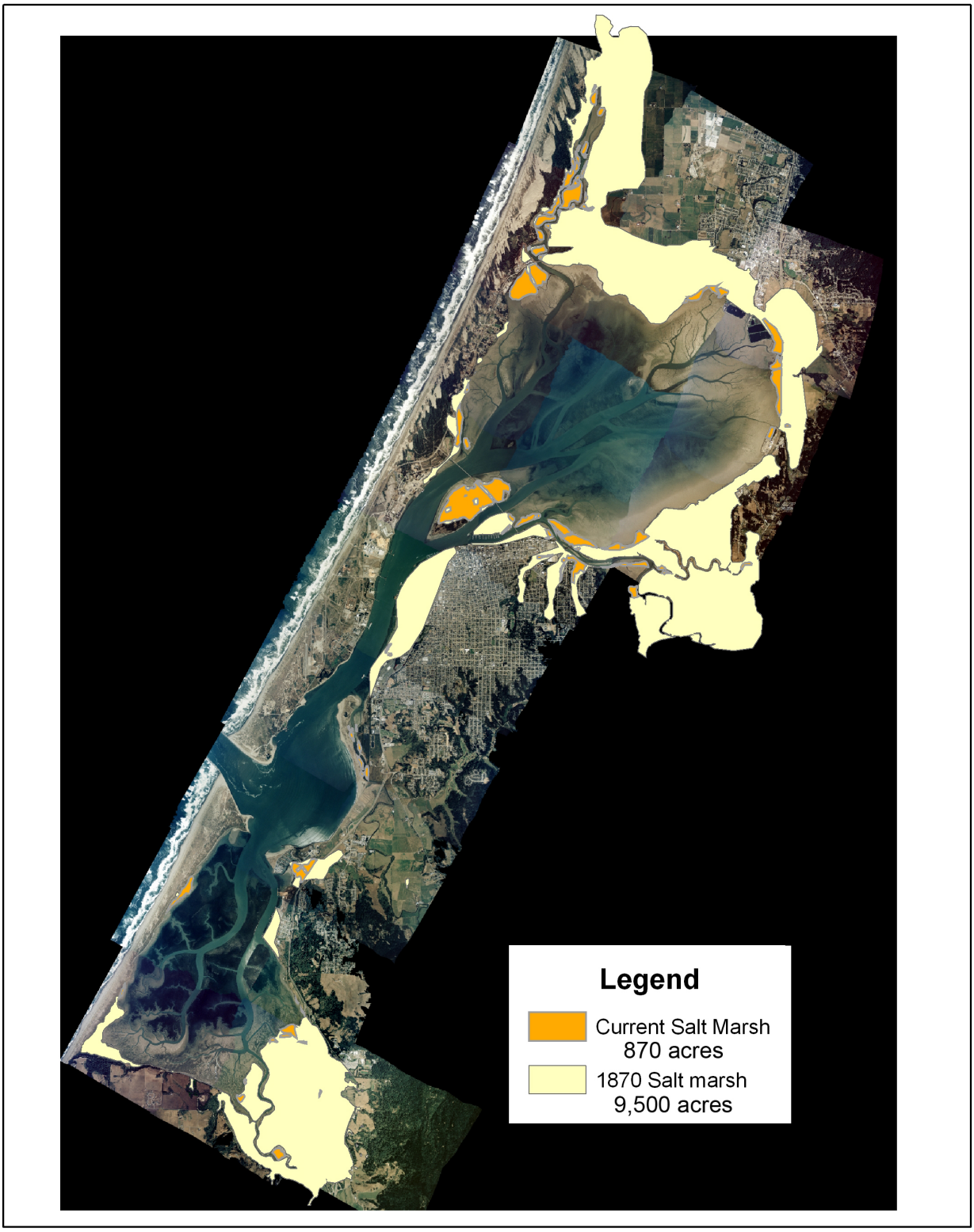
The pre-European settlement Humboldt Bay watershed was covered mostly by old-growth redwood (*Sequoia sempervirens*) forest in the uplands. The coastal forests reached from the ocean to 35 miles inland. Pre-1850 it was common to see herds of 40 to 50 elk (Loud 1918). Waterfowl, salmon, deer, and bear were abundant. Forest soils and vegetation diminished rainfall runoff and prevented significant changes in water quality. The bay margins were heavily forested from Arcata south to the Elk River (Coy 1982). The coastline, bay margins, and riparian area forests were dominated by Sitka spruce (*Picea sitchensis*) and red alder (*Alnus rubra*), and contained Douglas-fir (*Pseudotsuga menziesii*), coast hemlock (*Tsuga heterophylla*), red cedar (*Thuja plicata*), and tanoak (*Lithocarpus densiflorus*) (Loud 1918). Lowland and marsh areas around the bay were restricted due to surrounding mountain ridges.

In 1850 there were extensive intertidal flats and salt marshes in Humboldt Bay. The largest salt marshes were along Mad River Slough, McDaniel Slough, Eureka Slough, Hookton Slough, and Salmon Creek (Loud 1918). The lower Elk River and lower Salmon Creek deltas were tidally influenced alluvial plains. The north spit of Humboldt Bay was a mix of unvegetated, herbaceous, and forested dunes. The South Spit was primarily non-vegetated dune. The mouth of the bay was both shallow and narrow (Lewis 1943).

Landscapes found by early explorers and settlers were shaped and regularly renewed in part by the land management practices of Native American people (Anderson 2005).

Before EuroAmerican influence, there were an estimated 1,000 Wiyot people in the Humboldt Bay region. They occupied ~465 square miles, including the entire Humboldt Bay area. At the time of contact with EuroAmericans, the Wiyot were divided into three main groups: the Potawót, the Wigki, and the Wiyot. The Potawót settlements were on the lower Mad River, while the Wigki and the Wiyot settlements were near the Eel River (Seidner 1999). In 1850 there were 32 principal population centers and many smaller villages (Loud 1918). Population decreases were due to a number of factors (all attributable to the coming of the Europeans), and included reduction in the available resource base for subsistence, EuroAmerican-induced epidemics, displacement, and killings. By 1851 the Wiyot population of Humboldt Bay and north to Mad River was estimated at about 300 to 500. By 1910, due to conflicts with settlers, the Wiyot population had decreased to ~100 (Loud 1918).

The Humboldt Bay area provided a cornucopia of plant and wildlife resources to sustain the Wiyot people. The ancestral Wiyot territory extended from Little River to the north, Bear River Ridge to the south, and from the Pacific coast out to as far as Berry Summit in the northeast and Chalk Mountain in the southeast (Wiyot Constitution and Bylaws 1978). The Wiyot people lived along the rivers, bay, and estuarine environments. The land provided redwood for house planks and canoes, iris leaves for nets and ropes, grey pines (*Pinus sabiniana*), California hazelnut (*Corylus cornuta* var. *californica*), huckleberry (*Vaccineum ovatum*



PRODUCED AT THE LANPHERE DUNES UNIT, HBNWR
ARCATA, CALIFORNIA
LAND STATUS CURRENT TO: 2000
MAP DATE: 7/1/2008
BASEMAP: HUMBOLDT BAY IMAGERY 2000
HISTORIC SALT MARSH FROM 1870 MAP
CURRENT SALT MARSH FROM NWI

3 1.5 0 3 Kilometers

N

Figure 2. Historic and current tidal marsh surrounding Humboldt Bay.

and *V. parvifolium*), strawberry (*Fragaria* spp.), grass seeds, clover roots and bulbs, ferns, nettles, sea otter (*Enhydra lutris*), Roosevelt elk (*Cervus canadensis roosevelti*), Pacific harbor seal (*Phoca vitulina richardii*), Steller Sea-lion (*Eumetopias jubatus*), and black-tailed deer (*Odocoileus hemionus*) for food and household materials. It was said that the salmon ran so thick in the Mad River and Arcata sloughs you could catch them with a pitchfork (Loud 1918).

The Wiyot people were intricately involved with their environment. They, as many Pacific North Coast peoples, manipulated the tidal flats to harness the productivity of the salt marshes, one of the world's most biologically productive environments (Deur 2005). The tribe modified estuarine soils, plants, and hydrology for the production of root crops. Silverweed (*Potentilla anserina* ssp. *pacifica*) and coast clover (*Trifolium wormskioldii*) were important food sources, which were cultivated in family plots. Root cultivation methods demonstrated a detailed understanding of environmental systems. With EuroAmerican settlement of the region during the 19th century, estuarine cultivation practices were rapidly swept away.

In 1806, the first EuroAmerican explorers arrived at the bay. However, no settlement took place until the 1850s when Humboldt Bay became a place of departure and supply for the gold mines of Trinity and Siskiyou counties. Most of the current agricultural lands around Arcata and the Mad River bottoms were occupied by settlers by 1853.

In the 1850s the Humboldt timber industry began, which greatly impacted the biological functioning of the bay. The timber industry became successful in part by the passage of the Morril Land Act of 1862, which allowed large areas of timber to be purchased for commercial use. Timber exportation prompted the start of the shipping industry for timber and agricultural exports. Early land use changes in the bay were primarily a result of the shipping industry. Docks were built in Eureka and Fields Landing. Fish companies became established at the mouth of the Mad and Eel rivers by 1854. Clams, sharks, Dungeness crab (*Cancer magister*), oysters, shrimp sole, rockfish, and tuna were all harvested for export.

The completion of the Northwestern Pacific Railroad along the eastern margins of Humboldt Bay in 1901 caused major wetland changes. The railroad functioned as a dike, and tidegates were placed at most slough crossings. Many of the wetlands were converted to agricultural lands with seasonal wetlands used for grazing. By 1927, with the construction of Highway 101, most of the marshes east of Humboldt Bay had been diked and drained.

Exotic invasive species have greatly altered the pre-1850 salt marshes (Figure 3). Dense-flowered cordgrass (*Spartina densiflora*), introduced in the late-1800s, is currently the dominant species in many of the bay's salt marshes. The burrowing exotic isopod, *Sphaeroma quoyanum*, is also currently degrading the salt marsh. Within the bay itself there are 95 species of exotic organisms ranging across a variety of taxonomic groups (Boyd et al. 2002).

1.6.4. History of Humboldt Bay NWR Establishment and Acquisitions

In recognition of the area's unique fish and wildlife resource values, and especially the bay's importance to Pacific brant, parts of Humboldt Bay were initially proposed for refuge status in the early 1960s. However, it was not until September 1971 that refuge boundaries were set and acquisition began, officially establishing the Humboldt Bay NWR. An environmental assessment for proposed land acquisitions was originally written in 1974, and updated in both 1980 and 1988. The original refuge boundary included 7,814 acres, which was increased by 1,122 acres in 1989. With this addition, the refuge totaled 8,936 acres.

Approximately 1,081 acres of the Salmon Creek Unit were purchased by the Service in 1989 following expansion of the refuge boundary (1988) to include all of the former McBride Ranch.

In 1998, the 474-acre Lanphere Dunes Unit was donated to the refuge by The Nature Conservancy (TNC).

Ma-le'l Dunes officially became a unit of Humboldt Bay National Wildlife Refuge on August 12, 2005, the culmination of years of cooperative effort. The acquisition of this property and its transfer to the refuge was jointly funded by the Service and State Coastal Conservancy (SCC), and made possible through the collaborative efforts of many, including the SCC, BLM, Center for Natural Lands Management, Friends of the Dunes, the Humboldt Coastal Coalition, Wiyot Tribe-Table Bluff Reservation, and many individual members of the local community. The 160-acre parcel is managed together with the southern 120 acres of the Lanphere Dunes Unit as the Ma-le'l Dunes Unit. The unit bears the Wiyot name for the locale, which was used for thousands of years by the ancestral Wiyot people for fishing, gathering, and implement-making.

Today, the approved refuge boundary consists of a total of 9,502 acres, of which 3,379 acres are owned in fee title.

PRODUCED AT THE LANPHERE DUNES UNIT, HBNWR
ARCATA, CALIFORNIA
LAND STATUS CURRENT TO: 2000
MAP DATE: 3/3/05
BASEMAP: HUMBOLDT BAY IMAGERY 2000

3 1.5 0 3 Kilometers

UTM ZONE 10
NAD 27

Figure 3. Historic and current tidal marsh surrounding Humboldt Bay, including density of non-native dense-flowered cordgrass populations.

1.6.5. Current Management of Humboldt Bay NWR

The primary focus of Humboldt Bay NWR is the enhancement, restoration, and management of a diversity of wetland and upland habitats for the benefit of all the natural resources that those habitats ultimately help sustain. These habitats include a continuum of estuarine, freshwater, riparian and seasonal wetlands; agricultural grasslands; and a large dune-dominated landscape. Another focus of the refuge is its public use, or visitor services, program. This program is geared toward providing quality opportunities for the public to engage in the six priority public uses which were established by Congress: wildlife observation and photography, environmental education and interpretation, hunting and fishing.

Providing support for the habitat and visitor services programs is the primary role of all refuge staff as well as contractors, volunteers, and the Friends of Humboldt Bay NWR. Support includes a wide range of duties including: facilities maintenance, heavy equipment use, habitat management and administrative assistance.

Habitat Management Program

All of the refuge units in South Bay were historically salt and brackish marsh that was diked off by previous landowners more than 100 years ago. These dikes allowed development and changes in land use, and have resulted in alterations in hydrology, sedimentation, and topography. In some locations these dikes have been actively breached (Table Bluff Unit), while at others (Teal Island) nature has/is taking its course. The dikes on the Salmon Creek and Hookton Slough Units have been, and are currently, maintained where there is risk of flooding to adjacent private lands and/or public facilities and infrastructure.

Wetland Management. The Salmon Creek, Hookton Slough, and White Slough Units are all in the floodplain, and flood seasonally every year, generally from November through March. Prior to refuge acquisition, these lands were managed for grazing. Water was drained off the land as quickly as possible through a system of ditches, culverts, and tidegates. Because the refuge has different objectives, the drainage system has been modified with dozens of water control structures to hold freshwater seasonally, creating hundreds of acres of seasonal wetlands in an area historically occupied by salt and brackish marsh. These seasonal wetlands provide migration and wintering habitat for thousands of waterbirds annually.

Estuarine Restoration. In 1989, the Fish and Wildlife Service purchased what is now the Salmon Creek Unit of Humboldt Bay NWR. The previous landowners had rerouted and channelized Salmon Creek and cleared vegetation from the creek/ditch every few years. One of the refuge's initial goals was to restore the channelized portion of Salmon Creek on the refuge. In addition, the upper portions of the watershed had been extensively impacted through timber harvest, livestock management, and rural development, impacts that carried downstream in the form of sediment buildup and aggradation of the stream and slough channels. Currently, the upper Salmon Creek watershed is the BLM-owned Headwaters Conservation Area, which is dedicated to habitat restoration that is expected to reduce sediment input to the watershed.

In 1993, refuge staff and others were able to reroute approximately half of the creek on the refuge into a meandering channel located as close as possible to the historic channel alignment. This creek channel now includes some large woody debris and riparian overstory that provides shade and structure to the creek habitat. The restoration resulted in increased riparian habitat, increased juvenile fish habitat, and improved water quality, however problems and concerns still exist. An aggraded channel bottom (up to 3-5 feet) reduces stream depth and increases water temperatures and sediment deposition. In addition, in 1997, all salmonids that use Salmon Creek (Coho, Chinook, steelhead, coastal cutthroat) were listed as threatened under the Federal ESA. The tidewater goby had already been listed as endangered in 1994.

Salmon Creek Restoration Project Phase I. In 2001, an effort was initiated to significantly modify the tidegates on lower Salmon Creek and on Hookton Slough to improve fish passage, sediment routing, and water quality. It was a collaborative effort that included the refuge, the Pacific Coast Fish, Wildlife and Wetlands Restoration Association (PCFWWRA), California Department of Fish and Game (CDFG), Coastal Salmon Recovery Fund, the Coastal Program managed from the Arcata Fish and Wildlife Office (AFWO), and many local contractors who have contributed and volunteered significant amounts of time and effort to the project. The work was completed in 2008.

Salmon Creek Restoration Project Phase II. Phase II is in the planning stages and will require excavation of approximately one half mile of former creek channel and construction of a small fish screen or other measures to protect fish and to allow seasonal water diversions to flood refuge wetlands. Phase II is needed to complete all the objectives

of Phase I and the restoration of that portion of Salmon Creek on the refuge. It is also expected to significantly improve habitat conditions of the creek up to a mile upstream of the refuge.

Agricultural Grassland Management. The refuge currently manages grazing and haying on the refuge through a cooperative land management agreement with local ranchers, which is based on grazing and haying rates established by the UC Agricultural Extension Office. Grazing and haying provide short grass habitat (2 to 6 inches) primarily used by Aleutian cackling geese, but also wigeon, swans, shorebirds, and other species. Grazing and haying generally occur from late spring (late April to early May) through September or October. The pH of pasture soils is monitored every 3 to 5 years and lime is periodically added as needed to maintain soil conditions favorable to growing pasture grasses. In addition, refuge staff conducts mowing (outside of nesting season) along edges where agricultural grasslands merge into wetland plant communities. This is done throughout the Salmon Creek Unit in places where haying is not feasible to maintain short grass habitat and to control non-native invasive weeds, such as thistle (*Cirsium* spp.).

Dune Restoration. Restoration at the Lanphere Dunes Unit has been ongoing, beginning under ownership by the Lanpheres through 1997 by The Nature Conservancy. In 1998, when TNC donated its holdings at Lanphere Dunes to the refuge, restoration focused on invasive species eradication with associated research on ecosystem function and restoration techniques. Management objectives and associated monitoring plans have been completed for the Lanphere Dunes Unit, and work is ongoing to meet these objectives. In 2003 the refuge created a restoration, management, and monitoring plan for beach pine/Sitka spruce and red alder riparian forest on the Lanphere Dunes Unit (USFWS 2003b) to prioritize forest management tasks. The goal is to restore and maintain the ecological integrity of the native beach pine/Sitka spruce and riparian forest communities. The plan also includes objectives related to monitoring, research, and coordination with tribal entities.

The Ma-le'l Dunes Unit is being restored consistent with a restoration plan prepared as part of a mitigation program funded by California Department of Corrections. This plan includes elements on invasives control, as well as habitat manipulation and revegetation.

The refuge does not currently have a regionally approved Habitat Management Plan. However, the Service expects that an HMP will be developed within 4 years of completion of the CCP.

Invasive Species Management. Invasive plant species are regularly surveyed by staff, volunteers, and partners. The refuge does not currently have an approved Integrated Pest Management (IPM) plan. However, once documented and mapped, an attempt is made to either eradicate or control priority invasive plants throughout the Humboldt Bay NWR using a variety of IPM techniques, including mechanical, cultural, and chemical control methods. Plants controlled in the South Bay units include blue gum (*Eucalyptus globulus*), thistles (*Cirsium vulgare* and *C. arvense*), bristly ox-tongue (*Picrus echioides*), reed canarygrass (*Phalaris arundinacea*), white morning glory (*Calystegia silvatica*), Himalayan blackberry (*Rubus discolor*), and others. Two key invasives that have been found in the area (and could do profound damage to existing habitats), but have not yet reached the refuge are Japanese eelgrass (*Zostera japonica*) and purple loosestrife (*Lythrum salicaria*).

Restoration of salt marsh at the Lanphere and Ma-le'l Units has begun, through collaboration with the State Coastal Conservancy and others, to remove dense-flowered cordgrass (*Spartina densiflora*) and revegetate with native salt marsh species. Successful techniques will be adapted for use at other refuge units and likely at other locations around the bay.

Major invasive plant removal initiatives at the Lanphere and Ma-le'l Dunes have included European beachgrass (*Ammophila arenaria*), yellow bush lupine (*Lupinus arboreus*), ice plant (*Carpobrotus edulis x C. chilense* hybrids), English ivy (*Hedera helix*), a suite of invasive annual grasses, and dense-flowered cordgrass. Management of the first three species is in a maintenance stage, where minor work is needed to prevent new starts or complete eradication of any small persisting populations. English ivy management is nearing a maintenance stage, but requires some additional work. Annual grass management work is still in progress. However, while major progress has been made, control is hampered by off-refuge sources. The cordgrass management initiative has resulted in the restoration of 10 to 15 acres of salt marsh in the Lanphere and Ma-le'l units. All of these initiatives have been carried out using manual or mechanical methods of control.

Herbicides that are periodically used to control invasive plants on the Humboldt Bay NWR include Rodeo, Roundup pro, and Roundup pro concentrate. Prior to any herbicide use on Humboldt Bay NWR, a Pesticide Use Permit is filed in the regional and national office for each herbicide. All pesticide usage is in compliance with labeling instructions and under the direction of a certified applicator. The refuge

does not currently have an approved IPM Plan, but will be developing one within 4 years of completion of the CCP.

Biological Program

Monitoring and Surveys of Fish, Wildlife, and Plants. Monitoring and survey efforts are meant to complement and inform refuge management, and often vary in degree of intensity and/or regularity based on a combination of refuge staffing, funding, and competing priorities. Habitat management is dependent upon biological information collected through monitoring and research, without which managers have little basis for prescribing management actions.

The refuge participates in ongoing partnerships with AFWO and CDFG to monitor lower Salmon Creek and Hookton Slough for salmonids, tidewater goby, and amphibians.

Other wildlife species monitored or surveyed on the refuge or by refuge staff, contractors, or partners include Aleutian cackling geese, western Canada geese (*Branta canadensis moffitti*), Pacific brant, tundra swans (*Cygnus columbianus*), ducks, shorebirds, snowy plover (*Charadrius alexandrinus*), seabirds, passerine birds, deer, otter, and frogs. In addition, birds on the refuge are monitored annually for avian influenza and avian cholera.

In keeping with the management goals and objectives formulated for the Lanphere and Ma-le'l Dune Units, there is ongoing monitoring of the following target plants and plant communities:

- Humboldt Bay wallflower (*Erysimum menziesii* ssp. *eurekense*)
- Beach layia (*Layia carnosa*)
- Pink sand verbena (*Abronia umbellata* ssp. *breviflora*)
- Humboldt Bay Owl's-clover (*Castilleja ambigua* ssp. *humboldtiensis*)
- Point Reyes bird's-beak (*Cordylanthus maritimus* ssp. *palustris*)
- Dune mat plant community
- Salt marsh plant community
- Forest mycoheterotrophs (orchids and other species that are mutualists with mycorrhizal fungi associated with woody plants) and culturally significant geophytes (bulb plants)

Vegetation surveys were conducted for the wetland and dune vegetation of the refuge from 2005-2007. A vegetation classification based on quantitative sampling is still being finalized.

Visitor Services Program

Visitor Services are managed primarily from the Richard J. Guadagno Office and Visitor Center, located on the Salmon Creek Unit of the refuge. It was opened in spring 2002, and accommodates most of the refuge staff. The Center has several high quality interpretive dioramas and a large room for refuge-designed public events and wildlife viewing of the surrounding seasonal wetlands. The refuge hosts a very informative website that provides detailed information about all refuge programs, especially visitor services opportunities (www.fws.gov/humboldtbay). The proposed Visitor Services Plan is included in Appendix B.

Wildland and Wildlife Observation and Photography. Currently, the refuge maintains the 1.75-mile Shorebird Loop Trail on the Salmon Creek Unit, the 1.5-mile Hookton Slough Trail on the Hookton Slough Unit, and ~2 miles of trails on the Lanphere Dunes Unit. All of these trails offer great opportunities for wildlife observation and photography. There is also a photoblind for use at the Salmon Creek Unit.

Refuge staff coordinates with two Friends groups, (Friends of the Humboldt Bay NWR and Friends of the Dunes), and Audubon volunteers who offer guided walks on the refuge units several times per month.

Birdwatching walk. Photo: Shannon Smith

The refuge maintains a non-motorized boat dock at the Hookton Slough Unit as a way to encourage wildlife observation from the bay. The refuge is currently working with the State Coastal Conservancy (SCC), the Humboldt Bay Harbor Recreation and Conservation District, the Redwood Community Action Agency, and Explore Northwest to develop safe, sustainable options for boating access on the bay that minimize impacts to natural resources.

The refuge is also working with the SCC, BLM, and Friends of the Dunes on development of the Ma-le'l Dunes Cooperative Management Area Access Plan. This plan will ultimately provide increased opportunities for the public to enjoy this magnificent dune and slough area south of the Lanphere Dunes Unit. The most recent draft of this plan can be found on the refuge website.

Environmental Education and Interpretation. Currently, the refuge accommodates pre-scheduled classroom visits, drop-in classroom visits, and also on-site visits where volunteers and/or staff go into schools and provide programs. The Friends groups are instrumental in providing these opportunities. The refuge currently offers and/or participates in seven annual special events: the Aleutian Goose Fly-off and Family Fun Weekend the first weekend in March, the Aleutian Goose Festival, Godwit Days, Migratory Bird Day, and the Lupine Bash each spring, Outdoor Youth Days in August, and a celebration for National Refuge Week in October.

Hunting. Hunting on Humboldt Bay NWR is managed in compliance with the 1990 Sport Hunting Management Plan. Waterfowl, coot (*Fulica americana*), and snipe (*Gallinago* spp.) hunting is permitted in accordance with State regulations on most areas of the refuge, including the Eureka Slough, Jacoby Creek, and Table Bluff Units. On the Salmon Creek Unit during the regular waterfowl season a lottery draw hunt is held from shoot time until 3:00 p.m. on Tuesdays and Saturdays. The waters and islands of Hookton and White Slough are open concurrently with over-water shoot days on the bay. The proposed Sport Hunting Plan is included in Appendix C.

Fishing. Fishing on the Humboldt Bay NWR is managed in compliance with the 1992 Fishery Management Plan. Fishing is permitted in Humboldt Bay and in tidal sloughs year round in accordance with State regulations. The Hookton Slough Trail and boat dock are open to fishing; access to other areas is by boat. Limited fishing does occur for sharks and rays, and shellfish on Humboldt Bay NWR. The proposed Sport Fishing Plan is included in Appendix D.

1.6.6. Castle Rock NWR Setting

Castle Rock is a 14-acre island located in Del Norte County, less than a mile northwest of Crescent City. Castle Rock in located on California's northwest coast between Arcata and the Oregon border. Castle Rock remains largely in its natural state, as a rocky nearshore island with little disturbance by people.

1.6.7. Historic Conditions of Castle Rock NWR

The first historic accounts of seabird populations on Castle Rock came from the field notes of Clay, an egg-collector in the early 1900s (Clay 1901-1953 MS). Clay first visited the island in 1916, spent two weeks there in late July 1917, and returned in 1934 and 1935. He reported that Leach's storm-petrels (*Oceanodroma leucorhoa*) were nesting by the "tens of thousands" on the island. Fork-tailed storm-petrels (*Oeanodroma furcata*) and tufted puffins (*Fratercula cirrhata*) were also present and breeding. Another egg-collector, T. Fraser, visited the island around the same time. Altogether, nine seabird species were observed, including common murre (*Uria aalge*), Brandt's cormorant (*Phalacrocorax penicillatus*), western gull (*Larus occidentalis*), and Cassin's auklet (*Ptychoramphus aleuticus*). Ornithologist Robert Talmage (in Osborne 1972) visited the island in the mid-1930s and observed a few double-crested cormorants (*Phalacrocorax auritus*) describing their breeding status as sporadic. He looked for rhinoceros auklet (*Cerorhinca monocerata*) without success. Osborne observed breeding rhinoceros auklets on Castle Rock in 1969-1970. Black oystercatchers (*Haematopus bachmani*) have bred in small numbers on the island since at least the 1930s (Osborne 1972). All of the contemporary seabird species breeding on Castle Rock were present during the early 1900s, as recorded in the notes of early ornithologists.

Over the last century, distinct changes to the vegetation has occurred, as have the populations of seabirds. Unfortunately, the cause and effects of these changes are primarily unknown. Meadow areas once covered with Pacific reedgrass (*Calamagrostis nutkaensis*) have receded and been replaced with goldfields (*Lasthenia maritima*) and sand spurrey (*Spergularia macrotheca*) (Castle Rock NWR plant communities are discussed in detail in Section 3.7.3). Photographs taken in 1935 show reedgrass growing over most of the meadow, covering an estimated 3 acres (Osborne 1972). By 1961 the area covered in reedgrass was reduced by about 50 percent. In 1970, reedgrass covered only 1 acre and was largely replaced by bluegrass (Poa sp.) (Osborne 1972). By 1984 the hummocks of reedgrass

were mostly dead. "Rhizomes and roots were all that was left of the once extensive populations" (Sawyer 1984). In 1989 only a few tussocks remained on the east end of the island (Carter et al. 1992). By 2000 there was no evidence of this species as viewed from shore or boat (D. Jaques unpublished). Aleutian geese have been known to use Castle Rock since at least pre-European times as they are known from Tolowa verbal history. In 1974, there were fewer than 1000 geese using the island and today there are ~20-25,000 which use the island for roosting each winter and spring. The effects of that many geese include impacts on vegetation and substrate, biological contribution of their droppings, and possible exclusion of area to other species due to their large numbers and interspecific behavior.

1.6.8. History of Castle Rock NWR Establishment and Acquisitions

The Service proposed to purchase Castle Rock in 1978 to protect critical habitat for the then-endangered Aleutian Canada goose (now called Aleutian cackling goose) (USFWS 1978). The geese were first detected at Castle Rock in spring of 1975. It was later found that the island and nearby mainland agricultural grasslands were the spring staging ground for virtually the entire population of Aleutian Canada geese (Woolington et al. 1979). The island was recommended for critical habitat status in 1977 (USFWS 1991), and a negative declaration for purchase of the island was completed in 1978 (USFWS 1978). The original proposal included lease acquisition, a Memorandum of Understanding (MOU), and Cooperative Agreements to also preserve nearly 800 acres of grazing habitat on Point St. George.

In 1979, TNC purchased Castle Rock from the G. E. Kibbe Estate. The Service purchased the island from TNC by fee acquisition in 1980 for $41,250, using funds from the Land and Water Conservation Fund. A letter from the Service to TNC on July 5, 1980 stated, "We plan to manage Castle Rock primarily for its values to endangered species (mainly the Aleutian Canada goose) and nesting marine birds (murres, auklets, petrels, etc.)…Like the Farallon Island NWR, Castle Rock would be managed by the FWS as a sanctuary. Human disturbance is the main factor that must be controlled…We would expect to permit a limited amount of research but only that which would have high potential to increase management knowledge of these avian resources."

1.6.9. Current Management of Castle Rock NWR

Castle Rock NWR is so rich with sensitive wildlife species, and the habitat so fragile, that only very limited access for research, monitoring, and management has been allowed. Currently, refuge staff collaborates with San Francisco Bay National Wildlife Refuge Complex (SFBNWRC) and partners such as Humboldt State University (HSU), the Service's Coastal Program at Humboldt Bay, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Coast Guard (USCG) to conduct photo surveys of birds and marine mammals utilizing Castle Rock NWR and associated habitat. Associates from HSU and SFBNWRC maintain remote automatic cameras on Castle Rock NWR used to assess the ecology and populations of nesting seabirds, and are working with the refuge to develop a long-term monitoring plan. Live video from these cameras can be viewed seasonally by the public at the National Park Service (NPS) Visitor Center in Crescent City or over the internet. In addition, the refuge is looking into using this footage to develop short educational/interpretive films appropriate for different grade levels. Interpretive panels highlighting Castle Rock NWR wildlife are located on Pebble Beach Drive, adjacent to the shore overlooking Castle Rock NWR.

1.7. Related Projects and Studies in the Area

1.7.1. U.S. Fish and Wildlife Service, NOAA, and Pacific Flyway Projects and Studies

Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (*Charadrius alexandrinus nivosus****)***
The Pacific coast population of the western snowy plover is listed as threatened under the Federal ESA (USFWS 2007). The Pacific western snowy plover is a small bird that winters mainly in coastal areas from southern Washington to Central America. The Pacific coast population breeds primarily above the high tide line on coastal beaches, sand spits, dune-backed beaches, sparsely-vegetated dunes, beaches at creek and river mouths, and salt pannes at lagoons and estuaries. Habitat degradation, caused by human disturbance, urban development, introduced beachgrass, and expanding predator populations, has resulted in a decline in nesting areas and in the size of the populations (USFWS 2007).

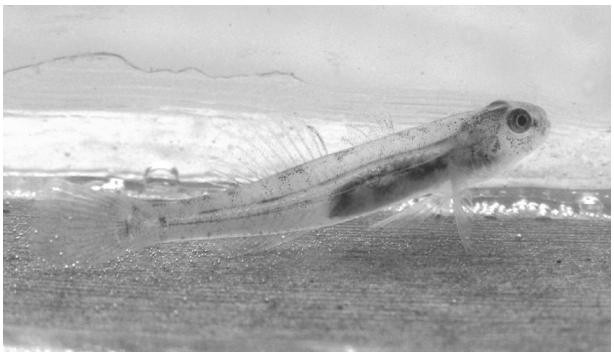
Recovery Plan For the Tidewater Goby (Eucyclogobius newberryi)
The tidewater goby is listed as endangered under the Federal ESA (USFWS 2006a). This small fish inhabits coastal brackish water habitats entirely within California, including portions of the Humboldt Bay NWR, which are identified in the plan as critical habitat.

The tidewater goby is uniquely adapted to coastal lagoons and the uppermost brackish zone of larger estuaries, rarely invading marine or freshwater habitats. Principal threats include loss and modification of habitat, water diversions, predatory and competitive introduced fish species, habitat channelization, and degraded water quality.

Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly (Speyeria zerene myrtleae)
Seven plants and one invertebrate native to the coastal dunes of northern and central California are covered in this recovery plan (USFWS 1998).

Two species, Humboldt Bay wallflower and beach layia, are present on the Humboldt Bay NWR. The recovery plan calls for seven primary actions to be taken to recover the two species:
1. Protect existing populations and habitats.
2. Minimize the threats to the plants.
3. Develop management strategies incorporating ecological and land use strategies.
4. Manage populations and habitats to achieve delisting.
5. Monitor population trends to evaluate recovery success.
6. Coordinate recovery actions to protect other listed and sensitive species.
7. Develop and implement an outreach program.

Final Revised Steller Sea Lion Recovery Plan
Current Species Status: The Steller sea-lion was listed as a threatened species under the ESA on April 5, 1990 (55 FR 12645) due to substantial declines in the western portion of the range.
At the time of listing, the overall abundance of sea-lions in the eastern portion of the range (in southeastern Alaska and Canada) was increasing at approximately 3 percent per year. Critical habitat was designated on August 27, 1993 (58 FR 45269) based on the location of terrestrial rookery and haulout sites, spatial extent of foraging trips, and availability of prey. In 1997, based on demographic and genetic dissimilarities, NOAA Fisheries Service designated two distinct population segments (DPSs) of Steller sea-lions under the ESA: a western distinct population segment (DPS) and an eastern DPS (62 FR 24345, 62 FR 30772). Due to



Tidewater goby. Photo: © Greg Goldsmith

persistent decline, the western DPS was reclassified as endangered, while the increasing eastern DPS remained classified as threatened. The eastern DPS was estimated to number between 46,000 and 58,000 animals in 2002, and has been increasing at approximately 3 percent per year since the late 1970s (Pitcher et al. 2007). Castle Rock NWR is within the range of and used by a portion of the eastern population segment. The Final Revised Steller Sea Lion Recovery Plan can be viewed at http://www.fakr.noaa.gov.

The primary objective of all recovery plans is to manage the threats to and improve the population status of the species sufficiently to warrant reclassification (from endangered to threatened status) or delisting.

Pacific Flyway Management Plan for the Pacific Population of Brant
The goal of the Pacific Flyway Management Plan for the Pacific Population of Brant is to identify the requirements and responsibilities necessary to cooperatively manage the population on a sustained basis (PFC 2002). An essential part of this goal is the continued availability and health of Pacific brant habitats throughout their range, including eelgrass beds and associated habitat in Humboldt Bay and on the refuge.

Pacific brant are found in the United States, Canada, Mexico, Russia, and Japan. As such, a cooperative effort has been, and will continue to be, required for sound management. The winter population objective of Pacific brant for Humboldt Bay is 5,000 (PFC 2002). The overall population objective for Pacific brant is 150,000.

Pacific Flyway Management Plan for Pacific Population of Aleutian Cackling Geese
The goal of the Pacific Flyway Management Plan for Aleutian Cackling Geese is to identify the requirements and responsibilities necessary

to cooperatively manage the Aleutian cackling goose population on a sustained basis (PFC 2006). Essential components of this goal are to reduce the goose population to 60,000, and manage goose habitat on public lands in northern California to the maximum extent practicable in order to reduce depredation impacts on private landowners.

Pacific Flyway Management Plan for the Western Population of Tundra Swans
The purpose of the Pacific Flyway Management Plan for the Western Population of Tundra Swans is to establish guidelines for the cooperative management of the Western Population of tundra swans (PFC 2001).

The goal of the Pacific Flyway Management Plan for the Western Population of Tundra Swans is to ensure the maintenance of the Western Population of tundra swans at a size and distribution that will provide for all their benefits to society. The objectives are to:

- Maintain a population of at least 60,000 swans to provide suitable public benefits.
- Maintain current patterns of distribution throughout the Western Population tundra swan range.
- Provide breeding, migration, and wintering habitats of sufficient quantity and quality to maintain the desired numbers and distribution of swans.
- Provide for aesthetic, educational, and scientific uses of swans.
- Provide for sustainable sport and subsistence harvests of western population tundra swans.

Seabird Conservation Plan, Pacific Region
The Seabird Conservation Plan identifies the Service's priorities for seabird management, monitoring, research, outreach, planning, and coordination (USFWS 2005). The Seabird Conservation Plan prioritizes all species at a regional scale (California, Oregon, Washington, Hawaii, and U.S. Pacific Island commonwealths, territories, and possessions), and identifies prioritized recommendations for conservation actions.

Objectives and strategies with implications for Castle Rock NWR include:

- 7.g.(i). Count archived common murre and cormorant aerial photographs from 1980 through the present from California and Oregon colonies. Highest priority to photographs taken 1995 through the present.
- 10.a. Develop K-12 curricula on seabirds with specific chapters on the California Current System and tropical/subtropical island systems.

Tundra swans at the Salmon Creek Unit.
Photo: USFWS

Southern Pacific Shorebird Conservation Plan
The Southern Pacific Shorebird Conservation Plan (Hickey et al. 2003) identifies priority shorebird species, habitats, sites and conservation actions within coastal California and the Central Valley. It specifically identifies Humboldt Bay as one of 25 Coastal Wetlands of Importance to shorebirds in the region. Specific conservation actions for Humboldt Bay include:

- Prohibit further alteration of tidal flats for oyster culture.
- Eliminate the introduced salt-water cordgrass from the tidal flats of Humboldt Bay.
- Protect seasonal wetlands and pastures important to shorebirds from development.

Lower Salmon Creek Delta Salmonid Habitat Enhancement Opportunities: Humboldt Bay NWR
In 2003, the Lower Salmon Creek Delta Salmonid Habitat Enhancement Opportunities document (Salmon Creek Restoration Plan) was funded through the CDFG's Coastal Salmon Recovery Fund (PCFWWRA 2003). The Salmon Creek Restoration Plan identifies opportunities for salmonid habitat restoration and improved salmonid access on Humboldt Bay NWR's Salmon Creek Unit and is the template for ongoing restoration work there.

1.7.2. California Department of Fish and Game Projects and Studies

California Wildlife Action Plan
In compliance with the Congressionally enacted State Wildlife Grants Program, CDFG created the California Wildlife Action Plan (comprehensive wildlife conservation strategy) (CDFG 2007). A

major component of the Wildlife Action Plan is to identify and compile information on wildlife species, including low and declining populations that are indicative of the diversity and health of the State's wildlife populations.

The CDFG uses a Special Animals List, which is maintained and updated within the California Natural Diversity Database (CNDDB). This list is commonly referred to as the list of special status species. Many of the special status species have been identified as Species of Special Concern due to their low or declining numbers. In addition, the Wildlife Action Plan regional chapters describe major problems and threats that may adversely affect wildlife and their habitats within each region.

Recovery Strategy for California Coho Salmon
The CDFG, with the assistance of recovery teams representing diverse interests and perspectives, created the Recovery Strategy for California Coho Salmon as a guide for recovering Coho salmon on the north and central coasts of California (CDFG 2004a).

Five primary goals have been identified to recover Coho salmon on the north coast of California:
1. Maintain and improve the number of key populations and increase the number of populations and cohorts of Coho salmon.
2. Maintain and increase the number of spawning adults.
3. Maintain the range, and maintain and increase distribution of Coho salmon.
4. Maintain existing habitat essential for Coho salmon.
5. Enhance and restore habitat within the range of Coho salmon.

1.7.3. Other Pertinent Projects, Programs, and Documents

Wiyot Tribe Restoration Project on Indian Island
Indian Island, the largest contiguous salt marsh area left in Humboldt Bay, provides food and shelter for hundreds of species of native plants, fish, shellfish, and birds.

Around 1870, a shipyard repair facility was built on the property now owned by the Tribe. This shipyard operated until the 1980s. Creosote, solvents, and other chemicals used to maintain ships remain. Dilapidated buildings and tons of scattered metal and wood debris still litter the area. Remains of dikes and drains built by settlers to control tidal flow across the island still impact the land, and continue to degrade valuable habitat.

The Table Bluff Reservation/Wiyot Tribe plans to clean up the debris and pollutants left on the village site. The Tribe is exploring ways to restore the natural waterways of the area to allow the bay to interact more naturally with the tidal marsh area, increasing native plant and fish populations. The result will be a cleaner place for people, surrounded by more productive and diverse habitats for wildlife.

The Bureau of Land Management
The Bureau of Land Management manages lands that directly impact both refuges of the Complex. They manage the Headwaters Reserve, which includes the headwaters of both Elk River and Salmon Creek. These terminate in Mid and South Bay respectively. BLM also manages South Spit, which is owned by CDFG. On the North Spit, BLM manages additional lands, including part of the Ma-le'l Dunes Cooperative Management Area. The Ma-le'l Dunes Cooperative Management Area consists of the BLM's Manila Dunes and the refuge's Ma-le'l Dunes Units. This 444-acre stretch of dune and wetland habitats is managed cooperatively by USFWS and BLM. Partners in this project include the State Coastal Conservancy; the Wiyot Tribe, Blue Lake Rancheria, and Bear River Band of Rohnerville Rancheria; Friends of the Dunes; and the Redwood Gun Club.

In addition, BLM manages the California Coastal National Monument, which includes all the rocks, reefs, and islands of the California coast not owned by the Service, National Park Service, or other entities.

Pacific Coast Joint Venture Northern California Component
The Pacific Coast Joint Venture (PCJV) was established in 1991 to implement the North American Waterfowl Management Plan of 1986 to restore waterfowl populations of the Pacific Coast in Canada, the United States, and Mexico to the levels recorded during the 1970s (PCJV 2004). The PCJV partners have acquired and restored important wetlands, including portions of the Humboldt Bay NWR.

State Coastal Conservancy
The State Coastal Conservancy is involved in multiple projects and planning efforts on the north coast, including the Ma-le'l Dunes Cooperative Management Area, Aleutian Cackling Goose Management, *Spartina* Control Research and Implementation, and Humboldt BayTrails Projects (both water-based and land-based).

The Humboldt County Dunes Cooperative
This cooperative consists of Federal, State, Tribal, local, and private entities that work together to

research, evaluate, prioritize, and implement dune conservation and restoration in Humboldt County. One of their first projects was the Coastal Dune Mapping Project, which will result in the classification and mapping of all dune vegetation in Humboldt County.

Friends of the Dunes

Plans are currently underway to transform the ocean and bay view property formerly known as the Stamps House into a "gateway to the dunes." Featuring an interpretive nature center, restrooms, ample parking, and a marked trail system, the Humboldt Coastal Nature Center will provide the community with an easy point of entry to the coastlands and dune trails that will connect to the Ma-le'l Dunes Cooperative Management Area to the north, and Manila Community Services District to the south. The linked trail system will provide visitors with access to ~1,000 acres of coastal dune habitats, and the nature center and an adjacent loop trail will be wheelchair accessible. In addition, the facility will serve as a home base for the Friends of the Dunes ongoing education and restoration activities.

Humboldt/Del Norte County Weed Management Area

This group's purpose is to effectively manage, coordinate, and implement the invasive plant species programs among the BLM, U.S. Forest Service, NPS, US Fish and Wildlife Service, California State Parks, CDFG, California Department of Transportation, Humboldt County, Del Norte County, Natural Resource Conservation Service (NRCS), Humboldt County Resource Conservation District, California Cattlemen's Association, California Department of Food and Agriculture, UC Cooperative Extension, City of Eureka, City of Arcata, Friends of the Dunes, Center for Land Management, Manila Community Services District, and the North Coast Chapter of the California Native Plant Society. The groups have mutually agreed to:

1. Participate and/or cooperate in the development of a Weed Management Plan, which will be created for the Humboldt-Del Norte County Weed Management Area (WMA).
2. Share information among cooperators and provide assistance and expertise regarding alien species management (e.g., control methods, introduction prevention measures, restoration tools) activities on their units.
3. Provide opportunities to outside interest groups, private landowners, and the public for involvement in carrying out the Weed Management Plan on lands within the Humboldt-Del Norte County WMA.

The Humboldt Bay Management Plan

In order to balance port-related commercial and industrial uses, expanding recreational uses, and environmental protection, a planning document for Humboldt Bay was deemed necessary by the Humboldt Bay Harbor, Recreation and Conservation District (HBHRCD 2007). The HBMP is the region's first ecosystem-based management approach intended to improve the management of Humboldt Bay. The Humboldt Bay Management Plan (HBMP) is a large cooperative project funded by Federal, State, and local agencies. Many Conservation Element Policies from the HBMP are relevant to Service cooperation with other regional organizations and management of Humboldt Bay NWR. The Humboldt Bay Management Plan contains a tremendous amount of information on the history of development and the natural ecology of Humboldt Bay (www.humboldtbay.org).

Humboldt Bay Ecosystem Program

The Humboldt Bay Ecosystem Program (HBEP) is a relatively new ecosystem-based management program coordinated by the Eureka Sea Grant Office (UCANRP 2007). The mission of the HBEP is to increase the scientific understanding of the Humboldt Bay ecosystem and to create an integrated framework for resource management and collaboration that links the needs of people, habitats and species to ensure a healthy future for Humboldt Bay's natural and human communities.

The HBEP defines ecosystem-based management as a comprehensive process of integrated resource management that considers the entire ecosystem, including humans. It integrates the best available scientific, traditional and local knowledge, is geographically specific, defines management based on ecological boundaries, addresses complexities of natural processes and social systems, considers multiple simultaneous factors influencing management, and is collaborative, integrating social and environmental goals. The purpose of this project is to develop practical implementation of an ecosystem approach.

The foundation for this program is two community based plans, the Humboldt Bay Management Plan and the Humboldt Bay Watershed Salmon and Steelhead Conservation Plan. Issues, priorities and recommendations in these plans were used to develop ecosystem-based management approaches to sediment dynamics, governance, ecosystem and socio-economic indicators concept proposals. These proposals will be further developed and explored in 2009.

The Humboldt Bay Watershed Salmon and Steelhead Conservation Plan

The Humboldt Bay Watershed Salmon and Steelhead Conservation Plan compiles and evaluates watershed information, with a list of high priority goals and objectives aimed at protecting and/or restoring watershed processes to preserve and enhance salmon and steelhead habitat (HBWAC, RCAA 2005). The Salmon and Steelhead Conservation Plan was developed by the Humboldt Bay Watershed Advisory Committee (HBWAC), a diverse group of watershed stakeholders, "to improve the Humboldt Bay watershed's anadromous salmonid populations and related resources while considering regional ecological and socioeconomic needs."

Steller sea-lion. Photo: © Ron LeValley

Other Wetland Habitat Restoration Projects

Other wetland habitat restoration projects in the Humboldt Bay/Eel River area include the City of Arcata's McDaniel Slough and Baylands Restorations, and collaborative efforts involving the Service, CDFG, the Redwood Community Action Agency (RCAA), and other parties on Jacoby Creek, Gannon Slough, Rocky Gulch, Washington Gulch, Cochrane Creek, Fay Slough, Freshwater Slough and Wood Creek, Martin Slough, Elk River, and Salmon Creek on Humboldt Bay, and the Salt River (tributary on the lower Eel River). Service staff of the Partners for Fish and Wildlife Program and the Coastal Program at Humboldt Bay have provided funds and technical assistance to many of these projects.

Humboldt Bay Initiative

The Humboldt Bay Initiative seeks to bring people together to help envision the desired future state of the Humboldt Bay ecosystems, to help understand past, current and future conditions, and to move forward in the spirit of collaboration towards a sustainable and dynamic future. In order to address priority stresses to the ecosystems due to human activities, climate change, excessive sediment, and invasive species, the Humboldt Bay Initiative proposes a set of strategies that help create the conditions necessary for a shared vision of the future. Through an ecosystem-based management approach, the Humboldt Bay Initiative enhances integrated management to address these stresses with strategies to adapt to climate and coastal change, coordinate a response to invasive species, study and control sediment sources, promote sustainable community development, and ultimately support integrated forest management. The project team includes Federal, state and local agencies, and other partners. The USFWS Coastal Program and USFWS Humboldt Bay National Wildlife Refuge have been actively involved. A final report was released in May 2009 (Schlosser et al. 2009).

Marine Mammal Monitoring Surrounding Castle Rock NWR

The NOAA Fisheries Service monitors pinnipeds on and surrounding Castle Rock NWR. The Southwest Fisheries Science Center (SWFSC) conducts a Pinniped Aerial Surveys Project, which includes censuses at the refuge. Surveys are flown for breeding elephant seals in February, harbor seals in May to July, and Steller's and California sea-lions in July. Surveys are conducted at an altitude of either 750 to 800 feet, or 1400 feet, depending on the camera equipment used and sensitivity of marine mammals at a particular location. Stock assessment reports are produced and are available online (swfsc.noaa.gov). The reports generally do not provide specific information for Castle Rock NWR populations, but can be used to assess regional trends.

2. The Planning Process

2.1. Planning Process Policies

Service policy, the Improvement Act, and NEPA provide specific guidance for the planning process, such as seeking public involvement in the preparation of the Environmental Assessment document. The development and analysis of a reasonable range of management alternatives within the EA include a no action alternative (Alternative A) that reflects current conditions and management strategies for both refuges in the Complex. Management alternatives were developed as part of this planning process (see Appendix E: Environmental Assessment).

2.1.1. The Planning Process

Part of comprehensive conservation planning includes preparation of a NEPA document. Key steps in the CCP planning process and the parallel NEPA process include (Figure 4):

- Preplanning and Team formation
- Public Scoping
- Identifying issues, opportunities, and concerns
- Defining and revising vision statement and refuge goals
- Developing and assessing alternatives
- Identifying the preferred alternative plan
- Draft CCP and EA
- Revising draft documents and releasing final CCP
- Implementing the CCP
- Monitoring / Feedback (Adaptive Management)

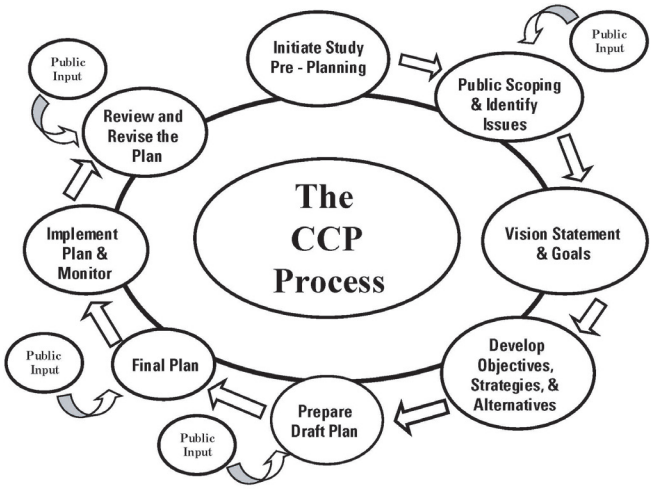


Figure 4. The CCP planning process.

2.2. Humboldt Bay NWR Complex CCP Process

Preliminary CCP planning began with information gathering in the fall of 2006. The official process began on January 29, 2007, when a Notice of Intent to prepare a CCP and EA published in the Federal Register (Vol. 72, No. 18, p. 4020). The Notice of Intent requested that the public submit comments on the scope of issues to be considered in the CCP and EA by March 15, 2007. A core planning team was established to prepare the CCP and EA. Planners, biologists, and managers from the Service formed the core planning team. The extended planning team included members of tribal governments, Service archaeologists, and specialists from various relevant disciplines. Elected officials and State resource agencies were offered briefings on the CCP/NEPA process and were invited to provide input on Complex management. CCP briefings were provided to representatives of interested County, State, Congressional, and Tribal governments. Meetings were held with the planning teams throughout the process to discuss various planning issues and develop vision statements, goals, alternatives, objectives, and strategies, as well as to share information about the Complex.

2.2.1. Public Involvement During Public Scoping Meetings and Initiation of CCP/NEPA Process

Prior to public scoping meetings, the Complex issued a press release to many local media outlets such as local radio stations including KHSU, KHUM, KSLUG, and KEKA; local newspapers including the Eureka Times Standard, Eureka Reporter, Humboldt Beacon, EcoNews, and the North Coast Journal; and local television stations including FOX, ABC, NBC, and PBS (community

calendar). Flyers advertising the public meetings were posted on community bulletin boards by members of the Service in January of 2007. Service staff provided an interview to a local television news show and to a radio station prior to the public meetings. A planning update was distributed in January 2007 to interested stakeholders that had been identified through prior planning processes. An issues workbook was also distributed to the mailing list and at public meetings to help focus public input on issues relevant to the CCP.

2.2.2. Public Scoping Meetings

Three Public Scoping Meetings were held in Del Norte and Humboldt counties to receive public input on the scope of the Complex's CCP and associated NEPA document. Each public scoping meeting consisted of a presentation by Service staff on the CCP/NEPA process, a presentation on the history of the Complex's refuges, questions and answers, and documentation of public comments. The majority of each public meeting was spent documenting public comments.

The first meeting was held on February 13, 2007, at the Del Norte Family Resource Center from 6:00 p.m.–8:30 p.m. in Crescent City, CA. Five members of the public attended the meeting. The second meeting was held on February 15, 2007, at the College of the Redwoods from 5:30 p.m.–8:00 p.m. in Eureka, CA and 23 members of the public attended and signed in. The third meeting was held on February 17, 2007 at the Humboldt Area Foundation from 2:30 p.m.–5:00 p.m. in Bayside, CA and 14 members of the public attended and signed in. Members of the public attending the meetings were encouraged to also submit written comments by March 15, 2007. Copies of the Issues Workbook were distributed to interested stakeholders at the meetings.

2.2.3. Supplemental Request for Comments on Castle Rock NWR

Due to Castle Rock NWR's seasonal popularity, primarily related to birding events, the Service attempted to obtain additional public input on the CCP by distributing an additional planning update to members of the public attending the annual Aleutian Cackling Goose Festival during the week of April 2, 2007. The second planning update encouraged the public to provide comments on the future management of Castle Rock NWR by May 17, 2007.

2.2.4. Comments Received During Scoping

A complete list of public comments received orally and in writing during the public scoping process are contained in Appendix M: Public Involvement Process. Hundreds of comments were received during the public scoping meetings on a wide variety of Complex management topics. In total, 14 completed issues workbooks were returned during the public scoping period. In total, 13 letters or e-mails were received during the open comment period. In addition, three sets of written comments were turned in during public meetings.

2.2.5. Public Involvement During the Public Comment Period for the Draft CCP/EA

Appendix R presents a detailed summary of all comments received in response to the Humboldt Bay National Wildlife Refuge Complex Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) during the 45-day public comment period. Public comments on the Draft CCP/EA were accepted from February 6, 2009, through March 23, 2009. Also included in the Appendix are the Service's responses to comments and a summary of the changes made between the draft and the final versions of the Comprehensive Conservation Plan and Environmental Assessment.

3. Refuge Resources

3.1. Overview of Humboldt Bay NWR

California's north coast ecoregion is a unique area where the southern extension of the temperate coastal rain forests of the Pacific Northwest meet the relatively drier coastal forests of California. The north coast region is characterized by mountain ranges that parallel the coast, ranging in elevation from sea level to over 4,000 feet. Ocean currents and plate tectonics combine to produce long narrow valleys and large rivers that produce rich estuaries as they drain into the Pacific Ocean. Foggy forested mountain ranges descend into remnants of once vast coastal marshes. A variety of habitat types still exist along the coast supporting a wide diversity of flora, fauna, recreational uses, and resource economies. Northern California's coastal habitats include grasslands, terrace prairies, dunes, marshes, eelgrass beds, mudflats, and diverse forest types. Lowland areas near the north coast are dominated by coastal redwood, Sitka spruce, and Douglas-fir forest. Inland ecosystems include Douglas-fir/tanoak forest, Oregon oak woodland, annual grasslands, and mixed broadleaf/coniferous evergreen forests.

3.1.1. Humboldt Bay NWR Physical Environment Geography and Climate

The Humboldt County coast has a Mediterranean climate characterized by moderate temperatures, heavy precipitation, with many foggy days throughout the year (HC 2001). The average annual precipitation for Eureka, California, just north of the Complex, is 38.10 inches as recorded for the period 1887–2003. Record annual average precipitation rates range from a high of just over 67 inches in 1983 to a low of about 21 inches in 1929. In this coastal area the rainy season lasts from October through April, accounting for 90 percent of its annual precipitation. Table 1 displays the average monthly and annual precipitation data for Eureka, CA (WRCC 2007). On December 27, 2002, a new all-time record was set for maximum daily rainfall for any calendar day in Eureka, 6.79 inches of rain, breaking the previous record of 5.04 inches set in 1950. This event also broke the 24-hour rainfall record of 6.32 inches set 1996. Prevailing winds during spring and summer are from the northwest (WRCC 2007). Winter storms can bring winds, generally from the south or southwest, sometimes exceeding 55 to 69 miles per hour.

The climate of the Humboldt Bay NWR is completely maritime with high humidity prevailing throughout the year. The rainy season begins in October and continues through April, with the refuge receiving ~40 inches of rainfall annually (WRCC 2007). The dry season from May through September is marked by considerable fog or low cloudiness that usually clears by late morning. Temperatures are moderate throughout the year. The usual yearly range is from lows near 35°F (2 °C) to highs near 75 °F (24 °C). Summer temperatures are generally between 46 °F (8 °C) and 75 °F (24 °C).

3.1.2. Humboldt Bay NWR Global Climate Change and Sea Level Rise

The recent warming trend of the global climate is unequivocal, and is confirmed by observations of increases in global average air and ocean temperatures and rising mean sea level (IPCC 2007). Global average temperature increased 0.74°C in the past 100 years and is expected to increase another 0.4°C in the next 20 years (Hazeltine 2008). For the next two decades a global warming of about 0.36 °F (0.2 °C) per decade is expected to occur (IPCC 2007). Continued greenhouse gas emissions at or above current rate would cause further warming and may induce changes beyond those seen in the twentieth century (IPCC 2007).

Since at least the twentieth century, sea levels have been rising in correlation with the overall globally increasing temperatures. Sea level rise can occur from both land-based ice melting and thermal expansion of ocean water. As land-based ice melts and flows into the oceans, the volume of liquid water in the world's oceans increases. As ocean temperatures increase, water expands to a greater volume than the same amount of water would at a lower temperature.

Between the period of 1961–2003, sea level rose by an average rate of 0.07 inch per year, totaling a 2.94 inch increase over the period (IPCC 2007). Notably,

Table 1. Monthly and annual precipitation data for Eureka, CA (near Humboldt Bay NWR), from 1948 through 2007 (adapted from WRCC 2007).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	54.4	55.5	55.5	56.4	58.7	60.8	62.0	62.9	63.0	61.1	58.0	54.9	58.6
Average Min. Temperature (F)	41.4	42.6	43.1	44.6	47.8	50.6	52.4	53.1	51.3	48.1	44.8	41.8	46.8
Average Total Precipitation (in.)	6.82	5.43	5.26	3.02	1.67	0.64	0.15	0.33	0.75	2.66	5.70	7.12	39.54
Average Total SnowFall (in.)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Period of Record : 7/1/1948 to 12/31/2007
Percent of possible observations for period of record.
Max. Temp.: 99.8% Min. Temp.: 99.8% Precipitation: 99.8% Snowfall: 99.8% Snow Depth: 99.8%
Source: http://www.wrcc.dri.edu/summary/Climsmnca.html

the average rate of sea level rise nearly doubled over the period of 1993–2003 to ~0.12 inch per year (IPCC 2007).

Globally, approximately 20 to 30 percent of species will be at increasingly high risk of extinction by 2100 if global mean temperatures exceed a warming of 2 to 3 °C above pre-industrial levels (medium confidence) (IPCC 2007).

Climate Change and Sea Level Rise in the U.S.
The U.S. Department of the Interior issued an order (Order Number 3226, January 19, 2001) requiring Federal agencies under its direction with land management responsibilities to consider potential climate change effects as part of long-range planning endeavors.

Parmesan and Galbraith (2004) discuss the many important impacts of global climate change that have already been detected in U.S. ecosystems and stress that climate change should be a primary consideration in the preservation of biodiversity. Important conclusions from their analysis of the observed impacts of climate change on U.S. ecosystems include:

1. The timing of important ecological events, including plant flowering and wildlife breeding, has shifted in conjunction with changes in U.S. climate.
2. Ranges of some plants and animals have shifted northward and upward in elevation, or contracted.
3. Species composition within communities has changed in concert with local temperature rise.
4. Findings that climate change is affecting U.S. ecosystems are consistent across different geographic scales and species.
5. Species range contractions are more likely than simple northward or upslope range shifts.
6. Reducing adverse effects of climate change on ecosystems can be facilitated through a broad range of actions, including adaptive management, providing transitional habitat between preserved areas, and alleviating non-climate change stressors.

Climate Change and Sea Level Rise in California

During the next few decades, average temperatures in California are expected to rise between 1 and 2.3 °F (CCCC 2006). Major changes to California's precipitation are not predicted to occur over the life of this CCP, but are likely to occur over the next century (CCCC 2006).

Smerling et al. (2005) projected localized sea level rise for each U.S. state. According to their projections, California will experience a sea level rise of between 1.26 inches (low, historic extrapolation), to 2.96 inches (medium, 50 percent probability), to 6.0

inches (high, 5 percent probability) sea level rise by 2020 (Smerling et al. 2005). Their projections predict even greater increases over the next 50 to 100 years, which is beyond the intended scope of this CCP.

In addition to the relatively steady impacts likely to occur from global trends, sea levels along the California coast are expected to undergo more variability above or below predicted tide levels because sea level rise will coincide with decadal oscillations (Cayan et al. 2006), such as the ENSO and LNSO (see Section 3.6.2). Historically, the highest Pacific coastal sea levels have occurred when winter storms and Pacific climate disturbances, such as El Niño, have coincided with high tides (Cayan et al. 2006). More recently, based on a set of climate scenarios prepared for the California Energy Commission's Public Interest Energy Research (PIER) Climate Change Research Program, Cayan et al. (2008) project that, under medium to medium-high emissions scenarios, mean sea level along the California coast will rise from 1.0 to 1.4 meters by the year 2100. It is important to note that most climate models fail to include ice-melt contributions from the Greenland and Antarctic ice sheets, and as a result, the potential increase in mean sea level may be much higher (Herbreger et al. 2009).

Climate Change and Sea Level Rise for Humboldt Bay NWR

Considering that nearly one third (161 of 548) of refuges are coastal, sea-level rise is a highly significant factor in Refuge System management and planning. Shriner and Street (1998) estimate that a rise of ~20 inches (50 centimeters) in sea level could lead to the loss of 50 percent of North American coastal wetlands. Major effects of sea-level rise on coastal refuges include inundation and loss of terrestrial habitats, saltwater intrusion and an increase in frequency and severity of flooding events. All of these factors have the potential to alter ecosystem dynamics. In some cases, wetlands may move inland in response to sea-level rise (Shriner and Street 1998), but in many cases this possibility is compromised by coastal development (Bedoya et al. 2008). This is very much the case around Humboldt Bay.

The south Humboldt Bay NWR units are, in part, below mean high water level and are currently protected by dikes. This elevation makes many of the southern unit habitats vulnerable to dike failures, particularly as sea level continues to rise. The current elevation of these units below mean high water is largely due to land subsidence caused by draining lands for agriculture combined with anthropogenic modification of streams, which has changed sediment recruitment and distribution. There are methods being studied by the U.S. Geological Survey in the Sacramento Delta to use wetland vegetation (cattail and tules) to increase soil elevations. At one site on Twitchell Island, soil elevations have risen 1 to 2 feet in 15 years. This process, as well as better information on current sedimentation rates and distribution should be studied in the Humboldt Bay area.

As noted in the previous section, mean sea level along the California coast is estimated to rise from 1.0 to 1.4 meters by the year 2100 (Herbreger et al. 2009). Hazard maps showing the extent of coastal flooding and erosion under one scenario of sea level rise for the Humboldt Bay NWR and Castle Rock NWR areas are included in Appendix P. These hazard maps were prepared by researchers at the Pacific Institute, with support from the California Energy Commission, California Department of Transportation, and the Ocean Protection Council. While various climate change models differ in their predictions, all agree that sea level will continue to rise over the 15-year life of the CCP. Given the current predictions of sea level rise, it is unlikely that most of the Complex habitat would be substantially affected by sea level rise over the next 15 years. However, without further action, likely future impacts from global climate change and sea level rise on the Humboldt Bay NWR include:

- Foraging habitat for wintering and migrating shorebirds may suffer severe losses as sea level rise inundates current intertidal foraging areas (Galbraith et al. 2002).
- Changes in the timing of migration and nesting of birds could put some bird species breeding and migration cycles out of synchronization with the life cycles of their food sources.
- Changes in ocean currents could put marine mammal breeding out of synchronization with the migration of primary prey species that provide food at critical life stages, such as pup rearing.
- Changes in precipitation and temperature may affect the population dynamics of plants of dune and marsh communities (including listed species)
- Shifts in ranges of both native and invasive plant species may cause extirpations on the refuge, increase management needs, and result in significant changes to community composition.
- Changes in the ecosystem dynamics (precipitation and temperature) of headwater forests could impact sedimentation, temperature, dissolved oxygen, and other habitat parameters on lower Salmon and Jacoby Creek on Humboldt Bay NWR.
- Changes in rainfall, storm patterns, sedimentation, littoral transport, and wind speed could affect dune stability/migration, and may affect plant communities on dunes and salt marshes.

- Continuing changes in sea level, sedimentation, turbidity, currents, and wave energy could affect estuarine plants including eelgrass and salt marsh species.
- Continuing changes in winter storm frequencies and relatively minor increases in tidal heights could dramatically increase costs to maintain some refuge infrastructure, such as dikes and tidegates.

The Service is working with partners to reduce the effects of climate change on fish, wildlife, and their habitats (plant communities). Much of the land within the current approved refuge boundary is within the zone of impact for projected sea level rise. The Service continues to seek appropriate lands that would buffer refuge lands and help mitigate over time the effects of sea level rise and climate change by providing broader opportunities for migration of plants and wildlife. The refuge staff will evaluate appropriate opportunities to expand the approved boundary to increase the resilience of wildlife and their habitats as they adapt to changes in climate. For more information on how the Service is working with others to conserve the nature of America in a changing climate, visit http://www.fws.gov/home/climatechange/ .

3.1.3. Humboldt Bay NWR Hazardous Materials and Contaminants

An inactive nuclear reactor is located adjacent to Humboldt Bay. The reactor operated from 1963 to 1976 (RCEA 2005). In 1976, the plant was shut down for a normal refueling and subsequently a number of unresolved seismic issues led Pacific Gas & Electric (PG&E) to keep the plant shut down for an extended period of time. In 1984, the fuel was removed from the reactor vessel and the plant was inactivated, with spent nuclear fuel rods stored in water pools on site (RCEA 2005). More recently, PG&E announced its intent to remove 390 spent (irradiated) fuel rods from the pool at the plant, and place them in on-site steel containers called dry casks pending permanent removal (RCEA 2005). While in the local area, the inactive nuclear reactor is not known to pose any foreseeable risk to the Humboldt Bay NWR.

In late 2006, the California Water Resources Control Board placed Humboldt Bay on its list of water bodies impaired by dioxins. Dioxins are a group of chemical compounds that share certain chemical structures and biologically active characteristics. In laboratory animals dioxins are highly toxic, can cause cancer, and alter reproductive, developmental, and immune system function (NIH 2007). Studies have shown that exposure to dioxins at high doses can cause a number of adverse health effects (USEPA 2006). Although they are at low levels in food, some dioxins are very slowly removed from the body and accumulate in human fat tissue (NIH 2007). Chlorine bleaching of pulp and paper, certain types of chemical manufacturing and processing, and other industrial processes that have occurred around Humboldt Bay, can create dioxins (USEPA 2006).

No area within the Humboldt Bay NWR is listed as a hazardous waste site by the U.S. Environmental Protection Agency.

3.1.4. Humboldt Bay NWR Air Quality

Air Pollution Control Agencies

The Federal Clean Air Act (42 U.S.C. §§ 7401, as amended) mandates the establishment of ambient air quality standards and requires areas that violate these standards to prepare and implement plans to achieve the standards by certain deadlines. The deadline for attaining both the ozone and carbon monoxide standards was August 31, 1988. Areas that do not meet Federal primary air quality standards are designated as “nonattainment” areas. Areas that comply with Federal air quality standards are designated as “attainment” areas. Attainment and nonattainment designations are pollutant specific. The Federal Environmental Protection Agency (EPA) sets health protection standards for 8 substances called “criteria pollutants.” Humboldt and Del Norte counties are in attainment of Federal EPA standards for these criteria pollutants, including carbon monoxide, nitrogen dioxide, sulfur dioxide, sulfates, and lead; however, they are nonattainment areas and do not meet State standards for particulate matter less than 10 microns in diameter (PM10). Del Norte County is unclassified for hydrogen sulfide; Humboldt County is classified as an attainment zone for hydrogen sulfide. Both counties are unclassified for visibility reducing particles.

In the winter months, the air quality in Humboldt, Del Norte and Trinity County does not fully meet the State health standards for clean air. The two pollutants of greatest concern are ozone and particulate matter. The ambient air in portions of the air quality management district (AQMD) with Humboldt County exceeds the State PM10 standard during many of the winter months. Some sources of particulates in Humboldt County include automobile emissions, saw pulp mills, and residential home heaters (wood stoves). Geographic features that adversely influence air quality include mountains and valleys that trap stagnant air (North Coast

Unified Air Quality Management District) http://www.ncuaqmd.org/.

Many agencies are involved in air pollution control, including the U.S. Environmental Protection Agency (USEPA 2006), California Air Resources Board (ARB), and air quality management districts (AQMDs).

In California, all agricultural burning is regulated jointly by the ARB and local AQMDs. Each day the ARB determines, based on recent and anticipated weather conditions, whether the following day will be a permissible burn day or a no-burn day. Each ARB's primary objective in making this determination is to control the amount of smoke from agricultural burning that reaches urban areas. On permissible burn days few restrictions are placed on the amount of land that may be burned in the region. On no-burn days fields may be burned only if a special permit has been issued by the local AQMD. Such burn permits are allocated based on an estimated allowable acreage for the entire region, or air basin. Air basin boundaries generally follow political boundary lines and are defined to include both the source area and the receptor area. Both refuges in the Complex fall within the North Coast Air Quality Management Basin, which includes Del Norte, Humboldt, Mendocino, and Trinity counties, and a portion of Sonoma County (ARB 2005).

Ambient Air Quality Standards and Quality in the North Coast Air Quality Management District

Both the State of California and the Federal government have established a variety of ambient air quality standards. The North Coast Air Quality Management District (NCAQMD) collects and analyzes ambient air samples to determine concentrations of regulated pollutants within the North Coast Air Quality Management Basin. There are three monitoring sites where samples are collected: Crescent City, Eureka, and Weaverville. By analyzing the samples, the NCAQMD is able to determine the concentration of particulate matter less than 10 microns (PM10) and less than 2.5 microns (PM2.5). Air quality data is reported to a Federal database maintained by the U.S. Environmental Protection Agency. The following discussion focuses on the ambient standards and existing concentrations for PM10 because the ambient air in portions of the NCAQMD exceeds the State PM10 standard during many of the winter months (NCAQMD 2007). It is the primary pollutant that could be affected by Humboldt Bay NWR management.

Particulate Matter Less Than 10 Microns Diameter

Both Humboldt and Del Norte counties are classified as nonattainment zones for PM10 (ARB 2007). Atmospheric particulates are the result of many types of dust and fume-producing industrial and agricultural processes (HC 2001). The NCAQMD PM10 emissions are generated primarily by entrained road dust, construction and demolition activities, farming operations, and agricultural waste burning (HC 2001).

Health concerns associated with suspended particles focus on those particles small enough to reach the lungs when inhaled. Few particles larger than 10 microns in diameter reach the lungs. Consequently, both the Federal and State air quality standards for particulate matter have been recently revised to apply only to these small particles, designated as PM10. According to ARB (2005), exposure to particulate matter aggravates several respiratory illnesses and can cause early death in people with heart and lung diseases. Both long- and short-term exposure to PM10 can have adverse health impacts. All PM10 particles are harmful. PM10 also includes the subgroup of PM2.5. These finer particles pose an even higher health risk because they can deposit deeper in the lungs and contain substances particularly harmful to human health (ARB 2005).

PM10 particles are a mixture of substances that includes elements such as carbon and metals; compounds such as nitrates, sulfates, and organic compounds; and mixtures such as diesel exhaust, and soil (ARB 2005). These substances and mixtures may occur as solid particles or liquid droplets. Some particles are emitted directly into the atmosphere, while other secondary particles are the result of gases that are transformed into particles through various physical and chemical processes in the atmosphere (ARB 2005).

Toxic Air Contaminants

A toxic air contaminant is an air pollutant that may cause or contribute to an increase in mortality or in serious illness, or which may pose a hazard to human health (ARB 2005). No management activities carried out on the Complex would be expected to produce toxic air contaminant levels that would cause negative impacts to human health.

3.1.5. Humboldt Bay NWR Paleontological Resources

No known paleo-faunal remains occur within the approved refuge boundaries. However, diatoms (eukaryotic algae encased in persistent silica) are

present and could be used as a tool in interpreting paleoecology (Hemphill-Haley 1992).

3.1.6. Humboldt Bay NWR Minerals

There are no known mineral deposits within the Humboldt Bay NWR boundaries (USFWS 1985). Areas in western Humboldt County, including the bay, are underlain by sedimentary rock from the Tertiary Age and have some potential for oil and natural gas extraction. The only oil production recorded was near Petrolia, ~30 miles to the south, in 1954.

There are natural gas deposits in Humboldt County, mainly in the Eel River basin (RCEA 2005). Currently, there are 38 producing wells and 15 shut-in (not producing) wells in the county (RCEA 2005). The active gas wells are concentrated in the Tompkins Hill gas field, where there are 31 producing wells. Net gas production from these wells in 2003 was 1,010,605 thousand cubic feet (RCEA 2005).

Due to changes in energy markets, there are now multiple active proposals for both wind and wave energy development not far from the refuge. Any such project(s) would likely have impacts on migratory bird and other natural resources, but all proposals are still in planning stages.

3.1.7. Humboldt Bay NWR Geology

Humboldt Bay NWR is located within the Coast Range of northern California. The Coast Range geological province is located along the coastal portion of the Klamath ecoregion from Sonoma County to the Oregon border. It includes the entire watershed of most of the smaller coastal streams, as well as portions of the Smith, Klamath, and Eel River hydrobasins. It consists of a system of north and northwest trending mountain ridges and valleys formed by folding and faulting.

Barnhart et al. (1992) provides a thorough description of Humboldt Bay geology. Humboldt Bay is ~30 miles northeast of the Gorda-Pacific-North American plates triple junction. The Pacific plate is to the south, the Gorda plate to the northwest, and the North American plate to the east. The region is tectonically active with many northwest-southwest faults, as the Gorda plate is subducted beneath the North American plate. Uplifting and folding, fault lines and erosion have exposed a complex pattern of rock formations around Humboldt Bay.

Four geologic formations are predominantly exposed in the Humboldt Bay region: the Franciscan Formation (Late Jurassic to Late Cretaceous in age); the Yager Formation; the Wildcat Group (Late Cenozoic in age); and the Hookton Formation (Pleistocene in age) (Barnhart, et al. 1992). Older geologic formations are largely overlain by more recent river channel deposits, floodplain deposits, beach and dune sands, tidal flat deposits, and landslide debris. Most of these deposits, from the Mad and Eel rivers, are 16 to 23 feet deep.

Current sediments in Humboldt Bay are derived from runoff, oceanic input, and biological activity. Most of the silt and clay in Humboldt Bay probably enters the bay during flood tides. A smaller amount of sediment is introduced by small rivers and creeks that enter the bay. Decaying organic material from biological activity probably contributes the least amount of sediment to the bay.

Dune Geology

The persistence of the Humboldt Bay dune sheet over long periods is the result of a localized subsiding basin, which continues to provide receptive areas near sea level (Orme and Tchakerian 1986, Orme 1992). In the Pacific Northwest (including Humboldt Bay), episodes of subsidence are believed to occur as rapid, co-seismic events along the Cascadia subduction zone at intervals of between 300–700 years, generating tsunamis (Clarke and Carver 1992, Carver et al. 1998).

California's Holocene dunes formed up to 7,000 years BP (middle to late Holocene) during high to falling sea levels (Orme 1992, Peterson et al. 2004). In Humboldt Bay, the dunes represent two phases of activity. The most recently accreted or re-mobilized Holocene dunes support early successional vegetation (foredune grassland and dune mat) although wetland conditions favorable to later successional (shrub) vegetation may exist in low-lying areas. Older, stabilized Holocene dunes located on the eastern edge of the dune system are stabilized by coniferous and riparian forests (Pickart and Barbour 2007).

Because of the location of faults and seismic activity, the entirety of the low lying Humboldt Bay area, including the entire refuge and all infrastructure, is a high-risk zone for tsunamis (tidal waves). The county has worked diligently to prepare an action plan, post signs, and deploy warning sirens.

3.1.8. Humboldt Bay NWR Soils

Soils of Humboldt Bay NWR are in the process of being revised and remapped by the Natural Resources Conservation Service (Soil Survey Staff 2007). Soils of Humboldt Bay NWR include the poorly drained Weott and Arlynda Series derived from old salt marsh soils. Dune areas are characterized by the Samoa, Clambeach, and Lanphere Series derived from marine and eolian sands and characterized by well to excessively drained sand (Soil Survey Staff 2007).

According to the maps available at the time of this document, all of the Salmon Creek Unit except a small portion of Salmon Creek Overflow is classified as the Weott Series, characterized by very poorly drained silt loam in the top 12 inches with frequent ponding and very high surface runoff. The Hookton Slough Unit is classified as the Arlynda Series, composed of peat in the top 3 inches and underlain by silty clay loam to 14 inches. Hydrologic characteristics are similar to Weott soils: very poorly drained, subject to frequent ponding, and very high surface runoff. Weott soils are described as having a salinity of 0–2.0 dS/m and pH of 6.1–7.3 in the top 0–12 inches. Arlynda soils have a reported salinity of 0 dS/m and pH of 5.1–6.0 to a depth of 3 inches, with higher salinity (0–2.0 S/m) and more acid pH (6.1–7.3 from 3–14 inches.

Dunes soils are comprised of three series: Samoa, Clambeach, and Lanphere. The Samoa Series is found on the upland nearshore dunes, and consists of very deep, excessively drained, sandy soils with slopes ranging from 2 to 50 percent (Soil Survey Staff 2007). The A and O horizons are missing in areas where dunes have sparse dune mat vegetation or European beachgrass. In lower seasonally wet areas of the nearshore dunes (dune swales), the Clambeach series is present. These are also deep and poorly drained, composed of eolian and marine sand, but with shallower slopes from 0–2 percent, and with redoximorphic features (colors in the soil that indicate water is seasonally present at the level the features are found) and free water within 80 inches. The Lanphere Series is found on stabilized forested backdunes. They are deep, somewhat excessively drained, sandy soils formed in eolian sand. Slopes range from 2–75 percent (Soil Survey Staff 2007).

3.1.9. Humboldt Bay NWR Water Resources

There are four sizable coastal streams that empty into Humboldt Bay. Jacoby Creek and Freshwater Creek enter into North Bay, Elk River meets the bay near its entrance, and Salmon Creek enters the South Bay. These watersheds are all roughly 12 miles in length and support anadromous fish. Salmon Creek and Jacoby Creek have relatively small amounts of estuarine habitat, while Freshwater Creek and Elk River have somewhat larger estuaries. All four systems have been significantly altered by logging, development, and diking.

The Mad River Slough is one of four major channel systems carrying water to and from Arcata Bay (Thompson 1971). The slough runs north-south for ~3.4 miles from its confluence with the main body of Arcata Bay. The current extent of tidal influence within Mad River Slough and its tributary, Liscom Slough, is 480 acres. Prior to diking, the salt marshes of the slough were contiguous with those of the rest of Arcata Bay, and the slough was less of an isolated feature. Using present day Highway 255 as a division between the slough and the rest of the bay's historic salt marshes, the historic tidal extent of the slough was as much as 1,500 acres.

Mad River Slough collects runoff from the Arcata Bottoms, including periodic overflow from the Mad River. Perennial fresh groundwater flows, as well as one perennial stream (Iron Creek), enter Mad River Slough from the dune side of the slough. The slough comprises an interlacing collection of tidal flats, channels, and salt marshes. The slough contains a total of 150 acres of salt marsh, or 17 percent of the bay's total salt marshes (Pickart 2001).

Although the Mad River did historically flow directly into ancestral Humboldt Bay, the slough does not represent a historic channel (Thompson 1971). Much of the Arcata Bottoms represent deltaic deposits, and the slough is believed to be a natural trough formed between the edge of subsiding delta deposits and the more recent spit deposits. However, a canal was dug to connect the Mad River and Mad River Slough in 1854 in order to facilitate log rafting from the river to the bay. The higher velocity of the river required that a boom be constructed across the river, and during the 30 year history of the canal it was functional for only a few years due to repeated failing of the boom during flood events. The canal had a lasting impact on both the river and bay, however. Logjams caused alterations in the river bed that exacerbated flooding on the Arcata Bottoms, and to an unknown extent debris and silt were diverted into the slough and bay (Haynes 2003).

Jacoby Creek provides a freshwater source for thousands of waterbirds and cuts through the north end of the refuge's Jacoby Creek Unit. This unit includes one of the largest remaining salt marshes

in Humboldt Bay. To the east, across the freeway, the City of Arcata has purchased additional lands adjacent to and including lower Jacoby Creek and is planning restoration work.

In the South Bay, three streams flow into Humboldt Bay NWR's Salmon Creek Unit: Willow Brook, Cattail Creek, and Salmon Creek. The former two are small (less than 1 mile long) perennial streams that drain the Tompkins Hill area and flow onto refuge lands. One additional small perennial stream flows off north Tompkins Hill through the White Slough Unit and into the bay. Two other small unnamed perennial creeks flow north off Table Bluff and into the Hookton Slough Unit.

Salmon Creek is the only sizeable perennial stream that flows into south Humboldt Bay. It is the main water course for the drainage which affects most south Humboldt Bay lowlands. Peak flows for Salmon Creek occur between November and March (PCFWWRA 2003), with low to barely perceptible flows during the rest of the year.

Salmon Creek historically flowed into the bay through a relatively large multi-channeled alluvial floodplain (delta) which included a dynamic transition of habitats from riparian to salt marsh, and from creek channel to tidal slough. Large woody debris (trees and/or logs that were washed down the creek during flood events) had a significant role in the historic delta ecology by jamming and causing the re-routing of flows, stabilizing banks, and creating and providing habitat diversity (Gregory et al. 2003).

The entire delta area was diked off for development in the late 1800s and early 1900s. During that time, and in later years, Salmon Creek was channelized and diverted to maximize drainage, spread silt, sub-irrigate agricultural grassland, and provide drinking water for livestock during the dry season (A. McBride pers. comm.). Large woody debris was also removed to the extent possible. During this same time period and later, the upper watershed was also heavily logged, roads built, and lands toward the bottom of the watershed converted from forest to pasture for livestock. These alterations significantly changed the natural topography, hydrology, and ecological function of the delta by reducing fish passage, impeding sediment and flood flows, and nearly eliminating tidal exchange and large woody debris from the delta. As a result, the lower stream channel filled with silt, adjacent roads were (and are) flooded multiple times each winter, and flows reached the bay only through tidegates at different locations. Generally, tidegates were constructed to allow freshwater to flow into estuaries but prevent the upstream movement of estuarine waters (Giannico and Souder 2005).

The Salmon Creek Unit of the refuge includes most of the Salmon Creek delta. Since most of this area was acquired by the refuge in the 1980s, there have been substantial efforts made to restore the natural function of the creek to the extent possible. These efforts (past, present, and future) are adaptive in nature and include installation and modification of newly designed tidegates, channel restoration, reintroduction of large woody debris, fish screening, and monitoring of both the physical and biological changes taking place. The objectives are to significantly increase tidal exchange, which in turn will improve fish passage, movement of sediment and flood flows, water quality, and increase the total area and natural function of salt marsh and brackish marsh habitats. An outline and summary of these efforts can be found in the Lower Salmon Creek Delta Salmonid Habitat Enhancement Opportunities (PCFWWRA 2003)

Humboldt Bay NWR Hydrology and Water Management

The Salmon Creek Unit is composed of a complex arrangement of dikes, diversion structures, ditches, ponds, water control structures, and tidegates. Each plays a role in creating a wide variety of habitat types while providing drainage for storm runoff.

Willow Brook collects water from the northern end of Tompkins Hill and then runs under the freeway onto the refuge through the north diversion and out into the bay through the White Slough tidegates.

Cattail Creek drains the southern Tompkins Hill area and also enters the refuge from the east after emerging from under Highway 101. It has a substantially smaller drainage area than Willow Brook. After entering the refuge, Cattail Creek currently flows in a ditch through the Middle Diversion and then eventually into Long Pond.

Long Pond, a former tidal slough, is now a large brackish pond that serves as a collection and discharge basin for much of the waters draining from the refuge. The pond receives flow from both Salmon and Cattail Creek. The water surface elevation of the pond is managed through a set of tidegates at the west end and a large water control structure at the east end (equipped with flashboards) that allows captured floodwater to be channeled into seasonal wetlands to the north.

Salmon Creek approaches Humboldt Bay from the southeast after crossing under bridges located on Tompkins Hill Road, Highway 101, Loleta Drive,

and Hookton Road. Between Eel River Drive and the Humboldt Bay NWR the stream flows in an aggraded meandering channel flanked by agricultural grassland and a former dairy facility. Just as it enters the refuge, the stream channel makes a 90° turn and becomes linear, flowing west in a straight diked channel. At the end of this reach the stream passes uninterrupted through the First Diversion, which is no longer actively operated. Downstream of the First Diversion the stream flows through a meandering channel constructed by refuge staff and partners in 1993, eventually reaching the Salmon Creek tidegate and lower tidal estuary. A cooperative project begun in 2003 and completed in 2008 replaced and/or reworked all of the tidegates of lower Salmon Creek and added a new tidegate in the Salmon Creek overflow. The goals of the project were to improve fish passage and water quality, increase sediment transport and estuarine habitat and function, and allow flood flows to reach the bay in one tide cycle. Prior to adding the new tidegate and enlarging the one on Salmon Creek, flood events would overwhelm the drainage capacity of the tidegates, causing floodwaters to back up and sediment to fill the lower creek channels (a situation that worsens with each ensuing flood), which then impairs water quality and reduces habitat quality. The new structures are larger, which allows greater volume to escape each tide cycle, and are equipped with sluice gates which remain open to allow fish passage and upstream tidal flows during high tides, which will passively remove sediment built up on the creek bed and help cut the channel down to its natural elevation.

During high flow events, which typically occur several times each year, Salmon Creek overtops the First Diversion. These flood waters fill the diversion ditch that runs north and eventually drains via the Long Pond and White Slough tidegates. These flood or overbank events provide the water used to flood all the seasonal freshwater wetlands that occur on this unit of the refuge.

Humboldt Bay NWR Water Quality

There have been ongoing efforts to assess water quality in lower Salmon Creek over the last decade. In general, until 2007, the water quality in lower Salmon Creek could be characterized as fair to good during the winter rainy season and poor during the summer and early fall months. However, the late summer water quality has improved with the installation and replacement of new tidegates which have increased the movement of bay water up the creek.

Water quality data is summarized in a report by PCFWWRA (2003).

3.2. Humboldt Bay NWR Biological Resources

3.2.1. Humboldt Bay NWR Ecoregional Context

The California North Coast Ecoregion represents the southern extension of the temperate rainforests of the U.S. Pacific Northwest (TNC et al. 2005). This ecoregion is characterized by a series of mountain ranges that approximately parallel the coast. Elevations range from sea level to over 2,100 meters (7,000 feet) on the crest of the Yolla Bolly Mountains (TNC et al. 2005). Many small streams originate in the coastal mountain ranges, feeding larger rivers that flow towards the ocean creating estuaries as they merge with the Pacific Ocean. The cool, foggy coastal climate supports coastal redwood forests and the resident flora and fauna that depend on these forests.

The diverse topography supports a wide variety of plant community types. According to TNC et al. (2005), the lowland areas near the coast are dominated by redwood and Douglas-fir forests. Inland, the ecoregion is dominated by Douglas-fir/tanoak forest, Oregon oak woodland, annual grasslands, and mixed evergreen forests. Higher elevations contain montane mixed coniferous forests (white fir [*Abies concolor*], ponderosa pine [*Pinus ponderosa*], and Douglas-fir). The interior southeastern portion of the ecoregion is characterized by mixed chaparral, gray pine, and blue oak (*Quercus douglasii*) (TNC et al. 2005).

The immediate coast also provides microhabitats that favor plant communities not dominated by coastal redwood forest. Other important coastal systems in the region include grasslands, bald hills (prairies), coastal terrace prairies, dune communities, coastal estuaries with salt marsh, brackish marsh, and eelgrass beds (TNC et al. 2005). Coastal estuaries are of particular importance to bird, fish, wildlife, and plant production and diversity. Estuaries are fueled by emergent vegetation, algae, and detritus-based food webs (Rumrill 2002). Tidal basins accumulate sediments and the resident communities contribute to water quality in the bay (Rumrill 2002).

The ecologically important eelgrass beds in Humboldt Bay are the largest between Willapa Bay, Washington, and Baja California, Mexico. These extensive eelgrass beds provide cover for many species of marine and estuarine vertebrates and invertebrates, and food for hundreds of thousands of migrating shorebirds and waterfowl, especially Pacific brant (WHSRN 2007).

Humboldt Bay NWR Geographic/Ecosystem Setting

The refuge is located in and around Humboldt Bay near the cities of Arcata and Eureka. Humboldt Bay is located on a narrow coastal plain and is a natural land-locked harbor 0.5 to 4 miles wide and 14 miles long. Humboldt Bay consists of two tidal basins, designated as the Arcata Bay and the South Bay (USFWS 1997).

The Mad and Eel rivers bound Humboldt Bay on the north and south respectively. The countryside adjacent to the refuge is relatively flat with rolling terraces. The Humboldt Bay NWR contains many types of habitats including intertidal flats (mudflats and eelgrass beds), estuarine wetlands, palustrine wetlands, agricultural grasslands, riparian forest communities, dunemat/foredune grasslands, dune swales, dune riparian/swamp forest communities, and coniferous dune forest. The topography of the area immediately east of the coastal plain is characterized by steep hills and narrow valleys. Vegetation of these uplands consists of dense forests of redwood, Sitka spruce, and Douglas-fir.

The majority of land within the refuge boundary was tidally influenced. Vast expanses of wetlands around the bay, including lands within the Humboldt Bay NWR boundary, were historically diked to prevent tidal water exchange and to convert salt marsh to pasture to allow for cattle grazing and other agricultural practices. Many changes in the topography, hydrology, soils, and plant species composition have taken place since these lands were diked. Freshwater marsh was historically rare within the Humboldt Bay area, however, freshwater wetlands are an extremely valuable habitat type for a large variety of birds, and contribute to the abundance of wildlife found at the Humboldt Bay NWR specifically and around the bay generally. Other areas that provide freshwater marsh habitats include the Arcata Marsh and several of the CA Department of Fish and Game Wildlife Areas. Both estuarine (tidally Influenced) wetlands and freshwater wetlands have been reduced by over 90% throughout California.

3.2.2. Humboldt Bay NWR Units

The refuge consists of nine units located within Humboldt Bay (five units in South Bay and four units in North Bay) and two units to the west of the Mad River Slough (dune units) (Figure 5). The South Bay units include Table Bluff, South Bay, Hookton Slough, Salmon Creek, and White Slough, while the North Bay units include Indian Island, Eureka Slough, and Jacoby Creek. The Sand Islands in northern Humboldt Bay are within the Humboldt Bay NWR boundary, although no interest in the Island's lands have been acquired by the Service. These islands are likely at elevations below 3.15 feet above mean sea level, and therefore, under the management of HBHRC District. Three of the low elevation islands are man-made of dredge spoil. The refuge has no plans for the refuge to acquire these islands. As with other private lands within the boundary, because they are not owned in fee title by the Service, no management actions are proposed. The approved refuge boundary encompasses over 9,500 acres, of which ~ 3,379 are owned in fee title by the Service (Table 2).

South Bay Units

Table Bluff Unit. The Table Bluff Unit, comprising ~168 acres, is located in the southwest corner of Humboldt Bay (Figure 6). Former salt marsh on the site was diked around 1914 to create agricultural grasslands (Pickart 2005b). The Table Bluff Unit was added to the Humboldt Bay NWR in 1981. The pastures were of low quality and the long-term plans were to restore this tract to tidal exchange. Leaky tidegates had created a mosquito nuisance, and in the summer of 1984 the dike was breached in two places by the Service to alleviate the mosquito problem. The unit now includes a continuum of mudflat to dune habitats.

The Table Bluff Unit has unique wetland vegetation composition and patterns for Humboldt Bay, resulting from its history of diking and subsequent breaching (Pickart 2005b). The gradient of salt to freshwater is very well defined across the northern arm of the Table Bluff Unit, from palustrine dune wetlands on the west to estuarine salt marsh on the east. The presence of the Little Salmon Creek fault, responsible for the juxtaposition of the bluff and dune/estuary habitats, also contributes to the uniqueness of the site.

In 2004 the Table Bluff Unit was surveyed for rare plants and to classify its vegetation communities (Pickart 2005b). Seven wetland vegetation types were characterized and mapped. Cordgrass, salt marsh, and two of the three brackish marsh subtypes (salt rush and mixed brackish marsh) are estuarine wetlands, subjected to regular or irregular tidal inundation and occurring on primarily organic soils (although there is much intergrading of sand and peat), while freshwater/brackish marsh and agricultural grassland, shrub swale, and herbaceous swale are palustrine wetlands on primarily sandy dune substrates.

The Table Bluff Unit freshwater and brackish marsh communities include mixed brackish marsh dominated by salt rush (*Juncus leseurii*),

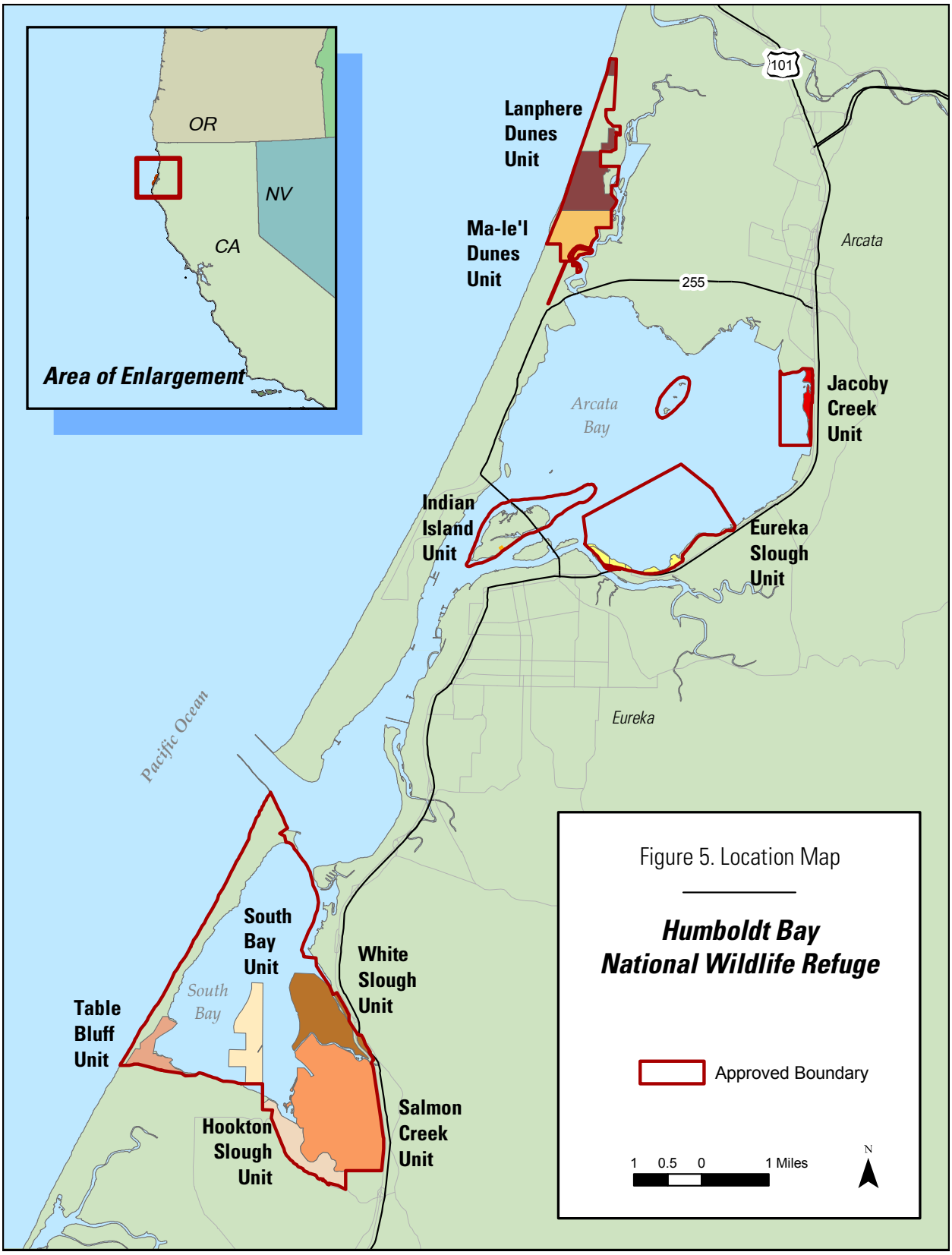
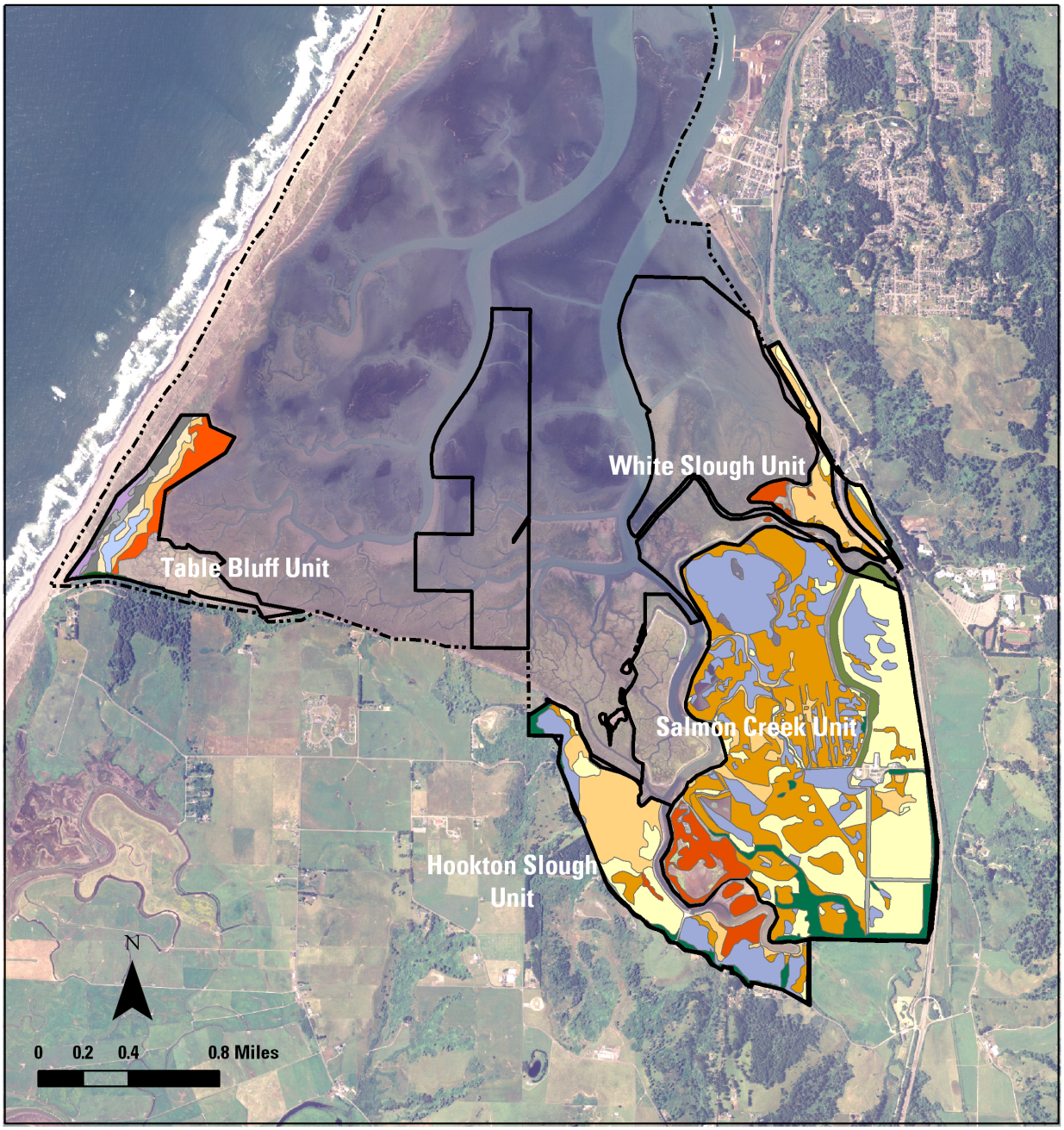


Figure 5. Refuge boundary and management units for Humboldt Bay NWR.

Table 2. Habitat type and acreage by unit.

Habitat Type	Acreage by Unit									
	Lanphere Dunes	Ma-le'l Dunes	Jacoby Creek	Eureka Slough	White Slough	Salmon Creek	Hookton Slough	Table Bluff	South Bay	Total Acreage by Habitat Type
Beachgrass	3	7								**10**
Brackish marsh (Native)	3	7			35	42	84	14		**185**
Coniferous Forest	111	71								**182**
Dune mat with beachgrass								11		**11**
Dune mat	74	40								**114**
Dune swale	46	21						33		**100**
Freshwater marsh		2				218	50	10		**280**
Infrastructure						63				**63**
Tidal flats/slough channels/eelgrass							206	62	823	**1091**
Non-native Brackish marsh					12	339	12			**363**
Open sand	88	91								**179**
Open water (ponds, ditches)						30				**30**
Riparian forest/ Swamp	19	14			2	52	15	3		**105**
Salt marsh	9	37	73	86	11	36	26	35		**313**
Short-grass Pasture					10	270	51			**331**
Total Acreage By Unit	**353**	**295**	**73**	**86**	**70**	**1075**	**444**	**160**	**823**	**3379**



Short-Grass Pasture (Non-native)
Brackish Marsh (Non-native)
Riparian Forest/Swamp
Freshwater Marsh (Native)
Salt Marsh
Refuge Lands
Brackish Marsh (Native)
Forest (Exotic)
Approved Refuge Boundary

Figure 6. Terrestrial vegetation of White Slough, Salmon Creek, Hookton Slough, and Table Bluff units.

silverweed, and spear-leaved saltbrush (*Atriplex triangularis*); salt rush marsh dominated by salt rush); and slough sedge marsh dominated by slough sedge (*Carex obnupta*) with seacoast angelica (*Angelica lucida*).

Two types of salt marsh exist on the Table Bluff Unit: those dominated by non-native dense-flowered cordgrass; and those co-dominated by native species. Native salt marsh is characterized by 100 percent cover, comprised of saltgrass (*Distichlis spicata*; 25–50 percent), pickleweed (*Salicornia virginica*; 25–50 percent), jaumea (*Jaumea carnosa*; 5–25 percent), minor Lyngbye's sedge (*Carex lyngbyei*), salt rush, sand spurrey (*Spergularia macrotheca*), and seaside arrow-grass (*Triglochin maritima*). This vegetation falls within the "mixed marsh" type described by Eicher (1987), characteristic of high elevation marshes.

South Bay Unit. The approved boundary of the South Bay Unit includes almost all the natural tidelands in South Bay but excludes the navigation channel and turning basin along the developed portion of the bay between King Salmon and Fields Landing. The acquired area is ~823 acres in size and consists of deeper channels which convey the tidal flows, mudflats that are seasonally covered with algae that provide crucial nutrients to the bay's food web, and eelgrass (*Zostera marina*) beds, which are a key habitat and the food for many marine invertebrates, fish species, and waterfowl, especially Pacific brant. The unit is tidally influenced and covered by water for some portion of every day.

Hookton Slough Unit. The Hookton Slough Unit is ~444 acres of low, diked, former tidelands and tidal slough (Figure 6). The dike greatly prohibits tidal exchange but it also protects low spots on the county-owned Hookton Road from flooding. Prior to acquisition by the Service, this area was managed as agricultural grassland for cattle grazing. Upon acquisition, grassland management ceased and the area has been allowed to revert to seasonal and semipermanently flooded wetlands. The unit is split by an interior dike that formerly provided landowners access to houses, barns, and the slough. It now provides the public access to facilities including a hiking trail, boat dock, and vault toilets. The wetlands on either side of the dike receive seasonal freshwater input from drainage off Table Bluff and perennial freshwater input from springs. Both sides also receive limited tidal input by fish-friendly tidegates installed between 2003 and 2007. The vegetation in this unit was mapped in 2006–2007. The wetlands east of the interior dike have transitioned to a fresh to brackish wetland gradient ranging from more brackish saltgrass to fresher cattail (*Typha latifolia*), marsh pennywort (*Hydocotyle ranunculoides*), and willow (*Salix hookeriana*). To the west of the dike, the lands were more aggressively drained and this area is more transitional, but also displays a fresh to brackish continuum.

Although shortened by diking, Hookton Slough is tidal and could provide improved habitat for many estuarine species, including juvenile salmonids and the endangered tidewater goby, if it could be better reconnected to adjacent wetlands and have habitat complexity added in the form of large woody debris. There are also two salt marsh islands that remain in the upstream end of Hookton Slough. Teal Island, a 90 acre island of salt marsh that was diked in the mid-1900s, is now just the eroding remains of the dike surrounding a large tidal mudflat.

Salmon Creek Unit. The Salmon Creek Unit is composed of a modified arrangement of dikes, ponds, diversion structures, ditches, and tidegates (Figure 6). Each structure plays a role in creating a mixture of habitat types. This entire 1,075-acre unit consists of diked former tidelands that were converted to agricultural grasslands for cattle grazing from the late 1800s through the late 1980s. This also included a complex of ranching structures (houses, barns, silos, etc.) built on-site that were either converted to refuge use or demolished after the FWS purchased the ranch in 1988. The perimeter dike of this tract of land also protects Highway 101, refuge buildings and infrastructure, and some adjacent private lands between this unit and the Hookton Slough Unit from tidal influence.

Salmon Creek historically flowed through the middle of the Salmon Creek Unit and emptied into White Slough, but was diverted to Hookton Slough to maximize drainage, spread silt, and sub-irrigate agricultural grasslands. In 1993, refuge staff excavated a new serpentine channel for the lower end of Salmon Creek (from the first diversion structure to the Salmon Creek tidegate) and abandoned the straight-ditched channel. In addition, the Salmon Creek tidegate was modified to allow muted tidal wetland to develop and increase the passage of migrating salmonids. This muted condition extends to an area just beyond the Salmon Creek tidegate, an area known as the Salmon Creek Overflow. This area supports the largest pickleweed (*Salicornia*-dominated) marsh remaining in Humboldt Bay, and is one of the most important waterbird roosting and feeding areas on the Humboldt Bay NWR, likely because the area is tidally influenced and is flooded throughout the year with brackish water (Mini 2003).

Much of the east side of the Salmon Creek unit consists of improved agricultural grassland that is managed with a grazing and haying program accomplished through a cooperative agreement established with local ranchers. Grasslands are dominated by velvet grass (*Holcus lanatus*), Mediterranean ryegrass (*Lolium multiflorum*), and tall fescue (*Festuca arundinacea*), with lower areas covered with silverweed and spikerush (*Eleocharis macrostachya*). The Salmon Creek Unit provides important foraging and roosting habitat for Aleutian cackling geese, tundra swans, and other waterfowl, shorebirds, wading birds, and many other wildlife species.

White Slough Unit. The White Slough Unit totals ~70 acres in size and, like the other units, is diked former tidal marsh used for pasture (Figure 6). The management of this unit is constrained by its proximity to the railroad and Highway 101 (including the Tompkins Hill overpass) which bracket and split it into four different cells. There is a perennial spring upstream of this unit that contributes a small source of fresh water through the main cell and ultimately out to the bay. Brackish marsh constitutes the greatest acreage on the White Slough Unit. Vegetation types present include ~60 acres of brackish marsh dominated by salt grass, 10 acres of salt marsh dominated by cordgrass, one acre of freshwater riparian/swamp, and 6 acres of freshwater marsh/agricultural wetland. The dikes were in poor condition when the land was acquired by the refuge and have not been maintained because this area was always expected to ultimately be allowed to revert to salt marsh.

North Bay Units

Indian Island Unit. Indian Island, completely within the approved refuge boundary, is located in central Humboldt Bay. It contains ~205 acres of salt marsh, the largest contiguous stand of salt marsh remaining in the bay (Pickart et al. 2006). This tract of land was split by Highway 255 in the 1970s. A three-acre grove of mostly non-native trees (*Cupressus macrocarpa* and *Eucalyptus globulus*) contains a rookery (nesting habitat for several species of egrets and herons) that has been recognized by ornithologists, tribes, agencies, and bird enthusiasts for decades (Pickart et al. 2006). The rookery area is currently owned by the City of Eureka and the entire island is designated as an environmentally sensitive habitat area by the City of Eureka's General Plan.

Indian Island is an important cultural resource for the Wiyot Tribe, Blue Lake Rancheria, and Bear River Band of Rohnerville Rancheria, and was the site of a massacre, at the hands of EuroAmerican settlers, in 1860. The northern portion of the island was purchased by the Table Bluff Reservation in 2000. The North Coast Indian Development Council, working closely with the Wiyot Tribe, the City of Eureka, and the State Coastal Conservancy, is currently preparing a resource enhancement plan for the northernmost 60 acres of the island.

Refuge fee title ownership on the unit currently consists of two relatively small tracts, together totaling less than 2 acres in size.

Eureka Slough Unit. The Eureka Slough Unit is ~86 acres in size and preserves the relatively small remnant of the slough's historic salt marsh occurring west of Highway 101 (Figure 7). The marsh is dominated almost entirely by invasive cordgrass.

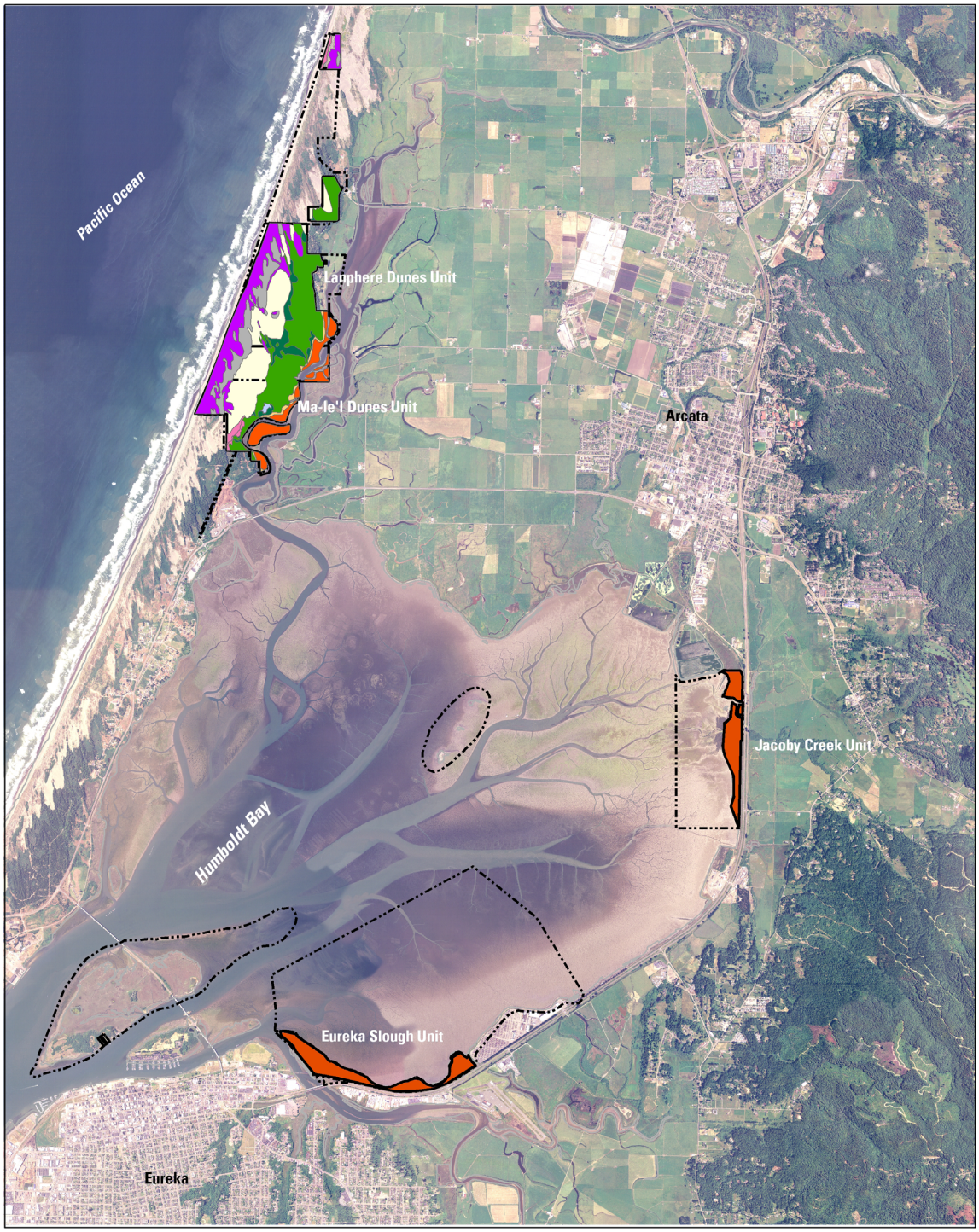
Jacoby Creek Unit. The Jacoby Creek Unit is ~73 acres in size and is located on the eastern shore of north Humboldt Bay (Figure 7). There is a significant amount of high elevation, native salt marsh vegetation, classified locally as mixed marsh (Pickart 2005a).

Salt marsh vegetation on the Jacoby Creek Unit consists of jaumea, saltgrass, pickleweed, seaside arrow-grass, arrow-grass (*T. concinnum*), coastal gum-plant (*Grindelia stricta* var. *stricta*), and western marsh-rosemary (*Limonium californicum*). Along the edges of the Jacoby Creek channel are higher areas supporting coastal tufted hair-grass (*Deschampsia caespitosa*), and along the creek itself is Lyngbye's sedge. Non-native invasive dense-flowered cordgrass occurs mostly in very dense discrete stands, which appear to be correlated well with lower elevations and tidal creeks (Pickart 2005a). The large cordgrass stands at the western edge of the marsh probably colonized relatively recent sediment accretions, rather than displacing historic salt marsh.

The high elevation salt marshes of Jacoby Creek Unit provide habitat for the two rare salt marsh species Point Reyes bird's-beak and Humboldt Bay owl's-clover. A previous 1999–2000 mapping of these two species show large populations were present at that time. Although no subsequent mapping or monitoring has been done, qualitative observations indicate that these populations are still extant (Pickart 2005a).

Dune Units

Ma-le'l and Lanphere Dunes Units. To the northwest of Humboldt Bay, adjacent to the Mad River Slough, are the Lanphere Dunes Unit and Ma-le'l Dunes Unit. The dune units are located on



Beach Grass
Brackish Marsh
Coniferous Forest
Dunemat
Dune Swale
Freshwater Marsh
Riparian Forest
Salt Marsh
Refuge Lands
Approved Refuge Boundary

N

0 0.25 0.5 1 Miles

Figure 7. Terrestrial vegetation of Lanphere Dunes, Ma-le'l Dunes, Jacoby Creek, and Eureka Slough units.

the upper North Spit of Humboldt Bay (Figure 7). These units contain ~648 acres consisting mainly of coastal dune and salt marsh habitats. The Lanphere Dunes Unit contains arguably the most pristine remaining dune system in the western U.S. This unit contains one of only a few remaining areas of the globally endangered foredune grassland community.

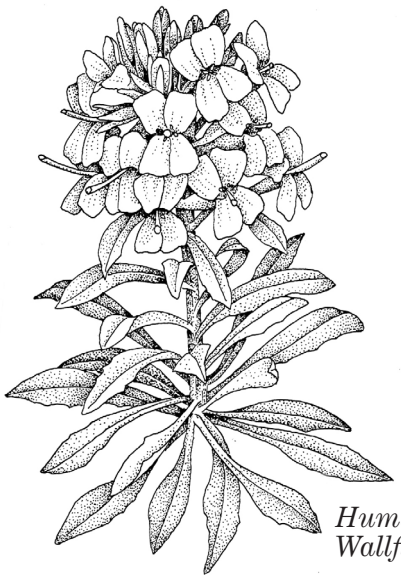
The biodiversity and resource values of the dune units have been well documented. At the local level (through the Humboldt County Coastal Plan) and at the eco-regional level (through The Nature Conservancy) the dunes have been identified as a high priority for conservation. At the national level a northern dune unit site is part of a dune system that was nominated for Natural National Landmark status. The dune units are also significant as stopover sites for neo-tropical migrants.

The dune mat plant community provides habitat for two federally listed plant species, Humboldt Bay wallflower and beach layia, and the open sand dunes provide potential nesting habitat for the threatened snowy plover (*Charadrius alexandrinus*). In addition to dune mat and foredune grassland, the nearshore dunes support seasonal dune wetlands (dune swales). Between the nearshore and stabilized forested dunes is a large sand sheet. The older stabilized dunes are colonized by red alder (*Alnus rubra*) riparian forest, and maritime forest of beach pine (*Pinus contorta* ssp. *contorta*), Sitka spruce, and grand fir (*Abies grandis*) (Pickart and Barbour 2007). East of the forest are estuarine salt marsh, brackish marsh, mudflats, and eelgrass beds.

The interspersion of freshwater wetlands, uplands, and estuary is responsible for the wealth of diversity found within a relatively small area of these units (see Figure 7). The nearshore freshwater wetlands, known as dune swales, are seasonal and depend on winter rainfall that raises the water table. A few permanent marshes in the backdunes provide water for wildlife year-round. Some swales are dominated by Hooker's willow thickets, which are important as habitat and forage for migrating bird species, as well as resident mammals and amphibians (Sendak 2008).

3.2.3 Humboldt Bay NWR Plant Communities and Habitats

Due to the rapidly changing nature of the National Vegetation Classification, the following summary of vegetation types relies on broader habitat and physiognomic distinctions. Vegetation sampling was carried out between 2005 and 2007 on the refuge, and alliance/association level classification and description are still being finalized. Plant taxonomy for California is also undergoing major revisions.



Humboldt Bay Wallflower

All plant nomenclature follows the *Jepson Manual* (Hickman 1993). Vegetation and habitat types are divided into three categories below: estuarine, palustrine wetland, and upland. A species list for vascular plants can be found in Appendix J. For further information on special status or protected species (listed species), see Appendix E: Final Environmental Assessment (chapter 4, Special Status Species section); Appendix L: Locally Occurring Special Status Species; and Appendix I: Compliance with the Federal Endangered Species Act.

Estuarine Plant Communities and Habitats

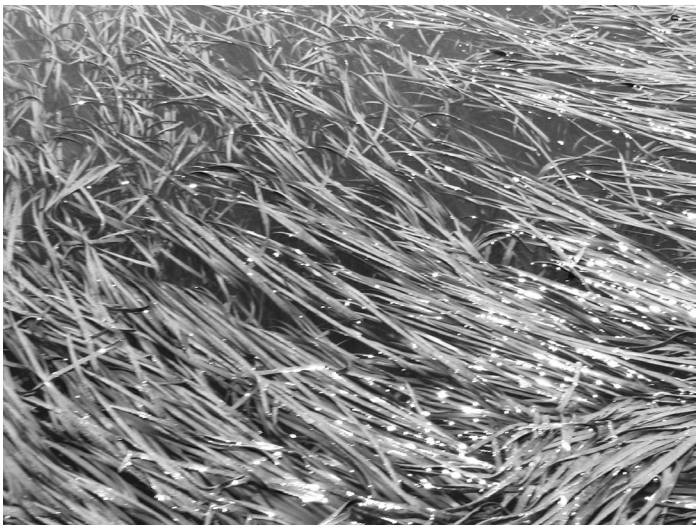
Eelgrass Beds. With nearly 3,015 acres, Humboldt Bay has the ninth largest eelgrass beds on the west coast (Wyllie-Echeverria et al. 2003). Eelgrass beds are among the most productive habitats in an estuarine ecosystem. They provide habitat for marine animals and are a substrate for epiphytes (plants) and epizoites (animals), small organisms that attach to the leaves (Cooke 1997).

Eelgrass (*Zostera marina*) is considered an important constituent of estuarine ecology, providing trophic support, improving water clarity, and functioning as refugia and nurseries (Shaughnessy et al. 2007). Eelgrass in Humboldt Bay has been shown to structure the size of some invertebrates such as Dungeness crab (*Cancer magister*) (Williamson 2006).

The non-native eelgrass *Zostera japonica* was identified in Humboldt Bay in 2002, and manual removal efforts were begun in 2003 by U.C. Sea Grant. Monitoring for new infestations continue as eradication proceeds, and a relatively large

occurrence was located in the Eel River estuary in 2008 (Kirsten Ramey pers. comm.). *Zostera japonica* introduction impacts have been documented elsewhere, including alterations of physical habitat and the richness and densities of resident fauna (Posey 1988); and changes to water column-benthos nutrient fluxes (Larned 2003) .

Intertidal Mud Flats (not mapped). Intertidal habitats are the most widespread habitat in Humboldt Bay, and are very productive in terms of the abundance and diversity of species they support. The intertidal zone contains a large variety of the phytoplankton and zooplankton that form the basis of food webs that support fish, mollusks, crustaceans, other invertebrates, birds, and mammals. This habitat supports abundant micro and macro algae growth and eelgrass at higher elevations.



Eelgrass. Photo: © Jeff Robinson

Macroscopic algal beds form as ephemeral communities on the intertidal mud flats. Two important species on the high intertidal flats are *Enteromorpha* sp. and *Ulva* sp. Algal beds are difficult to map because they are both ephemeral and spatially unstable. However, they are considered an important source of primary productivity for the estuary (Barnhart et al. 1992).

Brackish Marsh (*tidally influenced*). Brackish and estuarine marshes in the Salmon Creek area are behind dikes and may not represent natural (pre-diked) brackish marsh vegetation. Native dominants include seacoast bulrush (*Scirpus maritimus*), coastal tufted hair-grass (*Deschampsia caespitosa*), saltgrass, and salt marsh sand spurrey (*Spergularia marina*). Newly disturbed (excavated or disked) areas become seasonally dominated by invasive creeping saltbush or brass buttons (*Cotula coronopifolia*).

In the dune units and at the Table Bluff unit, brackish marsh occurs in its natural state as a linear strip of vegetation between the upland dunes and the salt marsh (although species composition at Table Bluff has been altered by past diking, now breached). These brackish marshes are irregularly flooded estuarine intertidal marshes. Dominant species include salt rush, seaside arrow-grass, hard-stemmed tule (*Scirpus acutus*) and Lyngbye's sedge.

Salt Marsh. The undiked salt marshes of the refuge are found in Hookton and White Slough in South Bay, and Mad River and Eureka sloughs and at the mouth of Jacoby Creek in North Bay. Island marshes are characterized by the highest tidal elevations and support the most diverse salt marsh plant assemblages. This community, classified as "Mixed Marsh" by Eicher (1987), is co-dominated by salt grass, pickleweed and jaumea with associated species arrow-grass, marsh rosemary, salt marsh plantain (*Plantago maritima*), dodder (*Cuscuta salina*), and sand spurrey. The rare Point Reyes bird's beak and Humboldt Bay owl's clover are found in some of the largest densities bay-wide on salt marsh islands on refuge units.

Invasive cordgrass now dominates most of Humboldt Bay's salt marshes. In medium elevation marshes it forms a monotype and displaces native species. This type was classified by Eicher (1987) as *Spartina* marsh. Experimental eradication efforts have cleared *Spartina densiflora* from most of the salt marshes in the Lanphere and Ma-le'l Units.

Salt Marsh Behind Dikes. Seasonally flooded salt marshes form with estuarine influence from leaking tidegates or frequent dike overtopping. This community is dominated by pickleweed but also present are salt grass and invasive dense-flowered cordgrass.

Palustrine Wetland Plant Communities and Habitats

Open Water/Ponds. Open water habitats are those areas where water is permanent and generally too deep to support emergent vegetation. Emergent vegetation often forms a ring of vegetation around open water habitats. Floating and submergent vegetation may also be present, including pondweeds (*Potamogeton pectinatus*), mosquito

fern (*Azolla* spp.) and duckweed (*Lemna* spp.). In brackish areas, such as drainage channel bottoms, wigeon-grass (*Ruppia maritima*) may be present.

Shortgrass Pasture (*non-native*). Most of the refuge's seasonal freshwater wetland areas were formerly salt marsh until they were diked and converted to agricultural use. Vegetation currently occurring in these areas is dominated by Mediterranean ryegrass (*Lolium multiflorum*), and common velvetgrass, with localized dominance by tall fescue, and bird's-foot trefoil (*Lotus corniculatus*). Associated species include silverweed, creeping bentgrass (*Agrostis stolonifera*), and white clover (*Trifolium repens*) (Pickart 2006). Weedy species such as bullthistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), bristly oxtongue (*Picris echioides*), and lesser hawkbit (*Leontodon taraxacoides*) are also found in the agricultural grassland.

Freshwater and Brackish Marsh. Freshwater to slightly brackish marshes occur on Salmon Creek, Table Bluff, Hookton Slough, White Slough, Lanphere Dunes, and Ma-le'l Dunes units. These habitats vary greatly in size, but are either spring-fed or seasonally-flooded and highly productive for wildlife food. Emergent vegetation in these marshes, including cattails and bulrush, can range from mostly open water to almost 100 percent cover. These marshes are generally at least seasonally brackish due to the high salinity of underlying soils and/or salt spray. However, they differ from estuarine brackish marshes in having no current tidal influence.

Native freshwater marshes on the Humboldt Bay NWR are dominated by one or more of the following species: water parsley (*Oenanthe sarmentosa*), marsh pennywort (*Hydrocotyle ranunculoides*), salt rush, small-fruited bulrush (*Scirpus microcarpus*), cattail, silverweed, common spikerush, short-awn foxtail (*Alopecurus aequalis*), or pondweed.

The invasive species creeping bentgrass is abundant to dominant in fresh to brackish marshes in south bay units (Pickart 2006). Other invasive species that require monitoring and control in freshwater /brackish marsh include large bird's-foot trefoil (*Lotus uliginosus*), woodland groundsel (*Senecio sylvaticus*), reed canarygrass (*Phalaris arundinacea*), fireweed (*Erechtites glomerata*), bristly ox-tongue, spiny sow thistle (*Sonchus asper*), and Harding grass (*Phalaris aquatica*) (Pickart 2006).

Riparian Swamp Habitat. Riparian swamp habitat communities are seasonally flooded, wooded palustrine wetlands dominated by coastal willow or red alder, with an understory including California blackberry (*Rubus ursinus*), salmonberry (*Rubus spectabilis*), small-fruited bulrush (*Scirpus microcarpus*), coastal wood fern (*Dryopteris arguta*), and coast hedge-nettle (*Stachys chamissonis*). Associated species include red elderberry (*Sambucus racemosa*), poison oak (*Toxicodendron diversilobum*), wax myrtle (*Myrica californica*), and cascara (*Rhamnus purshianus*).

Non-native invasive plant species that require monitoring and control in freshwater swamp/ riparian forest habitat include; English ivy, poison hemlock (*Conium maculatum*), reed canarygrass, periwinkle (*Vinca major*), eucalyptus (*Eucalyptus globulus*), and Himalayan blackberry.

Dune Swales. Dune swales, which occur on all dune units, are seasonal freshwater marshes and shrub swamps. Common dominants are slough sedge, spike rush, silverweed, Hooker's willow, and beach

Dune swale. Photo: Andrea Pickart

Dune mat. Photo: Andrea Pickart

pine. Transitional areas between swales and dune mat can be quite extensive due to annual variation in flooding and saturation extent. While classified as seasonal wetlands, they include many facultative dune mat species (Pickart and Barbour 2007). The dominant species is Brewer's rush (*Juncus breweri*). Invasive species in dune swales include rabbit's-foot grass (*Polypogon monspeliensis*), loosestrife (*Lythrum hyssopifola*), pennyroyal (*Mentha pulegium*) and yellow glandweed (*Parentucellia viscosa*).

Upland Plant Communities and Habitats

Foredune Grassland (not differentiated from dune mat in maps). This endangered community occurs only on dunes of the Pacific coast of North America. The characteristic species of this community is the native dune grass *Leymus mollis,* but large-flowered sand dune blue grass (*Poa macrantha*) can be common to dominant and associated species include a number of forbs such as yellow sand-verbena (*Abronia latifolia*), beach pea (*Lathyrus littoralis*), seaside daisy (*Erigeron glaucus*), coast buckwheat (*Eriogonum latifolium*), and beach morning-glory *Calystegia soldanella* (Pickart 2008). Foredune grasslands are so-called because *Leymus mollis* is generally confined to the upper beach and the first rise, or "foredune." Typically, foredune grassland is found on relatively high-energy sandy coastlines on ocean beaches.

Until the introduction and spread of the invasive European beachgrass, *Leymus mollis* was the dominant grass of northern California's foredunes. Over the past century, European beachgrass displaced native dune grass over much of our coastline. The Lanphere Dunes is one of only a few remaining healthy populations of native beachgrass south of Alaska (Pickart and Barbour 2007).

Dune Mat. Dune mat floristically intergrades with foredune grassland, which is described above. The boundary between them is transitional, occurring near the crest of the primary foredune if a continuous foredune ridge occurs. Behind the foredune the dune mat community occurs on dune ridges aligned parallel to the northwest prevailing wind. Native dune mat communities are diverse with variable localized dominant species. Common and abundant species include dune goldenrod (*Solidago spathulata*), large-flowered sand-dune blue grass, beach-bur (*Ambrosia chamissonis*), beach pea, coast buckwheat, coastal sagewort (*Artemisia pycnocephala*), yellow sand verbena, common yarrow (*Achillea millefolium*), beach strawberry (*Fragaria chiloensis*), and seaside daisy (Pickart and Barbour 2007).

Yellow Sand Verbena

Dune mat communities support two ESA-listed endangered plant species; Humboldt Bay wallflower and beach layia; two CNPS List 1B (rare, threatened or endangered in California and elsewhere) species; dark-eyed gilia (*Gilia millefoliata*) and pink sand verbena; and a CNPS list 4 species (plants with limited distribution), American glehnia (*Glehnia littoralis* ssp. *leiocarpa*).

Dune mat, like foredune grassland, has been significantly threatened by non-native European beachgrass. In addition, non-native species such as iceplant, yellow bush lupine, and several invasive annual grasses including ripgut brome (*Bromus diandrus*), rattlesnake grass (*Briza maxima*), barren fescue (*Vulpia bromoides*), and European hairgrass (*Aira* spp.) also impact the native plant communities and require active management.

The dune mat communities on the Lanphere Dunes and Ma-le'l Dunes units harbor rare biotic soil crusts, also called cryptogamic crusts. The dominant non-vascular plant in local biotic soils crusts are the mosses *Didymodon vineali* and *Homalothecium arenarium* (Glavich 2000). Associated lichens include *Leptogium intermedium* and *Cladonia pyxidata*.

Coniferous Dune Forest. Coniferous dune forest communities occur on the Lanphere Dunes and Ma-le'l Dunes units east of the large sheet of moving dunes, on relatively older and stabilized portions of the dune units. The coniferous dune forest is a lush productive environment harboring

over 300 species of fungi, lichen, and mosses. The forest canopy is dominated by Sitka spruce and beach pine, with grand fir, Douglas-fir, and madrone (*Arbutus menziesii*) subdominant. The forest understory occurs as two distinct phases. A dense shrub understory is dominated by evergreen huckleberry (*Vaccinium ovatum*), silk tassel (*Garrya elliptica*), and salal (*Gaultheria shallon*), while more open pine-dominated stands have a low carpet of bearberry (*Arctostaphylos uva-ursi*) with reindeer lichen (*Cladina portentosa* ssp. *pacifica*). Other common understory species include twinberry (*Lonicera involucrata*), false lily-of-the-valley (*Maianthemum dilitatum*), yerba buena (*Satureja douglasii*), vanilla grass (*Hierochloe occidentalis*), sword fern (*Polystichium minitum*), leather fern (*Polypodon scouleri*), and the orchids rattlesnake plantain (*Goodyera oblongifolia*), elegant rein orchid (*Piperia elegans*), and rein orchid (*Piperia tranversa*) (Leppig and Pickart 2005). A variety of nonvascular plants are found in the forest both on the forest floor and the canopy, including broom moss (*Dicranum scoparium*), cat-tail moss (*Isothecium myosuroides*), beaked moss (*Kindbergia oregona* and *K. praelonga*), flat-leaved liverwort (*Radula complanata*), and net lichen (*Ramalina menziesii*) (Pickart and Barbour 2007).

Open Sand. This habitat consists of areas of moving sand. The few vegetated areas consist of small hummocks of early successional species such as yellow sand verbena and sea rocket (*Cakile maritima*). The ESA threatened and California Species of Concern snowy plover may eventually breed in open sand areas of the dune units, but is not known to at this time.

Non-Native Dune Communities. Portions of the Table Bluff Unit support invasive European beachgrass, yellow bush lupine, and iceplant. Restoration of these communities to dune mat is needed, following techniques used at the northern dune units. These types are mapped as European beachgrass or dune mat/beachgrass in Alternative maps due to their localized nature.

Upland Dikes. Upland dikes surround much of the Salmon Creek, White Slough, Table Bluff, and Hookton Slough units. They are dominated by weedy grasses, and in some places by the native shrub coyote bush (*Baccharis pilularis*). Dike tops are regularly mowed in spring and summer. Perimeter dikes around the Hookton Slough and Salmon Creek Units are mostly armored on the bay side with some type of rip-rap (generally old broken concrete or medium to large quarry rock). All other dikes on the refuge are earthen and serve as roads and/or trails.

Non-Native Exotic Forests (not mapped). Approximately 20 acres of the Salmon Creek Unit is almost entirely dominated by non-native blue gum eucalyptus. There is little understory diversity in this habitat, due to competition by gum trees and the allelopathic effect of their leaves. Gum trees are also highly flammable (USFWS 2004).

Dune-forest ecotone.
Photo: Andrea Pickart

3.2.4. Overview of Humboldt Bay NWR Fish and Wildlife

The Humboldt Bay NWR and surrounding environments provide important habitats for fish, wildlife and plants.

The primary reason the refuge was originally established was because of the area's importance as stopover habitat for migratory birds.

Humboldt Bay is considered an internationally significant area for migratory birds due to the sheer number of birds that depend on it in the fall, winter, and spring. Important bird groups that depend on the bay include waterfowl, shorebirds, waterbirds, raptors, and passerines. Many of the birds using the bay area frequent lands within the existing refuge boundary on a daily basis.

Many species of birds have evolved complex migratory behavior, resulting in annual visitation to different parts of their ranges. The vast majority of bird species found on the Humboldt Bay NWR utilize refuge habitats during particular seasons to fulfill needs during migration (see Appendix F). A much smaller number of bird species use various refuge habitats for the breeding season or are year-round residents. Humboldt Bay's immense habitat value for birds is due, in part, to its proximity to a diverse array of nearby habitats including tidal marsh (Mad River and Eel River estuaries), restored freshwater marsh (HBNWR, CDFG Wildlife Areas, Arcata Marsh), eelgrass beds, wet agricultural grasslands, willow thickets, and coastal dunes (Evens and Tait 2005).

More than 50 different species of mammals and a wide variety of reptiles and amphibians are known to utilize Humboldt Bay habitats. Mammal species commonly found in bay ecosystems include river otter (*Lontra canadensis*), black-tailed deer, long-tailed weasel (*Mustela frenata*), and gray fox (*Urocyon cinereoargenteus*). Species much less commonly seen include black bear (*Ursus americanus*), mountain lion (*Felis concolor*), ringtail (*Bassariscus astutus*), and porcupine (*Erethizon dorsatum*). The dune forests typically have no mammals larger than the gray fox, although occasional deer stray into the forest.

The diversity of habitats around the bay support many amphibians and reptiles, including a variety of frogs (red-legged and tree), salamanders, and snakes.

In total, the bay provides habitat for ~95 species of fish, 41 of which contribute to sport or commercial fisheries or have contributed to those fisheries in the past. Salmon Creek provides a passage corridor or habitat for various life stages of steelhead, Coho salmon, Chinook salmon, and coastal cutthroat trout (*Oncorhynchus clarki clarki*), which are all Federal and/or State listed species. Tidewater goby, another federally listed species of fish, use the edges of the bay, particularly brackish areas with little to no current.

Benthic invertebrate communities in marshes and the bay, are dominated by gastropods, crustaceans, and polychaetes (Barnhart et al. 1992). Intertidal flats support eelgrass beds that provide cover and contribute to the invertebrate food source and are important spawning and feeding areas for sport and commercial species.

Invertebrates are abundant and diverse in the dunes system. Gordon (1984) identified 43 species of bees from six families at the Lanphere Dunes Unit. This unique assemblage of solitary nesting bees, including silver bees (*Habropoda miserabilis*) and leaf cutter bees (*Megachile wheeleri*), serve as crucial pollinators for dune plants (Nyoka 2004).

3.2.5. Humboldt Bay NWR Wildlife

Migratory and Resident Birds

Fall migration begins as early as July for some shorebirds, while the peak of waterfowl migrants reaching the Humboldt Bay area is September through November. Wintering and spring staging birds are at their greatest numbers from November to April. Dozens of species of waterbirds use the bay from July through April, with most beginning to migrate back to their northern breeding grounds by sometime in April.

Over 260 different bird species have been documented throughout the vicinity of the bay (Harris 1996, Ralph et al. 1998). Nelson (1989) estimated ~four million bird use-days annually for the South Humboldt Bay alone. On a typical winter or spring day, it is not unusual for more than 100,000 birds to use the bay as a feeding or resting site. According to WHSRN (2007), over 230 species of birds have been found within the refuge including over 31 species of waterfowl numbering ~70,000 throughout the winter. The migratory and over-wintering shorebird population generally exceeds 100,000 birds from 34 species. Among the birds heavily dependent upon the bay and associated seasonal wetlands are willet, marbled godwit, dunlin, least (*Calidris minutilla*) and western sandpiper, Pacific brant, Aleutian cackling geese, tundra swans, American wigeon (*Anas americana*), greater scaup (*Aythya marila*), bufflehead (*Bucephala albeola*), surf scoter (*Melanitta perspicillata*), green-winged

teal (*Anas crecca*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), great (*Casmerodius albus*) and snowy (*Egretta thula*) egret, great blue heron (*Ardea herodias*), and black-crowned night heron (*Nycticorax nycticorax*). Humboldt Bay is the northernmost wintering area on the Pacific coast for significant numbers of long-billed curlews, marbled godwits, and willets. Over a million shorebirds migrate through the Humboldt Bay area each year (WHSRN 2007).

The bay area is also a very important area for hundreds of passerine bird species, especially the dune and riparian habitats, which provide important food resources during migration (Ralph et al. 1998). In the dunes, passerine bird use and nesting is concentrated in the forest, with lesser use of the swales. During winter and migration periods the dune ridges are also frequented by red-tailed hawks (*Buteo jamaicensis*), short-eared owls (*Asio flammeus*), white-tailed kites (*Elanus leucurus*), and other raptors, because of the many rodents that occur there and provide a primary source of prey. The upper beach is an important feeding habitat for migratory and resident shorebirds such as the threatened western snowy plover (*Charadrius alexandrinus*) and sanderlings (*Calidris alba*). In addition, recently de-listed species, such as the bald eagle, peregrine falcon, and Aleutian cackling geese, utilize refuge and bay habitats.

Waterfowl

The Humboldt Bay watershed is considered the most important wintering waterfowl habitat between San Francisco Bay and the Columbia River (PCJV 2004). Many species of waterfowl use habitats on Humboldt Bay NWR, particularly for resting and foraging over winter and spring during their annual migration through the bay area. Seasonally common waterfowl that use refuge/bay wetlands and agricultural grasslands during migration include northern pintail, American wigeon, green-winged teal, Pacific brant, Aleutian cackling geese, tundra swan, white-winged scoter (*Melanitta fusca*), surf scoter, and red-breasted merganser (*Mergus serrator*). Several waterfowl species also nest on the refuge including western Canada geese, mallard, cinnamon teal (*Anas cyanoptera*), and gadwall (*Anas strepera*).

Pacific Brant

Pacific brant are small dark geese that migrate long distances to their primary wintering areas in coastal Mexico which are typically characterized by an abundance of sea grasses, (especially eelgrass, *Zostera maritima*) and certain marine algae (Reed et al. 1998). Eelgrass is the principal forage for Pacific brant and other herbivorous waterfowl. Each spring, eelgrass beds in Humboldt Bay attract the largest flocks of Pacific brant along the Pacific coast as the birds stopover during their migration from southern wintering sites to breeding grounds in the Arctic (Evens and Tait 2005). Humboldt Bay NWR is the southernmost in a chain of national wildlife refuges in the United States that provide habitat for most of the world's population of Pacific brant. It is estimated that over 40 percent of the Pacific Flyway population of Pacific brant use Humboldt Bay as a migratory stopover in the spring, primarily to utilize eelgrass resources (PCJV 2004). The bay's extensive eelgrass beds make it the most important Pacific brant wintering and migration site in California. The primary wintering areas for these geese is now the coastal lagoons in Baja and Pacific coastal Mexico. Peak counts of spring staging Pacific brant in Humboldt Bay were 20,000–40,000 from 1950–1977, declined to 10,000–15,000 in the 1980s, and has increased to 20,000–25,000 in the late 1990s (PFC 2002). It is not uncommon for more than 10,000 Pacific brant to be found on the South Bay alone from late February through mid-April (PCJV 2004).

Cackling Geese and Western Canada Geese

In 2004 the formerly broad Canada goose species was divided by the American Ornithologists Union into a group of large-bodied interior and southern range breeding subspecies, and a group of small-bodied tundra breeding subspecies. The members of the large-bodied group are still known as Canada geese (*Branta canadensis*), while the small-bodied group was given the name cackling geese (*Branta hutchinsii*) (Sibley 2007). Both Aleutian cackling geese and cackling geese (*Branta hutchinsii minima*), a separate small-bodied species that breeds on the Yukon-Kuskokwim Delta in Alaska and winters primarily in the Willamette Valley of Oregon, as well as the large-bodied western Canada geese, use the agricultural grasslands and freshwater wetlands on the Humboldt Bay NWR.

Aleutian Cackling Goose

The original decline of the Aleutian cackling goose primarily resulted from the introduction of Arctic foxes (*Alopex lagopus*) and, to a lesser extent, red foxes (*Vulpes vulpes*) during the late 1800 and early 1900s to the Aleutian Islands for the purpose of developing a fur industry. Hunting throughout its range in the Pacific Flyway, especially on the migration and wintering range in California, as well as loss and alteration of habitat on its migration and wintering range, also contributed to the Aleutian cackling goose subspecies' decline (USFWS 2001).

The formerly named Aleutian Canada goose (now called the Aleutian cackling goose) was first designated as an endangered species in the United

States on March 11, 1967, under the Endangered Species Preservation Act of 1966 (*see Abundance of Aleutian Cackling Geese; Preliminary Results*). Over time, conservation initiatives from the Aleutian Canada Goose Recovery Program were instituted. These included removal of foxes from nesting sites, closing of Canada/cackling goose wintering and migration areas to hunting, translocation of wild geese caught in the Aleutians to other islands where foxes had been removed, and habitat conservation (PCJV 2004). As a result of such management actions, the Aleutian goose population began a steady recovery and the subspecies was reclassified as threatened on December 12, 1990. The goose was officially removed from the list of ESA-listed threatened and endangered species on March 20, 2001.

Aleutian geese typically arrive in California in mid-October each year. The majority of the population currently bypasses the north coast and goes right to their primary wintering areas in the Central Valley. However, since 2002, there has been a relatively small (~1500-5000) number of geese that spend fall and winter on the north coast. In about late December the geese wintering in the Central Valley begin moving north, and by mid-February most of the Aleutian goose population is located in northwestern California until they depart for the Aleutian Islands in mid-April.

As the goose population grew (Figure 8, Table 3) so did their impact on grasslands in Del Norte County. Beginning in 2001, the geese began frequenting Humboldt County more often, likely as a result of a combination of hazing in Del Norte County and continued population growth. As of 2004, Humboldt County began receiving the majority of Aleutian goose use on the northwest coast from January through April. A working group of landowners, biologists, and others have been meeting since 2002 in efforts to manage this situation. It has been and likely will continue to be a contentious problem until managers can find a way to bring the population closer to the Pacific Flyway management goal of 60,000. A sustainable harvest of the geese is now allowed under CDFG regulations. Beginning in spring 2007, CDFG allowed a late season (~2 weeks in late February and early March) on private lands only with the intent to "push" geese off private and onto public lands.

Western Canada Goose

These large geese are native to the Great Basin but were not historically found on the coast. However, CDFG, with assistance from the Northcoast Waterfowlers, relocated several hundred birds from the Reno, NV, area during the mid-1980s. Those birds have become local nesters and year-round residents with a current population of ~3000. Approximately 50–75 pairs nest on refuge lands each spring (which are closed to hunting at that time).

Tundra Swans

Tundra swans are abundant in the Pacific flyway. Tundra swans are a relatively long-lived species that

Aleutian cackling geese. Photo: © Red Jioras

Abundance of Aleutian Canada (Cackling) Geese: Preliminary Results 2009

Todd A. Sanders, U.S. Fish and Wildlife Service, Division of Migratory Bird Management; 27 April 2009

Aleutian cackling geese (*Branta hutchinsii leucopareia*) were listed as an endangered population in 1967, downgraded to threatened status in 1990 and they were removed from protection under the endangered species act in 2001. Accurate determination of population status continues to be a priority for management agencies because of the population's past listing as endangered, the species status as a game bird, and because population expansion has resulted in depredation complaints. Breeding population inventories have never been considered a practical means of monitoring population status because of their remote and widely distributed breeding areas. Direct counts in winter were sufficient to monitor their status when the population was small and concentrated in a few local areas. However, as the population has grown and distribution expanded, challenges associated with direct counts have lead managers to indirect methods (mark-resight) of estimating population abundance of this important goose population. An estimate of Aleutian cackling geese abundance was derived by expanding an estimate of the abundance of marked birds by the ratio of total birds to marked birds. A closed robust design model was used for estimation of abundance of marked birds. The model included only sighting data from a primary sample period of 1 January–31 March annually with 2 secondary sample periods of 1 January–14 February, primarily in the San Joaquin Valley region, and 15 February–31 March, primarily in the California-Oregon Coast region. Estimation of the ratio of total birds to marked birds was determined during a single annual sample period 15 February–31 March in the California-Oregon Coast region. The estimated number of Aleutian Canada (cackling) geese in the winter of 2009 was 79,535 (95% CI = 53,454 – 105,617) (Fig.1 Table 1). Abundance of this subspecies has generally increased exponentially from 790 in 1975, reaching an estimated 112,276 (95% CI = 96,761–127,791) in 2008 (Fig. 8, Table 3).

The decline in the 2009 estimate was not expected, but is similar to the decline in annual estimates that occurred between 2004 and 2005. This decline may be real, or it may be the result of a bias in the estimate of the ratio of marked to total geese. No birds were marked in 2008, so there should be about 200 fewer marked birds available for detection compared to previous years. If abundance remained stable, the ratio of total geese per marked bird should have increased to about 300.

The estimated number of marked birds in the population was 377.0 (SE=45.6, 95% CI=307.9 to 491.0). This was down about 175 birds from each of the previous 2 years and probably reflects the lack of banding this year (about 200 birds annually). The variance associated with this estimate also doubled from the previous 2 years (probably because of fewer neck collar observations compared to previous years). Overall, the estimate seems reasonable.

The estimated ratio of marked birds to total birds was 211.4 (SE=23.7, 95% CI=164.9 to 257.9). This number is similar to last year except that variance doubled. The true ratio could be about 300 if the total population remained at about 110,000 similar to last year and the total number of marked birds dropped to about 375. A ratio of 300 may be too extreme to get an unbiased estimate although simulations with the current sample size suggest that unbiased estimates should be possible. Possibly marked and unmarked geese are not randomly distributed across spring staging areas and current ratio estimates reflect only the portion of the population in the core sampling area and not in the more peripheral areas. We plan further investigations of these factors in future years to see if these issues can be resolved.

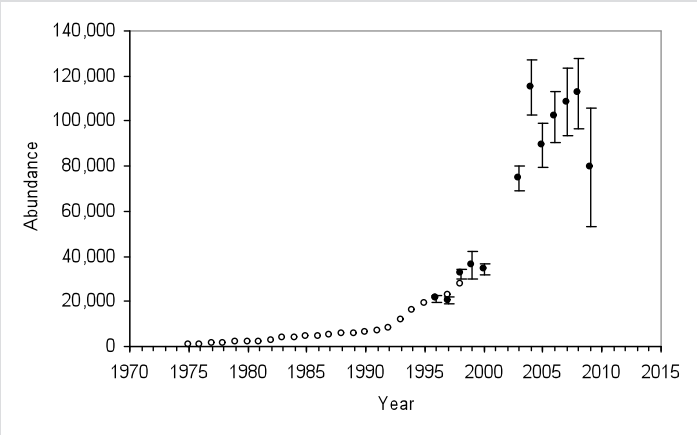


Figure 8. Abundance (point estimate and 95% confidence interval) of Aleutian cackling geese from direct counts (1975–1998) and from estimates of marked bird abundance based on a closed robust design model for the San Joaquin Valley and California-Oregon Coast regions combined and expanded by estimates of the ratio of total geese to marked geese in the California North Coast region (1996–2009). There is no estimate for 2001 and 2002 because of insufficient data.

Table 3. Abundance (point estimate and 95% confidence interval) of Aleutian cackling geese from direct counts (1975–1998) and from estimates of marked bird abundance based on a closed robust design model for the San Joaquin Valley and California-Oregon Coast regions combined and expanded by estimates of the ratio of total geese to marked geese in the California North Coast region (1996–2009). There is no estimate for 2001 and 2002 because of insufficient data.

Year	N	SE	L95%ci	U95%ci	Method
1975	790				Direct count
1976	900				Direct count
1977	1,280				Direct count
1978	1,500				Direct count
1979	1,590				Direct count
1980	1,740				Direct count
1981	2,000				Direct count
1982	2,700				Direct count
1983	3,500				Direct count
1984	3,800				Direct count
1985	4,200				Direct count
1986	4,300				Direct count
1987	5,000				Direct count
1988	5,400				Direct count
1989	5,800				Direct count
1990	6,300				Direct count
1991	7,000				Direct count
1992	7,680				Direct count
1993	11,680				Direct count
1994	15,700				Direct count
1995	19,150				Direct count
1996	21,420				Direct count
1997	22,800				Direct count
1998	27,600				Direct count
1996	21,280	777	19,757	22,804	Mark-resight
1997	20,227	756	18,744	21,709	Mark-resight
1998	32,270	1,064	30,185	34,356	Mark-resight
1999	35,845	3,139	29,692	41,997	Mark-resight
2000	34,290	1,364	31,617	36,962	Mark-resight
2001					
2002					
2003	74,677	2,855	69,081	80,273	Mark-resight
2004	115,050	6,265	102,770	127,330	Mark-resight
2005	89,255	5,061	79,336	99,174	Mark-resight
2006	101,905	5,738	90,658	113,152	Mark-resight
2007	108,346	7,647	93,357	123,336	Mark-resight
2008	112,276	7,916	96,761	127,791	Mark-resight
2009	79,535	13,307	53,454	105,617	Mark-resight

form monogamous pairs. Each year's young remain with their parents until their arrival back on the, arctic wetland breeding grounds the following year (Limpert and Earnst 1994).

The majority of tundra swans in the flyway winter in the Central Valley but ~1000 winter (November–February) on the northcoast with primary use areas being the Smith River bottoms and Lake Earl Wildlife Area in Del Norte County, and the Eel River bottoms and the refuge's Salmon Creek Unit in Humboldt County. Tundra swans graze agricultural grassland and forage for submerged aquatic vegetation, tubers, and some mollusks in ponds (Limpert and Earnest 1994).

Shorebirds

Many species of shorebirds use Humboldt Bay NWR habitats during migration and for overwintering. Humboldt Bay's particular importance to shorebirds is indicated by its designation as a Western Hemisphere Shorebird Reserve Network (WSHRN) site (WHSRN 2007). The mission of WSHRN is to conserve shorebird species and their habitats across the Americas through a network of key sites.

Marine waters, intertidal flats, seasonal wetlands, beaches, marshes, and agricultural grasslands are all used by shorebirds, primarily for foraging. Common species of shorebirds found in the Humboldt Bay area include marbled godwits, willets, long-billed curlews, whimbrels (*Numenius phaeopus*), western and least sandpipers, dunlin, long (*Limnodromus scolopaceus*) and short-billed (*Limnodromus griseus*) dowitchers, greater (*Tringa melanoleuca*) and lesser (*Tringa flavipes*) yellowlegs, common snipe (*Gallinago gallinago*), ruddy (*Arenaria interpres*) and black (*Arenaria melanocephala*) turnstones, several plover species, spotted sandpipers (*Actitis macularia*), and killdeer (*Charadrius vociferus*). In fact, surveys from the early 90s reveal that the bay supports 5-8 percent of the Pacific Flyway population of marbled godwits, 4-5 percent of dunlin, and 3-4 percent of willet. More rare species include semi-palmated (*Calidris pusilla*), buff-breasted (*Tryngites subruficollis*), pectoral (*Calidris melanotos*), and stilt (*Calidris himantopus*) sandpipers; ruff (*Philomachus pugnax*) and golden plovers (*Pluvialis fulva*).

Few species of shorebird breed on the refuge; those that have include killdeer, black-necked stilt (*Himantopus mexicanus*), and American avocet.

Waterbirds

Waterbirds is a generic term that refers to a large group of species that tend to obtain most of their

Long-billed curlew. Photo: © Red Jioras

food from water-associated habitats. Birds that dive and forage the marine edges of the Humboldt Bay NWR include common (*Gavia immer*), Pacific (*Gavia pacifica*), and red-throated (*Gavia stellata*) loons; brown pelican (*Pelecanus occidentalis*); double-crested cormorants (*Phalacrocorax auritus*); Clark's (*Aechmophorus clarkii*), western (*Aechmophorus occidentalis*), horned (*Podiceps auritus*), eared (*Podiceps nigricollis*), and red-necked (*Podiceps grisegena*) grebe.

Other waterbirds are best described as wading birds that feed primarily by wading in or standing still in fresh or brackish waters to strike at small fish and other prey. Many wading birds that breed on or near Humboldt Bay NWR primarily use freshwater and brackish marsh, seasonal wetlands, and riparian forest habitat. These include great blue heron; American bittern (*Botaurus lentiginosus*); great, snowy, and cattle (*Bubulcus ibis*) egret; green heron (*Butorides virescens*), and black-crowned night-heron.

Raptors

Raptors are birds of prey, including owls (Order Strigiformes), but most are in the Order Falconiformes which includes osprey (*Pandion haliaetus*), kites, eagles, hawks, and falcons. On Humboldt Bay NWR, raptors feed primarily on a

variety of birds and small mammals. Forest habitats on the refuge are primarily used by raptors such as Cooper's (*Accipiter cooperii*), sharp-shinned (*Accipiter striatus*), and red-shouldered (*Buteo lineatus*) hawks. Other raptors such as northern harrier (*Circus cyaneus*); white-tailed kite; rough-legged (*Buteo lagopus*), red-tailed, and Swainson's hawk (*Buteo swainsoni*); peregrine falcon; merlin (*Falco columbarius*); American kestrel (*Falco sparverius*); short-eared, long-eared (*Asio otus*), burrowing (*Speotyto cunicularia*), great horned (*Bubo virginianus*), and barn owls (*Tyto alba*) primarily use more open habitats such as grasslands, dunes, and marshes for hunting. Osprey and bald eagle both nest near the refuge with osprey being an obligate fish-eating (piscivorous) bird, while eagles will eat both fish and waterfowl, as well as occasionally scavenging.

Passerines

Over 150 passerine bird species have been sighted in the Humboldt Bay area (Harris 1996, Ralph et al. 1998), many of which use refuge habitats such as grasslands, dune swales, marshes, and coniferous, dune forest, and riparian/swamp. Riparian swamp In particular Is a favored habitat of migrating birds (Evens and Tait 2005).

The majority of these are migrants, but there are many breeding birds as well. Key species groups include swallows, sparrows, wrens, flycatchers, and warblers.

There have been banding sites set up and run at both the Lanphere Dunes Unit (since the 1980s) and the Salmon Creek Unit (since 2002) by the Humboldt Bay Bird Observatory (Ralph et al. 1998). These sites are part of the Monitoring Avian Productivity and Survivorship (MAPS) program (Figure 9). The program was started by the Institute for Bird Populations in 1989 "to assess and monitor the vital rates and population dynamics of over 120 species of North American landbirds in order to provide critical conservation and management information on their populations." The MAPS network now includes over 500 stations in North America and has captured and banded millions of birds. MAPS biologists use ultra fine nets, called mist nets which are about 2 meters high and 10 meters long, stretched between two poles to capture birds. A MAPS station typically utilizes 10 nets, which are open for 6 hours beginning at sunrise. Each station is run once every 10 day period between May 1st and August 8th. Birds captured during this period are more likely to be resident and breeding at the station site. Some stations, such as at Salmon Creek and Lanphere Dunes, capture birds earlier and/or later in the year

Osprey. Photo: © Ron LeValley

in order to capture birds during migration. Data collected on each bird captured includes its band number, species, amount of fat, and molt patterns. Biologists also attempt to determine the bird's sex and age based on its plumage, breeding condition, and other characteristics.

Birds that use the area but are not captured are also systematically surveyed via a method called area searching.

Mammals

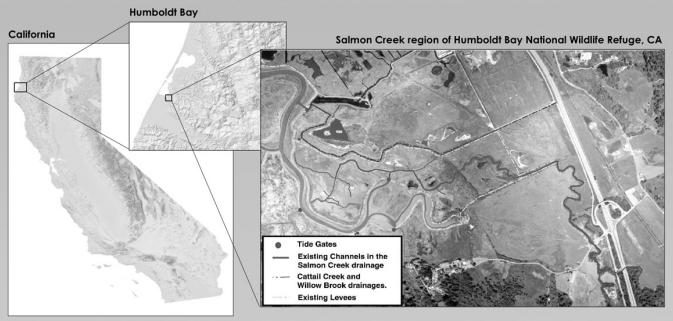
A wide variety of mammals use Humboldt Bay NWR aquatic and terrestrial habitats. Marine mammals such as harbor seal (*Phoca vitulina*), harbor porpoise (*Phocoena phocoena*) and California sea-lion (*Zalophus californianus*) use bay habitats as well as near shore habitats. Harbor seals bear and rear their pups on exposed tidal flats, and sea-lions occasionally use haulout sites near the shoreline for resting. River otters use the sloughs and associated riparian forest for foraging and den building.

The diversity of refuge habitats provide cover and forage for larger mammals including black-

5 years of Monitoring Avian Productivity and Survivorship (MAPS) on Salmon Creek restoration area, Humboldt Bay National Wildlife Refuge, CA, 2002-2006

Introduction

Salmon Creek flows into Hookton Slough and on into Humboldt Bay, which is part of the greater Klamath Bioregion of northern California and Southern Oregon. The Wiyot Tribe used Salomon Creek as a seasonal fishing village for hundreds of years. European settlers arriving in the 1850's soon began to dredge Hookton Slough for timber exports harvested from the Salmon Creek headwaters. In 1900, ranchers started to erect levees to convert wetlands into pastureland. Continued expansion of agricultural lands, intensive timber extraction, construction of the Northwest Pacific Railroad in 1901 and Highway 101 in 1927 added to the increasing number of dykes, infilling of wetlands, and deterioration of riparian habitats. In 1988 the US Fish and Wildlife Service acquired the Salmon Creek parcel, adding it to the Humboldt Bay National Wildlife Refuge Complex (HBNWR) and began restoration along a 762 meter reach of the creek. The restoration efforts included channel reconstruction and riparian tree planting to improve habitat for salmonids, birds, and many other species. In 2002, HBNWR, Redwood Sciences Laboratory, and the Humboldt Bay Bird Observatory began monitoring birds on Salmon Creek by establishing a MAPS bird-banding station to monitor the local bird community response to restoration of this riparian habitat which provides important resources for breeding, wintering, and "refueling" during migration.



Monitoring Avian Productivity and Survivorship (MAPS) Stations

Salmon Creek bird banding follows is part of the Monitoring Avian Productivity and Survivorship (MAPS) program. The program was started by the Institute for Bird Populations in 1989 "to assess and monitor the vital rates and population dynamics of over 120 species of North American landbirds in order to provide critical conservation and management information on their populations". The MAPS network now includes over 500 stations in North America and has captured and banded millions of birds. MAPS biologists use ultra fine nets, called mist nets which are about 2 meters high and 10 meters long, stretched between two poles to capture birds. A MAPS station typically utilizes 10 nets, which are open for 6 hours beginning at sunrise. Each station is run once every 10 day period between May 1st and August 8th. Birds captured during this period are more likely to be resident and breeding at the station site. Some stations, such as Salmon Creek capture birds earlier and/or later in the year in order to capture birds during migration that may not be resident at the station. Data collected on each bird captured includes its band number, species, amount of fat, and molt patterns. Biologists also attempt to determine the birds sex and age based on its plumage, breeding condition, and other characteristics.

A **Black-capped Chickadee** safely captured in a MAPS mist net.

A **Warbling Vireo** being removed from a mist net

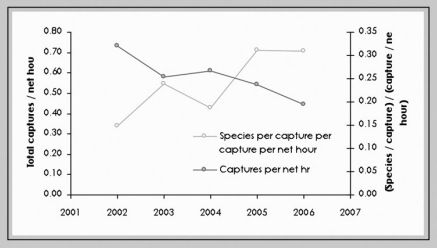
A **Wilson's Warbler being banded**

A **Yellow Warbler** fitted with a numbered aluminum USFWS band

Bird Banding Results at Salmon Creek

The 10 nets at Salmon Creek were open for a total average of 748 hours per year from mid-May though late October, 2002 through 2006. We made 971 total bird captures representing 42 species, listed on the right side of the poster. Species captured included year-round residents such as Song Sparrow and Black-capped Chickadee, summer breeding residents such as Swainson's Thrush and Barn Swallow, winter residents such as Fox Sparrow and Yellow-rumped Warbler, and stop-over migrants such as Lazuli Bunting and Nashville Warbler. Figure 1 shows the number of capture per net hour declined significantly over the five year period ($R2 = 0.82$, $F = 13.4$, $p = 0.035$), while the relative number of species captured increased ($R2 = 0.75$, $F = 9.23$, $p = 0.055$). The riparian vegetation along Salmon Creek has recovered and matured over the past 10 years, from grass pastureland to plants, shrubs, and small trees, to larger trees with a closed canopy. This process, called succession results in a habitat that provides a greater structural diversity for animals with multiple vertical layers of vegetation. Forest succession may increase overall species diversity by attracting birds such as migratory warblers and Willow Flycatchers, but may also result in a decline of more abundant and common species that use open or shrubby habitats such as Black Phoebes and Song Sparrows. Capture rates may also decline with changes in species diversity because forest birds that use the canopy will be less likely to fly into the 10 foot high nets.

Over time, number of captures decreases but species diversity increases



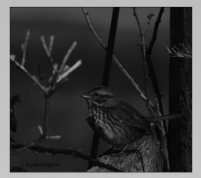
Species profiles

Swainson's Thrush – *Catharus ustulatus*

Swainson's Thrush are Neotropical migrants that breed in dense, shady riparian woods and moist coniferous forests of the northern United States and Canada and winter in Mexico and South America. Over 5 years, we captured 72 individual birds. Since the sexes can only be distinguished when they are in breeding condition, we were only able to identify 30 males and 18 females. At Salmon Creek, males arrive in late May to set up territories and depart in mid-July for their wintering grounds, while females arrive in early June and depart in early August. One benefit of bird-banding is that biologists can recognize individuals that return in subsequent years. Of the 72 birds captured, 13 were recaptured in later years. Of these, 10 were males, indicating strong site fidelity for the Salmon Creek area.

Song Sparrow – *Melospiza melodia*

Song Sparrows breed throughout most of North America and are a familiar year-round resident of riparian, wetland, and coastal scrub habitats. There are more genetically distinct populations, or subspecies of Song Sparrows, than any other bird species in North America, at least 24, of which 11 breed in California, 8 are endemic, meaning they occur nowhere else in the world, and 4 are listed as Species of Conservation Concern by U.S. Fish and Wildlife. We captured more than 200 individual Song Sparrows over 5 years. Of these, 16 individuals were recaptured during subsequent years. Seven birds were captured during two years, 7 during 3 years, and 2 were recaptured during 4 years.



Wilson's Warbler – *Wilsonia pusilla*

Wilson's Warblers breed in dense, brushy vegetation near water and utilize a diversity of woodland and shrub habitat during migration. At Salmon Creek, we captured 35 individuals over 5 years, all between late-July and Early September. 63% of birds were hatch year birds, meaning they were born the same year they were captured. These birds are likely dispersing from their natal sites and preparing for their first migration to Latin America. At least 54% of hatch year birds were male, while only 18% were female.

For more information on the ecology and conservation of Birds in California
Partner in Flight at : http://www.prbo.org/calpif/plans.html

Species captured 2002-2006

Red-shouldered Hawk
American Coot
Allen's Hummingbird
Belted Kingfisher
Downy Woodpecker
Red-shafted Flicker
Western Wood-peewee
Pacific -slope Flycatcher
Willow Flycatcher
Black Phoebe
Warbling Vireo
Hutton's Vireo
Cassin's Vireo
Tree Swallow
Barn Swallow
Black-capped Chickadee
Chestnut-backed Chickadee
Winter Wren
Marsh Wren
Ruby-crowned Kinglet
American Robin
Swainson's Thrush
Hermit Thrush
Cedar Waxwing
Orange-crowned Warbler
Nashville Warbler
Audubon's Warbler
Myrtle's Warbler
Common Yellowthroat
Wilson's Warbler
Yellow Warbler
Lazuli Bunting
Golden-crowned Sparrow
Fox Sparrow
Song Sparrow
Lincoln Sparrow
Oregon Junco
Brown-headed Cowbird
Purple Finch
Pine Siskin
Lesser Goldfinch
American Goldfinch

Birds of Conservation Concern

captured at Salmon Creek MAPS station

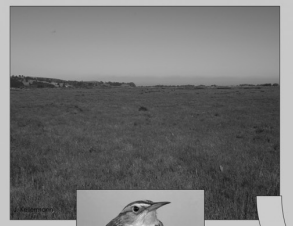
Willow Flycatcher

Allen's Hummingbird

Purple Finch

Riparian Forest Succession

Pastureland and grassland Bird species may include Brown-headed Cowbird, Western Meadowlark, Northern Harrier, and Aleutian Cackling Goose.



Western Meadowlark

Shrubs, small trees, tall grass and forbs Bird species may include Song Sparrow, Common Yellowthroat, Fox Sparrow, and Orange-crowned Warbler.

Common Yellowthroat

Closed canopy forest Birds species may include Willow Flycatcher, Red-shafted Flicker, Tree Swallow, and Yellow Warbler.

Red-shafted Flicker

Acknowledgements: Operation of the Salmon Creek MAPS station would not be possible without the commitment and effort of many interns and volunteers. Thanks to Redwood Sciences Laboratory – Bird Monitoring Lab

Figure 9. Monitoring Avian Productivity and Survivorship (MAPS) on Salmon Creek restoration area.

tailed deer, bobcat (*Lynx rufus*), mountain lion, gray fox, and porcupine (*Erethizon dorsatum*). Smaller mammals include the dusky-footed woodrat (*Neotoma fuscipes*), white-footed deer mouse (*Peromyscus maniculatus*), Pacific jumping mouse (*Zapus trinotatus*), California harvest mouse (*Reithrodontomys megalotis*), Trowbridge shrew (*Sorex trowbridgii*), vagrant shrew (*Sorex vagrans*), shrew mole (*Neurotrichus gibbsii*), California vole (*Microtus californicus*), and the rare white-footed vole (*Arborimus albipes*). Botta's pocket gopher (*Homomys bottae aticeps*) is very common and important on dunes. Bats include the big brown bat (*Esptesicus fuscus bernardinus*) and Yuma myotis (*Myotis yumanensis saturatus*). Open grassland and (seasonal) marsh habitats are preferred by black-tailed jackrabbit (*Lepus californicus*), brush rabbit (*Sylvilagus bachmani*), striped (*Mephitus mephitus*) and western spotted (*Spilogale gracilis*) skunk, long-tailed weasel (*Mustela frenata*), and American mink (*Mustela vison*), while also being utilized by some mammals mentioned above. The most adaptable and cosmopolitan mammals such as coyote (*Canis latrans*), gray fox, Virginia opossum (*Didelphis virgiana*), and raccoon (*Procyon lotor*) use a wide variety of habitats and food sources.

Anadromous Fish

The local anadromous salmonids have similar life histories. They begin their lives in streams and, after passing through larval stages, move out to the marine environment to mature. Finally returning to freshwater streams to deposit and fertilize eggs, they begin the cycle again. Fish trapping done on the Salmon Creek Unit in the late 1980s in cooperation with the Humboldt Fish Action Council and College of the Redwoods found that Salmon Creek supported remnant runs of steelhead, Coho, Chinook, and cutthroat trout. Chinook salmon utilize the main channels of larger rivers and some use of smaller tributaries. They are typically present in low-gradient area streams (1–2 percent grade) from October to January (HBWAC, RCAA 2005). Steelhead, an anadromous form of rainbow trout, utilize tributary channels with less than 8 percent grade, and may use stable side channels as well. Steelhead are typically present in area streams from winter through spring. Coho salmon utilize accessible reaches of streams, especially side channels with small gradients for breeding. Coho are typically present in area streams from November to January. Populations of Chinook salmon, steelhead, and Coho salmon, which migrate through Salmon Creek, are all listed as threatened species under the ESA. Since at least 2002, CDFG has been assessing salmonid populations at multiple locations in tributaries around the bay, including Salmon Creek. This work indicates that currently lower Salmon Creek is not receiving significant use by outmigrating salmonids.

River otter. Photo: © Red Jioras

Coastal cutthroat trout are listed as a California Species of Special Concern. Coastal cutthroat trout utilize small streams and headwaters, usually above those used by steelhead (HBWAC, RCAA 2005). Coastal cutthroats are weakly anadromous, being more tied to freshwater than other anadromous salmonids in California (Moyle 2002). Their preferred habitat is low-gradient coastal streams and estuaries (perhaps due to exclusion from other habitats by the more aggressive Coho and steelhead in pools and deeper water (Moyle 2002). They feed on invertebrates and small fish, becoming increasingly piscivorous with age. Coastal cutthroats first spawn at 2–4 years old, and may return to freshwater up to five times to overwinter and spawn (Moyle 2002). Cutthroats use off-channel habitats and intermittent tributaries and sloughs. Cutthroats are typically present from late winter through spring (HBWAC, RCAA 2005).

The tidewater goby is an ESA-listed endangered species. Tidewater goby proposed critical habitat includes most of the southern Humboldt Bay NWR units (USFWS 2006b). The entire life history of the goby can be completed on the refuge. Tidewater gobies are known to migrate upstream in tributaries up to 0.6 mile from estuaries. Sub-adult and adult gobies migrate upstream in tributaries in summer and fall for reproduction. Nesting burrows are dug in coarse, sandy substrate. They primarily feed on small benthic crustaceans and aquatic insects. Individuals typically live for 1 year (Moyle 2002).

The Pacific lamprey (*Lampetra tridentata*) is also anadromous and is likely to be found in the streams of Humboldt Bay, but is in the Family Petromyzontidae and unrelated to salmonids. According to Moyle (2002), adult Pacific lamprey spawn in streams generally from early March to late June. Adults typically die after spawning, and the embryos hatch in about 10 days. The ammocoetes (juvenile lampreys) burrow into sand or mud and live as filter feeders for 5–7 years. After the filter feeding life stage, lampreys become predatory and move downstream to the marine environment where they live for a maximum of 3–4 years (Moyle 2002).

Marine Fish

Hundreds of species of marine fish live in Humboldt Bay (Barnhart et al. 1992) (see Appendix K). Many marine fish may use nearshore areas adjacent to Humboldt Bay and estuarine/slough areas within the bay for a portion of their lifecycle. Several species are caught and or harvested for their commercial or sport value, while most others are relatively little known members of the bay, nearshore fauna and ecologic cycle(s).

Amphibians and Reptiles

Amphibians that occur in the local area include the western toad (*Bufo boreas*), pacific tree frog (*Hyla regilla*), northern red-legged frog (*Rana aurora aurora*), rough-skinned newt (*Taricha granulose*), northwestern salamander (*Ambystoma gracile*), Oregon ensatina (*Ensatina eschscholtzii oregonensis*), and Pacific giant salamander (*Dicamptodon ensatus*). These amphibians are associated with the various freshwater wetland habitats on the Humboldt Bay NWR, and breed in permanent freshwater areas near Salmon Creek and on dune units.

Snakes also make use of grassland, riparian forest, marsh, and dune habitats on the Humboldt Bay NWR including several species of garter (*Thamnophis* spp.) snakes and the gopher snake (*Pituophis catenifer*). Lizards that make use of these habitats include northern alligator lizard (*Elgaria coerulea*), western skink (*Eumeces skiltonianus*), and western fence lizard (*Sceloporus occidentalis*).

Management considerations for the long term persistence of the herpetofauna of the Humboldt Bay National Wildlife Refuge need to consider both breeding and upland habitats. Most amphibians breed in the freshwater wetlands and canal system on the main management unit of the refuge.

Most research focusing on management of amphibians has recently been conducted on northern red-legged frogs, due to their limited range in relation to other amphibian species found on the Humboldt Bay NWR. The northern red-legged frog uses freshwater habitat for breeding, which occurs locally on the refuge from mid-December to the end of March, when males and females congregate at breeding sites to deposit egg masses. Larvae hatch out of egg masses 2 to 4 weeks after oviposition, depending on water temperature, and the larvae are free swimming herbivores that go through metamorphosis starting in June to August. Wetlands where breeding occurs but hydroperiods last only until May might be insufficient in successfully recruiting new individuals into a population, so management should consider maintaining wetlands that have longer hydroperiods that will allow for completion of metamorphosis. Post-metamorphic frogs disperse from wetlands and move to upland habitats in alder forest adjacent to wetlands, although some individuals stay year round near wetlands. After two years post-metamorphosis, males become sexually mature and females become sexually mature after three years.

Recent surveys conducted in "Cattail Creek" from November 2006 until April 2007 revealed an effective population size of 237 females utilizing this ~500 meter reach of the canal as based on detection of egg masses (Bettaso et al. 2008). Population estimates of metamorphic northern red-legged frogs were 829 animals for Pond 1 and 851 animals for Pond 5 during abnormal frog surveys in 2004 (Bettaso 2004). Sendak (2008) found that northern red-legged frog abundance was greater in the smaller, permanent pond habitats out in the dune ecosystem, as compared to the seasonal pond breeding habitats in the study area. Sendak also

Pacific tree frog. Photo: Shannon Smith

found that movement of adults to the breeding ponds was greatest during the breeding season. Adult movements away from breeding ponds can be up to 4.8 kilometers to appropriate non-breeding habitats (Hayes et al. 2007) demonstrating the importance of maintaining upland habitats as part of management of this species.

Management of both freshwater breeding sites and adjacent upland habitats will likely maintain a robust effective population size of northern red-legged frogs and these same habitats would be utilized by the other pond breeding amphibians of the refuge. Proper management of the adjacent uplands will facilitate habitats that the reptile assemblage of the refuge would occupy. If restoration projects are to reduce freshwater breeding habitats (e.g. areas that are freshwater now but historically salt marsh), mitigation by construction of additional freshwater habitats could be managed on the refuge property. For restoration of currently occupied habitats, pre-construction and post-construction surveys should be initiated to understand the cost-benefits of restoration projects to the currently healthy population of breeding amphibians on the refuge.

Invertebrates

A wide variety of invertebrates inhabit wetlands and shorelines associated with Humboldt Bay NWR for at least a portion of their lifecycle. Barnhart et al. (1992) and Boyd et al. (2002) provide lists of marine and intertidal invertebrate species known to inhabit Humboldt Bay. In total there is thought to be in excess of 360 species invertebrates inhabiting the bay as well as the associated intertidal mudflats, marshes, and dunes (Hull 2002). Though they are generally considered unvegetated, intertidal flats contain a living system of diatoms, green, red and brown algae, protozoa, and other invertebrates. Other invertebrates living in the intertidal flats include suspension or surface deposit feeding invertebrates. The invertebrates are fed upon by larger consumers such as shrimp, fish, crabs, and birds. During low tide these primary and secondary producers are exploited by thousands of migratory shorebirds. Three taxa of invertebrates dominate the fauna of intertidal flats, polychaete worms, crustaceans, and molluscs. Each of these groups is represented by over 100, 75 and 60 species respectively along with many smaller groups. Humboldt Bay also host many non-native species introduced by humans, ocean currents, and other pathways. These include 24 polychaetes, 20 amphipods, and 8 bryzoa (Boyd et al. 2002). As microscopic species have not received much attention, the diversity and abundance of Humboldt Bay fauna probably exceeds the documented number many times over.

Two types of invertebrates, the Dungeness crab (*Cancer magister*) and Pacific oysters (*Crassostrea gigas*), have the highest respective commercial value to fisheries and aquaculture in Humboldt Bay. Limited sport harvest of Dungeness crab is also permitted by the CDFG, but is insignificant compared to the commercial harvest. Dungeness crabs prefer sandy and sand-mud substrates, but can be found on almost any substrate type. They live in the intertidal zone to a depth of 750 feet, but are not abundant beyond 300 feet (CDFG 2004b). Pacific oysters have been grown in the intertidal zones of Humboldt Bay (primarily the north Bay) for over 60 years using a variety of methods (Rumrill and Poulton 2004).

Many invertebrates also inhabit the bay's surrounding marine environment. Red rock crab (*Cancer productus*) are also commercially and recreationally harvested in large numbers in the area surrounding Humboldt Bay (CDFG 2004b). Rock crabs are both predators and scavengers. They feed on a variety of other invertebrates and provide a source of food to many predators (CDFG 2004b).

California's coastal dunes have been recognized for their unique and endangered terrestrial invertebrate (insect) fauna (Powell 1978). The nearshore dunes are populated by numerous beetles including darkling beetles (*Coelus ciliatus, Eleodes scabrosus*), carrion beetles (*Nicrophorus defodens*), blister beetles (Family Meloidae), and June beetles (*Polyphlla decemlineata, Phyllophaga* sp). Oregon tiger beetles (*Cicindela oregana*) are found in the spring around flooded dune swales. Pallid-winged grasshoppers (*Trimerotropis pallidipenis*) are ubiquitous in the dune mat during the late summer, while spur-throated grasshoppers (*Melanoplus* sp.) are common in herbaceous dune swales. Jumping spiders (*Habronottis amicus*) are found on the open sand, along with termites that colonize buried trees. Broad-headed bugs (*Alydus pluto*) are conspicuous when feeding on beach pea seeds with their piercing mouth parts. One of the most ubiquitous insects on the ground in the near-shore dunes are mound-building thatch ants (F*ormica obscuripes*) considered an "ecosystem engineer" for their disproportionate effect on the ecosystem (Crutsinger and Sanders 2005). Their mounds, constructed of pieces of vegetation, can reach a height of 4 feet.

The dunes are also home to 40 species of bees (Gordon 1984), including a unique assemblage

of solitary nesting bees such as the silver bee (*Hapbropoda miserabilis*) and leaf cutter bee (*Megachile wheeleri*). Many of these species are specialized on certain dune plants and serve as crucial pollinators (Nyoka 2004). Others require specialized nesting substrate present only on the dunes (Gordon 2000).

3.2.6. Humboldt Bay NWR Special Status Species

Federal Endangered Species Act Listed Species at the Refuge

An endangered species is an animal or plant species in danger of extinction throughout all or a significant portion of its range. A threatened species is an animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Various ESA-listed threatened and endangered species found seasonally or permanently on the Humboldt Bay NWR use a wide diversity of the available habitats. Two endangered plant species, Humboldt Bay wallflower and beach layia, are members of the dune mat community on the Lanphere and Ma-le'l dune units. Salmon Creek provides habitat for juvenile ESA-listed threatened steelhead, Coho and Chinook salmon, as well as passage for migrating adults of these species. Endangered tidewater gobies may migrate upstream in tributaries up to 0.6 mile from estuaries. Sub-adult and adult gobies migrate upstream in summer and fall to reproduce in tributaries (USFWS 2006a).

Birds of Conservation Concern

A 1988 amendment to the Fish and Wildlife Conservation Act mandates the U.S. Fish and Wildlife Service (USFWS) to "…identify species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." Bird species meeting this criteria are referred to as Birds of Conservation Concern (BCC). Further, the Service is required to update the list every 5 years. Species that occur in Humboldt Bay that are listed within the "Birds of Conservation Concern 2008" (USFWS 2008b) list are identified in Appendix L. Many BCCs migrate through the Humboldt Bay NWR area seasonally, including tricolored blackbirds (*Agelaius tricolor*), burrowing owls, ferruginous hawk (*Buteo regalis*), Swainson's hawk, black swift (*Cypseloides niger*), prairie falcon (*Falco mexicanus*), loggerhead shrike (*Lanius ludovicianus*), Lewis' woodpecker (*Melanerpes lewis*), and Caspian tern (*Sterna caspia*). Two BCCs are commonly found on the refuge: the olive-sided flycatcher is known to breed in Douglas-fir trees growing in stabilized dune coniferous forest habitat on the dune units and long-billed curlews are found on wetlands from fall through spring.

California State Endangered Species Act Listed Species

The California Endangered Species Act (CESA) listed endangered willow flycatcher (*Empidonax traillii*) and the threatened bank swallow (*Riparia riparia*) may use habitat on the Humboldt Bay NWR during their annual migrations. The CESA endangered bald eagle uses Humboldt Bay NWR habitat for hunting on the refuge.

California State Species of Special Concern

California Species of Special Concern (SSC) is a designation that the CDFG can give to vertebrate species because of declining population levels, limited ranges, and/or continuing threats that may make the listed species vulnerable to extinction. A single amphibian SSC, the northern red-legged frog, uses wetland habitats on the Humboldt Bay NWR. Fish SSC that use Humboldt Bay NWR habitat include green sturgeon (*Acipenser medirostris*), tidewater goby, coast cutthroat trout, Coho salmon (southern Oregon/northern California ESU), steelhead (northern California ESU), Chinook salmon (California coastal ESU), longfin smelt (*Spirinchus thaleichthys*), and eulachon (*Thaleichthys pacificus*). Bird SSC species that use the Humboldt Bay NWR include osprey, merlin, prairie falcon, ferruginous hawk, Swainson's hawk, Cooper's hawk, sharp-shinned hawk, northern harrier, long-eared owl, burrowing owl, short-eared owl, Barrow's goldeneye (*Bucephala islandica*), common loon, California gull (*Larus californicus*), black tern (*Chlidonias niger*), double-crested cormorant, long-billed curlew, western snowy plover, tricolored blackbird, Vaux's swift (*Chaetura vauxi*), black swift (*Cypseloides niger*), yellow-breasted chat (*Icteria virens*), yellow warbler, (*Dendroica petechia*) loggerhead shrike and purple martin (*Progne subis*).

Other Special Status Species

Two globally endangered lichens are found in the forest of the dunes units, *Bryoria spiralifera* and *B. pseudocapillaris* (Glavich 2003). Both are arboreal and are commonly found at the edges of the coniferous forest. These two lichens are endemic to the California and Oregon coastlines and listed under the Department of Agriculture/Department of Interior's InterAgency Special Status/Sensitive Species Program (http://www.fs.fed.us/r6/sfpnw/issssp/).

Population status of the endangered Humboldt Bay wallflower (*Erysimum menziesii ssp. eurekense*)

Humboldt Bay wallflower (*Erysimum menziesii* ssp. *eurekense*) is a federally and State-listed endangered plant in the Brassicaceae. The subspecies is restricted to coastal dunes in the Humboldt Bay region, and is one of three endangered subspecies of Menzies' wallflower (*Erysimum menziesii*). The semelparous life history (it is a short-lived perennial with only one reproduction event) of *Erysimum* is distinctive among dune plants. Many years of research on the Humboldt Bay wallflower have shown that it requires a semi-stable substrate with openings of bare sand to thrive, and is particularly vulnerable to invasions by stabilizing vegetation.

Over the past two decades, management for this subspecies has been carried out on Humboldt Bay NWR and other public lands on the North Spit of Humboldt Bay. Management has consisted primarily of removal of invasive species to allow for maintenance of underlying disturbance-generating processes. A sampling program for the entire North Spit population was carried out in 1988 (Sawyer and André 1990), and repeated in 1997 (Pickart et al. 2000) and 2006 (USFWS unpublished data), allowing for a unique opportunity to track the health of this plant over two decades of active management. Although the 2006 results are still preliminary, we present them (Figure 10) to illustrate the positive response of this plant to management. Between 1988 and 2006, the North Spit population of wallflowers has increased from 20,657 (+1,172 SE) to 55,605 (+7,020 SE). As is visible on the chart, the Lanphere Dunes subpopulation accounts for the greatest increase, and now represents nearly 50 percent of the total population. This subpopulation was the most intensively managed over this period, with removal of virtually all invasive species occurring in wallflower habitat (yellow bush lupine, European beachgrass, iceplant, and annual grasses) as well as the intentional movement of seeds from occupied to unoccupied habitat areas between 1997 and 2006.

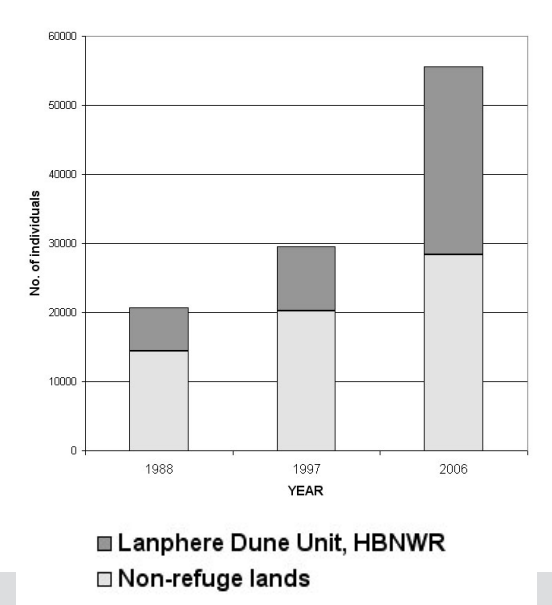


Figure 10. Population status of Humboldt Bay wallflower.

Of the three endangered subspecies, *Erysimum menziesii* ssp. *eurekense* is considered the closest to achieving recovery (USFWS 2008a). However, additional protection of privately held habitat, and additional off-refuge habitat restoration is still needed.

Non-native Wildlife
Beginning in 2000, the CDFG conducted the most thorough aquatic organism sampling program recently undertaken in Humboldt Bay (Boyd et al. 2002). During this survey of marine species, researchers collected and identified 95 species that are possibly non-indigenous to Humboldt Bay. These were representatives from diverse groups of organisms ranging from vascular plants to fish. The majority of non-indigenous species found were in various invertebrate groups, including polychaetes (24 species), amphipods (20 species), and bryozoa (8 species) (Boyd et al. 2002).

Non-native wildlife found on the other refuge units includes starlings, house sparrows (*Passer domesticus*), feral cats (*Felis domesticus*), and Norway rats (*Rattus norvegicus*).

3.3. Humboldt Bay NWR Visitor Services

3.3.1. Overview of Humboldt Bay NWR Visitor Services

Recreational uses occur throughout Humboldt Bay, but are most common in the North and South Bay areas. Some of the most common are recreational bird watching, fishing, boating, clamming, hunting, and hiking (Hull 2002).

Bird watching is one of America's fastest growing recreational pastimes (USFWS 1997), and the Humboldt Bay area is a birding destination due to both the diversity of birds and the number of great spots to view them. Godwit Days has grown into a very successful week-long community birding event that brings in hundreds of birding enthusiasts each spring.

Recreational boating (primarily kayaks and canoes) has also increased dramatically both nationally and locally. There are several businesses that rent boats for use on and around the bay, as well as a local kayaking club. Boaters have access from many locations around the bay including Woodley Island, Arcata Marsh, Fields Landing boat launch, and the refuge at Hookton Slough (non-motorized only). A water trails plan for the bay has recently been developed in order to inform people of some of the best locations, as well as provide information on safety, potential impacts to wildlife and habitats and considerations of tides and weather.

Sport fishing continues to be a popular pastime in and around Humboldt Bay. Most of the fishing around the South Bay occurs on the South Jetty and at Buhne's Point. The South Bay also contains large clam beds, including gaper (*Tresus capax*), and Washington (*Tresus nuttallii*) and littleneck clams (*Protothaca staminea*). Several thousand clamming-days occur in good years. Sport fishermen, including clammers, spend over $400,000 annually on licenses alone in Humboldt County.

Another popular traditional use on and around the bay is waterfowl hunting. Humboldt Bay has been well known for generations as one of the best places on the west coast of the United States to hunt Pacific brant. The recent increase in both Aleutian cackling and western Canada geese around the bay, in addition to other waterfowl, provides increased

Kayaking on Hookton Slough.
Photo: Shannon Smith

opportunities for hunters. Estimated use by hunters around the bay exceeds 7,500 use-days annually. Like other recreational pursuits, hunters add significantly to the local economy through purchase of local goods and services. In addition, a percentage of required licenses and stamps purchased by hunters and fishers are used to pay for State and Federal conservation programs and acquire lands for public use.

Painting waterbird silhouettes. Photo: Shannon Smith

Aesthetics of Humboldt Bay NWR Area
The southern units of Humboldt Bay NWR can be partially viewed from Highway 101. The refuge is enclosed by Tompkins Hill on the east and Table Bluff to the south. The views of these areas from the refuge are currently pastoral in nature, but increasing development on both ridges is a concern from the standpoint of a refuge visitor's aesthetic experience. Hopefully, in decades to come, refuge visitors will still have the sense of being in a rural area rather than semi-urban.

Once on the refuge, open agricultural grasslands and seasonal wetlands allow visitors to glimpse shorebirds, wading birds, geese, raptors, deer, and occasionally gray foxes, skunks, and/or otters. The southern portion of the Salmon Creek Unit appears as a deciduous riparian forest bordering Highway 101. Once visitors enter the Humboldt Bay NWR southern units they find several trails that can provide immediate viewing opportunities for a variety of wildlife, primarily birds and deer. Interpretive displays around the visitor center and along the trails provide visitors with basic information about the species and habitats present on these units. The refuge has two interpretive trails in South Bay, one each at the Hookton Slough and Salmon Creek Units. Peak viewing season from these trails is September through March for most species of waterbirds and raptors. On the Humboldt Bay NWR, Pacific brant and migratory shorebird viewing peaks from mid-March to late April. Summer visitors will see many gulls, terns, cormorants, and pelicans, as well as resident egrets and herons. Waterfowl, raptors, and harbor seals are visible throughout the year.

The entrance to Humboldt Bay's northern dune units is generally lined by willow swamp and coniferous dune forest and appears as a pristine natural forest along a country road. Those who take a guided tour of the dunes experience a continuum of pristine dune habitats from coniferous forest, to dune mat, moving dunes, swales, foredune grasslands, beaches, and finally the Pacific Ocean.

In the near future there will be a new trail open to the public at the Ma-le'l Dunes Unit adjacent to the Mad River Slough. The dunes offer spectacular panoramic views to the east and west all year long, but spring time is the best for birds and summer for viewing the prolific floral displays in the dune mat plant communities.

3.3.2. Humboldt Bay NWR Visitor Services

Public visitation of the Humboldt Bay NWR has steadily increased since 1988 when the refuge acquired the Salmon Creek Unit.

In spring 2002, the Richard J. Guadagno Headquarters and Visitor Center was dedicated and offered an obvious destination for visitors. Prior to 2002, the Humboldt Bay NWR headquarters and residence was an old ranchhouse at the end of a gravel road. Visitation increased dramatically shortly after the construction of the visitor center and paving of the entrance road.

As visitation increased, the older established trails had to be re-routed to minimize wildlife disturbance while providing the public with the opportunity to view a representative sample of wildlife and habitats on the refuge units. Increased public exposure and ongoing habitat improvement projects resulted in requests by the public to open the Salmon Creek Unit on weekends.

In response to the growing demand, and with volunteer assistance, the Salmon Creek Unit was opened on Saturdays in 2003. Due to the continued, increasing demand for weekend access to the refuge,

hours were again expanded in 2005 making the Salmon Creek Unit open to the public seven days a week from 8 a.m. to 5 p.m.

Currently, with the assistance of two Friends groups and volunteers, Humboldt Bay NWR makes a variety of visitor services accessible to the public. The total number of visitors averages 15,000 to 17,000 per year, conservatively. Wildlife observation, environmental education/interpretation, and waterfowl hunting are currently the principal public uses of the refuge. The Visitor Center has interpretive exhibits and staff or volunteers available to provide information daily from 8:00 a.m. to 5:00 p.m., excluding Federal holidays. The Hookton Slough Unit is open daily from sunrise to sunset. Only day-use activities are allowed on refuge units.

The southern units of Humboldt Bay NWR include two self-guided trails and a sheltered viewing area for wildlife observation. One trail is open seven days a week during daylight hours (Hookton Slough Trail), and one is open daily from 8 a.m. to 5 p.m. (Shorebird Loop Trail). The Hookton Slough Trail follows a tidal slough one and a half miles out along the south edge of the bay. The three mile round trip trail passes along grasslands, freshwater marsh, mudflats, and open water. Visitors can see herons and egrets, as well as shorebirds, waterfowl, and harbor seals. The 1.75-mile Shorebird Loop Trail passes near some of the refuge's best shorebird viewing areas. The trail affords a good overview of the diverse seasonal wetlands; an optional side trail goes to the refuge's photoblind. Interpretive panels along the way illustrate wildlife resources and habitat management practices on Humboldt Bay NWR. Visitors often see shorebirds, waterfowl, songbirds, raptors, tree frogs, deer, and river otters.

Seasonal waterfowl hunting is currently allowed on all refuge units except Hookton Slough and the dune units. The managed hunt area with the Salmon Creek Unit supported over 1000 hunter use-days during the 2007-08 waterfowl season. Humboldt Bay and tidal sloughs are open to fishing year-round. Areas separated from the bay by land, such as creeks and flooded areas behind dikes, are closed to fishing. The Hookton Slough Trail is open to shore fishing; access to other areas is by boat. The Hookton Slough Unit has a non-motorized boat launch.

The northern Lanphere Dunes Unit of Humboldt Bay NWR is accessible only by permit or guided tour to minimize disturbance of sensitive species and dune habitats. Visitation to the Lanphere Dunes Unit is estimated at 2500–3500 people per year. The recently acquired Ma-le'l Dunes Unit is currently closed to public access, but will be open to daily walk-on use by 2009. Volunteers for Friends of the Dunes (FOD), a nonprofit organization whose mission is "to conserve the natural diversity of coastal environments through community-supported education and stewardship programs at multiple locations around the bay," lead monthly walks, restoration events, and conduct environmental education activities on the Dunes Units.

The Humboldt Bay NWR tries to mitigate for, or minimize, disturbance impacts caused by public use through a variety of methods. Areas of some refuge units remain closed to the general public to provide inviolate sanctuary areas for wildlife. The White Slough Unit is closed to the public at this time. Trails have been re-routed and/or enhanced to provide closer views of wildlife and their habitats, while providing a distance buffer for wildlife. Certain uses, such as hunting and the refuge trails, are largely compartmentalized to reduce wildlife disturbance, as well as to provide safe high quality experiences for visitors. The Humboldt Bay NWR also limits the level, intensity, frequency, and time of day of public uses to minimize wildlife disturbance.

Environmental Education and Interpretation

The Humboldt Bay NWR has continually offered environmental education and interpretation, at some level, and provided off-site outreach since the establishment of the Salmon Creek Unit in 1988. Groups regularly utilizing refuge units for environmental education range from kindergarten through 12th grade, and university level students.

The Redwood Region Audubon Society led monthly bird walks on the Hookton Slough Unit for many years. In recent years, they have changed the location of their walks to the Salmon Creek Unit.

With the addition of the Lanphere Dunes Unit in 1998, the refuge gained the valuable support of the FOD. The FOD still conducts portions of their Bay to Dunes curriculum, restoration activities, monthly guided docent walks, and volunteer coordination on the Dunes Units.

In 2002, the refuge expanded its relationship with the FOD to include limited environmental education and volunteer coordination on the southern units of the Humboldt Bay NWR. The FOD received a Nature of Learning Grant which helped to expand their Bay to Dunes environmental education curriculum to include trips to the Salmon Creek Unit. In recent years, environmental education and interpretation activities on the South Bay Units have been coordinated by the newly formed Friends

of Humboldt Bay NWR, whose mission is to assist the refuge and staff in all functions.

Since 2005, the refuge has contracted with the California Waterfowl Association (CWA) to hire a temporary Visitor Services Assistant, who manages the Visitor Services Program.

The lack of a full-time, dedicated staff person has hindered the Complex's ability to provide consistent environmental education, interpretation, volunteer coordination, and outreach. However, in 2008 the refuge received funding for a permanent position to be shared with the Arcata Fish and Wildlife Office to accomplish Visitor Services and Outreach goals for the FWS mission on the north coast. When filled, the shared position will be stationed at the Salmon Creek Unit of the Humboldt Bay NWR.

The Humboldt Bay NWR conducted a Visitor Services Review in November 2006. This review gathered invaluable background material and helped to inform the Visitor Services Plan (Appendix B).

3.4. Humboldt Bay NWR Cultural Resources

Cultural resources are physical remains, sites, objects, records, oral testimony, and traditional life-ways that connect people to our nation's past. They include archaeological and historical artifacts, ecofacts, sites, landscapes, sacred locations, and traditional cultural properties. Cultural resources are integral components of the landscape. They tell us how people have used the land, its water, and its wildlife. Cultural resources are also important components of individual and group identification. Cultural resources remind us that, before the arrival of EuroAmericans in the mid-1800s, human beings have been part of the web of life at Humboldt Bay for thousands of years. And although the EuroAmerican settlement and modification of Humboldt Bay is well documented on paper, cultural resource sites provide a tangible link and an alternative perspective on our recent past.

It is beyond the scope of the CCP to prepare and present a comprehensive or detailed overview of the cultural resources and cultural history of the Humboldt Bay region. However, in preparation of this document, the Service did consult the principal documents and records, including information from the North Coastal Information Center (NCIC) of the California Historical Resources Information System, on the prehistory, history, and cultural resources of the refuge to compose the summary presented here. Moratto (1984) presents an overview of the prehistoric archaeology of the North Coast Region including Humboldt Bay. For the land within and adjacent to the Humboldt Bay NWR, the most important references on the prehistory and archaeology include publications by Loud (1918), Elsasser and Heizer (1964), Eidsness (1993, 2006), and Angelhoff et al. (2004). Important references concerning Wiyot ethnography and cultural places include Elsasser (1978), Loud (1918), and Nomland and Kroeber (1936). The Service recognizes the need for a detailed and comprehensive cultural resource overview and historic context for the Humboldt Bay NWR Complex and proposes in all CCP alternatives the preparation of just such a document when the CCP is implemented. Until then, the Service encourages the interested reader to pursue the references cited here for further information on the cultural resources of Humboldt Bay.

3.4.1. Humboldt Bay NWR Native American Cultural History

Archaeological research in northwest California shows a record of Native American occupation spanning at least 8,000 years that is subdivided into three time periods marked by different adaptive patterns, environmental regimes, and geographical distributions (Moratto 1984, Hildebrandt and Swenson 1985).

The Borax Lake Pattern is the oldest period dating from approximately 6000 B.C. to 800 B.C. The Borax Pattern involved generalized hunting and gathering by small, highly mobile family groups who moved among a series of temporary camps.

The Willits Pattern dating from approximately 800 B.C. to 900 A.D. sees the establishment of riverine villages near productive fisheries and acorn crops. Two common site types include "village sites," located near interior rivers and "special purpose sites" located in a variety of interior settings. The Willits Pattern is marked by a greater diversity of projectile point forms and a greater reliance on use of mortars and pestles over milling slabs and handstones.

The Gunther Pattern dates from about A.D. 900 to EuroAmerican settlement in 1850s. Settlement focused on the coast; particularly bays, estuaries and sloughs. The Gunther Pattern is characterized by a well-developed woodworking technology, riverine fishing specialization, and distinctive artifact types such as large obsidian ceremonial blades, antler spoons, steatite pipes and bowls, bone and antler harpoon points, and small Gunther Barbed stone projectile points. Archaeological investigations demonstrate that most prehistoric sites found along

the North Coast correspond to the Gunther Pattern. Archaeologically, Gunther Pattern occupation sites are commonly marked by dark-stained midden soils containing shellfish and other dietary remains, fire-cracked rock and cooking stones, chert toolmaking debris, a variety of flaked and groundstone tools and occasionally, preserved housepit depressions. Cemeteries are often associated with major villages.

Archaeologists, historians and the Wiyot people have identified and recorded hundreds of prehistoric and historic archaeological sites, ethnographic Wiyot places, historic buildings and structures, and plant and animal resources important to on-going Wiyot identity and heritage in the Humboldt Bay region. In 1913, Llewellyn Loud conducted the first formal archaeological and ethnographic fieldwork in the Humboldt Bay area. His interviews of early EuroAmerican settlers and Wiyot people formed the basis for a detailed presentation of Wiyot archaeology, settlement, and culture (Loud 1918). Loud described and mapped 115 archaeological sites, plus 57 "modern village and camp sites," for a total of 172 Wiyot sites in the Humboldt Bay area (Loud 1918:256, 258). Since then there have been dozens of other archaeological investigations in the region (e.g., Nomland and Kroeber 1936, Benson et al. 1977, Elsasser 1978, Hayes 1983, Hildebrandt and Swenson 1985, Raymond 1990, Eidsness 1993, 2003, and Angelhoff et al. 2004).

There are approximately 45 formally recorded cultural resource sites on the Humboldt Bay NWR. An exact count is impossible to ascertain at this time because many of the recorded sites have not been field checked since the creation of the refuge in 1985 so their location with respect to the boundary of the refuge is not well understood. Furthermore, only a small fraction of the over 3,000-acre refuge has been specifically inspected for cultural resources. The cultural resource surveys that have been conducted on refuge land have been in response to specific refuge development and habitat restoration projects. The Service's Region 1 archaeologists suspect that the 45 sites represent a small fraction of the total number of cultural sites that would be documented if the refuge was subjected to a comprehensive archaeological and ethnographic inventory.

Wiyot towns, villages, fishing camps and resource collecting zones compose the majority of the formally recorded archaeological sites in and adjacent to the Humboldt Bay NWR. Among these some important locations deserve mention including the village of Mole'l on Mad River Slough, Wiyot villages and surf fishing camps on South Spit and among the Lanphere and Ma-le'l dunes coastal dunes, the historic and modern settlements near Indianola, Table Bluff, Fields Landing, and *Tuluwat* and *EtpidoL wotperoL* on Indian (Gunther) Island.

Indian (Gunther) Island, which is located within the Humboldt Bay NWR boundary but is not owned or actively managed by the FWS, is one of the most important places of the Wiyot. Contemporary Wiyot people identify Indian Island as the traditional center of the Wiyot world. Located in the middle of Humboldt Bay, Indian Island hosts two large archaeological village sites (*Tuluwat* and *EtpidoL wotperoL*), provides access to a diverse array of plant and animal resources, supports a traditionally significant bird rookery, is the location of several important Wiyot myths and stories, contains a dance and ceremonial site for the Wiyot world renewal ceremony, and was targeted during the infamous Wiyot massacre by EuroAmerican settlers in 1860 (Loud, 1918, Eidsness 2003).

Tuluwat (CA-HUM-67) on Indian Island contains the remains of a large Wiyot village. It was continuously occupied from at least A.D. 900 to 1860. Loud's 1913 field investigation there contributed to establishing the cultural chronology for North Coastal California (i.e., Gunther Pattern), archaeological deposits include the remains of houses, cooking features and dumps, fishing gear and facilities, over 350 graves, and thousands of artifacts (Loud 1918, Elsasser and Heizer 1964). The account of the February 25, 1860 massacre at *Tuluwat* during the World Renewal Ceremony is well known (cf. Loud 1918). The *Tuluwat* site is listed on the National Register of Historic Places and designated a National Historic Landmark by the Department of the Interior.

EtpidoL wotperoL (CA-HUM-68/H) contains an extensive shell midden associated with a large pre-contact and historic Wiyot village. The site figures prominently in Wiyot mythology, had a level flat used for dancing, and its geographic position at the center of the island makes this site highly significant (Eidsness 2003). Among the mythological events at *EtpidoL wotperoL* is the story of a "medicine-man …who was the first man of one of the nations," and who sought power from the pelicans flying overhead and obtained strong fishing luck. This attracted many people to live at *EtpidoL wotperL* (Loud 1918:283). The historic period at the site includes the archaeological remains of the house and agricultural operation of Freidrick Robert Gunther, a German immigrant who purchased the property in 1860 from Captain John T. Moore, the first American to claim Indian Island in 1858. *EtpidoL wotperoL* is eligible to the National Register of Historic Places.

Many other cultural sites in and near the refuge are eligible National Register of Historic Places for their potential to yield information important to Wiyot archaeology and for their association with events and persons important in Wiyot culture and history. In addition, many Wiyot sites contain unmarked burials and other culturally sensitive materials that are very important to contemporary Wiyots. It is clear that the Humboldt Bay NWR contains many cultural places that are important archaeologically, historically, and as traditional cultural places important to the contemporary Wiyot.

3.4.2. Ethnographic and Contemporary Native American Setting

The Wiyot people and their ancestors have lived in the Humboldt Bay region of the California coast for thousands of years. From their homes and camps on the Bay and the rivers, streams, uplands, and coastlands between the Little River and the Eel River the Wiyot thrived on the richness of land (Fredrickson 1984). They were people of the wetlands. Their sustenance came from the Bay, rivers, estuaries, adjacent uplands, and occasionally the ocean. The varied diet of the Wiyot consisted of fish, shell-fish, marine mammals such as seal, sea-lion, and occasionally whale, waterfowl, deer, elk, small mammals and a host of plants. The Wiyot maintained their villages and camps close to the Bay and its estuaries. They built redwood plank houses with gabled roofs. They traveled by redwood canoe far more often than by foot (Loud 1918). The Wiyot legacy is embodied by numerous archaeological and cultural sites that are intrinsic elements of the modern landscape of the Humboldt Bay region.

Immediately prior to EuroAmerican contact the Wiyot numbered between 1000 and 3300 (Cook 1976). As such, they maintained one of the highest aboriginal population densities in California. But in 1850, numerous EuroAmerican adventurers, lured by the prospect of supplying California's inland gold mines, began arriving at Humboldt Bay. Almost immediately upon arrival the newcomers attacked the Wiyots, raided their villages, and appropriated their land and its resources. Within 15 years the new American settlers completely displaced the Wiyots. The farms, buildings, and streets of the white settlers covered up, if not destroyed, most of the villages and resource places of the Wiyots' homeland.

Nevertheless, the Wiyot continue to occupy the Humboldt Bay area. They are represented by the Wiyot Tribe (which consists of Wiyot only), the Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria, which are composed of Wiyot and several other tribal groups. There are currently over 600 Wiyot Tribal citizens. Approximately 50 Wiyot reside on the 88-acre Table Bluff Reservation, 16 miles south of the City of Eureka and adjacent to the Humboldt Bay NWR.

3.4.3. Humboldt Bay NWR EuroAmerican Cultural History

In 1806, the Russian governor in Alaska sent American sailing Captain Jonathan Winship, and 100 Aleuts to the California coast. Winship spent two days cruising and mapping Humboldt Bay which he referred to as the "Bay of Indians" (Loud 1918:245). Not until 1850 would more Americans, determined to supply the gold mines of the interior, arrive at Humboldt Bay. The new Americans displaced the Wiyot and appropriated their lands and resources. The inevitable hostilities climaxed in February 1860 when the settlers massacred the Wiyot at several locations around the bay and burned Wiyot villages including Tuluwat on Indian Island (Loud 1918, Sparks 1988).

The southern units of Humboldt Bay NWR are composed of land previously owned and developed by ranchers who began to settle the South Bay area in the late 1800s and early 1900s (USFWS 1990). Ranchers built a dike around the entire salt marsh zone of the South Bay, effectively eliminating daily tidal exchange in the marsh. Other dikes and channels were constructed to control and spread Salmon Creek and other unnamed brooks. The tidal marshlands of the South Bay steadily dried out. The marsh and soils, deprived of the daily sweep of tidewater and flushed with fresh water and silt from Salmon Creek, eventually supported agricultural grasses. The grasses quickly spread and fed hundreds of cattle. Ranching facilities were built in the area in the 1920s, which were removed, improved, or maintained through the present.

Large areas of the Hookton Slough, Salmon Creek, and White Slough Units have subsided as a result of land reclamation. Lacking tidewater, aeration increased, organic matter decomposed, and soil compacted. Elimination of salt marsh plants has stopped the annual accumulation of organic matter and peaty soil formation from senescing salt marsh plants. Cattle have also contributed to subsidence and soil compaction by their weight on soils as they forage. This resulted in a situation where at certain locations the substrate inside the dike on these units is anywhere from 1–4 feet lower than the tidal mudflat on the bay side of the dike.

However, in the southern part of the Salmon Creek

Unit along Salmon Creek, sediment has accumulated to a depth of 3 to 4 feet as a result of historic modifications of the channel and the resulting overbank flooding. The channeling of Salmon Creek into a network of canals has forced sedimentation here instead of onto the tidal flats of the bay. Since the area has been diked off from the daily influence of tides, the soil has changed from tidal marsh series to a Weott series (Soil Survey Staff 2007).

3.5. Humboldt Bay NWR Social and Economic Conditions

3.5.1. Humboldt Bay NWR Social and Economic Regional Overview

Since the 1850s, great demands have been placed on the Humboldt Bay region for timber, livestock, and agricultural products. Although these activities have provided economic benefits, they have also affected some of the region's other natural resources (USFWS 1997).

Humboldt County has historically been a very productive timber region (TNC et al. 2005). However, over the past 20 years the timber industry in California has undergone a major downturn, economically impacting the industry as well as the local community (TNC et al. 2005). One important factor in the industry's downturn is a reduction in supply due to prior intensive harvest. In addition, an inconsistent domestic housing market, declining Asian markets in the 1990s, an increasing foreign lumber supply with relatively lower cost from Canada, Brazil, Chile, and Russia, and regulatory constrictions for protected species have had negative impacts (TNC et al. 2005). Nonetheless, as of 2005, Humboldt County timber production was over 390 million board feet, equivalent to 22.6 percent of California's total production (CDOF 2007).

As of 2000, approximately 1,220 people were employed in agriculture in Humboldt County (CDOF 2007). Agricultural products, such as livestock and livestock products, as well as plant products, had a value of over $124 million (in year 2000 $) for Humboldt County (Table 4). Dairy and beef cattle are primary products. The illegal production of marijuana has occurred for decades and is acknowledged by literally everyone in the county as a substantial economic driver but obviously there are not reliable figures regarding production, employment, or societal costs of this particular crop.

Commercial and sport fishing have been a consistent part of the local economy for decades, but have recently fallen on hard times due to declining fisheries populations and increasingly complicated management and regulation (Table 5). For the first time in over 150 years, in summer 2008 there was not a commercial or sport ocean salmon fishing season allowed, due primarily to an unprecedented downturn in the Sacramento River Chinook salmon population.

Commercial oyster culture has a relatively long history on Humboldt Bay and provides much of the west coast supply of oysters as well as business and jobs within the local community.

The majority of non-agricultural employment in Humboldt County is in a few sectors including State and local government; trade, transportation and utilities; educational and health services; and leisure and hospitality (Table 6).

3.5.2. Humboldt Bay NWR Management Economics

The current Complex staff consists of six full-time employees and one term-funded position. All seven employees are permanently stationed at Humboldt Bay NWR. The Complex's total operational budget for fiscal year (FY) 2008 was ~$1M, including ~$362K for maintenance.

National Wildlife Refuges contribute funds to local counties through revenue sharing programs that are intended to cover unrealized tax revenues for either lands purchased in fee title or lands reserved from

Table 4. Value of agricultural commodities produced in Humboldt County for 2005.

Commodity	Value $ Million
Nursery Products	$43.50
Milk, Market	$29.10
Cattle and Calves	$19.90
Milk, Manufactured	$12.90
Biomas, Energy	$5.60
Pasture, Range	$4.70
Livestock	$3.70
Pasture, Irrigated	$3.10
Silage	$0.90
Vegetables	$0.90
Total Value	$124.30

from www.dof.ca.gov

the public domain. For fiscal year 2007, Humboldt County received payment in the amount of ~$15K from the Federal government under this revenue sharing program.

3.5.3. Humboldt Bay NWR Regional Land Use

Humboldt County and Bay Area Land Use
Humboldt County is comprised of ~2,286,400 acres. The county has nearly 132,000 residents with the vast majority of people living in the larger cities around Humboldt Bay of Eureka (27,208), Arcata (17,244), and Fortuna (11,207) (CDOF 2007). Today, the area surrounding Humboldt Bay is a mixture of developed urban areas, agricultural lands, forest lands, and publicly owned natural areas (Table 7). According to the California Department of Finance, as of 2001, 27.7 percent (634,000 acres) of Humboldt County was farmland. In 2002 there were 993 farms in Humboldt County.

As is the case with all development, including that around Humboldt Bay, there have been consequences to the local environment. Some of the regional environmental impacts from decades of development, logging, and agriculture include: sedimentation and aggraded stream and slough channels, degraded water quality and the reduction or loss of wetlands and other native habitats, and the fish, wildlife, and plants those lands support.

Humans drastically altered lands around Humboldt Bay beginning in 1850. From 1850–1870, much of the shrubs and trees (riparian plant communities) were cleared from the bottoms around the bay. From 1880–1910, the majority of the salt marshes were

Table 5. Eureka commercial fish harvest through 2005.

Year	Millions of Pounds of Fish	Millions of Dollars
1981	35	13.5
1982	36	12.4
1983	21.9	7
1984	22.5	8.6
1985	28.5	10.7
1986	19.4	8.3
1987	28.5	12.6
1988	27	12
1989	21.2	8.4
1990	24.4	12.8
1991	20	8
1992	21.2	10.1
1993	18.3	9.1
1994	18.4	13
1995	15.1	10.3
1996	18	12.3
1997	19.7	12.7
1998	12.8	9
1999	12.1	9.7
2000	13.7	7.7
2001	9.5	5.7
2002	16.4	7.2
2003	16.4	12.8
2004	19.4	13.1
2005	14.9	7

from: http://www.st.nmfs.gov/st1/commercial/landings/lport_hist.html

Table 6. Non-agricultural sector employment in Humboldt County as of 2006.

Humboldt County Non-Agricultural Sector in 2006	Number Employed in Sector	Percent of Total Employed in Sector
State and Local Government	13,050	26.8
Trade, Transportation and Utilities	9,867	20.2
Educational and Health Services	5,775	11.8
Leisure and Hospitality	5,250	10.8
Manufacturing	3,383	6.9
Professional and Business Services	3,158	6.5
Construction	2,533	5.2
Financial Activities	2,033	4.2
Other Services	1,833	3.8
Federal Government	792	1.6
Information	717	1.5
Natural Resources and Mining	383	0.8
Total	48,775	100

from www.dof.ca.gov

Table 7. Current land use in Humboldt Bay area as of 2001 (adapted from Hull 2002).

Use	Acres	Percentage
Agriculture	17,760	62.8%
Natural Resources	4,315	15.3%
Commercial/Industrial	2,596	9.2%
Residential/Rancheria	1,979	7.0%
Public	1,156	4.1%
Timberland	348	1.2%
Railroad	39	0.1%

from www.dof.ca.gov

diked and converted to agricultural grasslands. The higher areas of Arcata Bottoms, Jacoby Creek, Freshwater Creek, Elk River, Salmon Creek, and parts of Humboldt Hill were cleared and converted for hay production and agricultural grassland. Land use changes between 1871 and 1948 resulted in an approximate six-fold increase in agriculture lands with a corresponding loss in salt marsh. The current estimate of the area of salt marsh remaining around the Bay is 970 acres.

Currently, according to the National Wetland Inventory, there are ~10,200 acres of palustrine wetland (former tidelands) around Humboldt Bay, the majority of which is grazed or farmed. Most of the farmed or grazed wetlands are adjacent to the North Bay in the Arcata Bottoms and Eureka-Arcata agricultural grasslands. In recent decades there has been an increased interest in identifying opportunities and implementing actions to reclaim and preserve portions of historic bay ecosystems (Monroe 1973). Additionally, public interest is increasing for more wildlands and wildlife viewing opportunities (USFWS 1997), mirroring national trends that rank wildlife viewing as the most popular outdoor recreational activity (OIF 2006).

3.5.4. Humboldt Bay NWR Land Use

The Humboldt Bay area is the major population and industrial center along the California coast north of San Francisco (Table 5). The cities of Eureka and Arcata, and the small communities of Fairhaven, Manila, Samoa, King Salmon, and Fields Landing, lie along the shores of the bay. Several other communities, including Trinidad, McKinleyville, Loleta, Ferndale, and Fortuna, are within a broad service area. Arcata is the site of HSU, which currently has an enrollment of ~7,500 students. The College of the Redwoods, a two-year college with an enrollment of about 5,000 full-time and part-time students, is located a few miles south of Eureka, and right across Highway 101 from the refuge.

The South Humboldt Bay area, though strongly influenced by the urban and industrial nature of Eureka and the mid-bay, is still largely rural. Land uses along the east side of South Bay include log storage and deep-water docking facilities, a marina, power plant, two small residential areas (King Salmon and Field's Landing), the College of the Redwoods, and improved agricultural grassland. Table Bluff, which separates South Bay from the Eel River bottoms, supports the Wiyot Rancheria, as well as agricultural operations and rural residences.

3.5.5. Humboldt Bay and Surrounding Area Demographics

Humboldt County is home to 131,595 residents as of 2007 (CDOF 2007). The two largest cities near Humboldt Bay NWR, Eureka and Arcata, have populations of 27,208 and 17,244 respectively (CDOF 2007). According to the U.S. census of 2000, 51,238 households, and 30,640 families reside in Humboldt County. The population density was 35 per square mile in 2000. There were 55,912 housing units at an average density of 16 per square mile. The racial makeup of the county was 84.7 percent white, 0.9 percent black or African American, 5.7 percent Native American, 1.7 percent Asian, 0.2 percent Pacific Islander, 2.5 percent from other races, 6.5 percent Hispanic or Latino of any race, and 4.4 percent identified themselves as from two or more races.

As of 2000, there were 51,238 households in Humboldt County. The average household size was 2.4 people and the average family size was 3 people. The median age was 36 years.

3.5.6. Humboldt Bay NWR Local Economy and Employment

As of the 2000 U.S. census, the median income for a household in Humboldt County was $31,226, and the median income for a family was $39,370. The per capita income for the county was $17,203. About 12.9 percent of families and 19.5 percent of the population were below the poverty line. Although somewhat higher, Humboldt County's recent unemployment rates tend to closely follow the state's pattern (EDD 2007). As of May, 2007 the median home price in Humboldt County was $314,000 (Eschker et al. 2007).

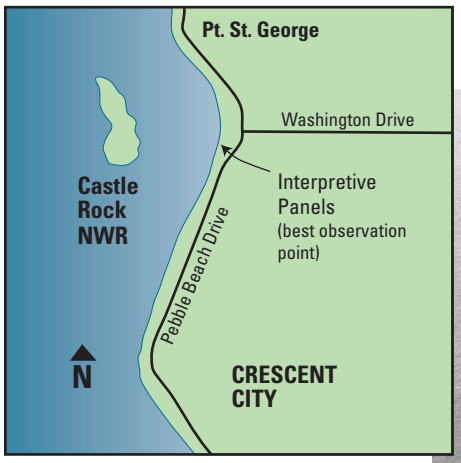
Economic development of the Humboldt Bay region is primarily limited by its remote location (Barnhart

et al. 1992). The economic base is dependent upon natural resource related industries including timber and wood products, fisheries, agriculture (primarily dairy products), and tourism (Barnhart et al. 1992). Commercial maritime activities associated with shipping and fishing operates from Fields Landing, King Salmon, and Eureka (Hull 2002). Major export products include wood chips, paper pulp, and logs and lumber, while logs, wood chips and fuel are the major imports to local port facilitates (Hull 2002).

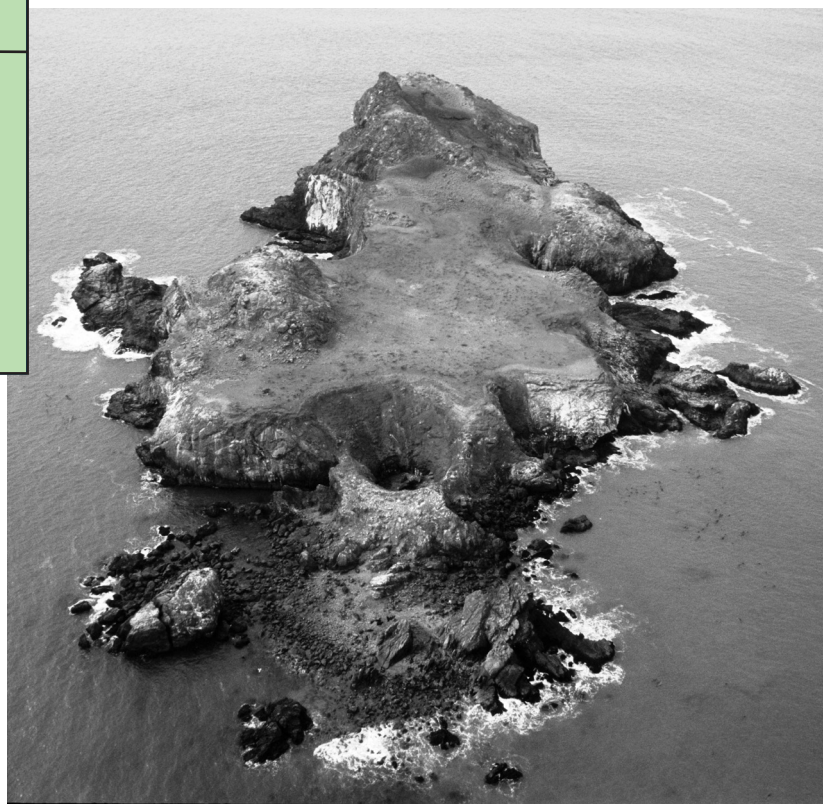
Lumber-based manufacturing generates about 55 percent of total Humboldt County manufacturing employment. Overall manufacturing is down 40.8 percent from 10 years prior throughout the county. Lumber-based manufacturing has declined sharply since its recent peak in 2005 (Eschker et al. 2007).

The ecosystems in and near Humboldt Bay have historically supported the largest commercial fishery of all California ports north of Los Angeles. While commercial fisheries vary in complex cycles, there has been a general downward trend in the annual harvest reported for the port at Eureka, CA, from well over 20 million pounds of fish harvested per year in the 1980s to well below 20 million pounds of fish harvested per year since the early 1990s (NOAA Fisheries Service 2007). Annual harvests of Dungeness crab off of Eureka, CA, are the largest in the state. Between the fishing seasons of 1982–1983 and 2001–2002, the annual harvest of Dungeness crab in northern California ranged from 1.9–13.1 million pounds, and averaged 6.9 million pounds per year (CDFG 2004b). Although declining in importance, commercial fisheries continue to be a significant source of resource-driven economic benefits.

During the period 2001–2005, Humboldt County's industry employment declined overall by 900 jobs. While the county experienced job losses in manufacturing, educational and health services; professional and business services; financial activities; and other services as well as growth in other industries offset some of the decline (EDD 2007). As of 2005, some of the largest industries in Humboldt County included government (26.8 percent); trade, transportation, and utilities (19.8 percent); education and health services (11.5 percent); leisure and hospitality (10.5 percent); manufacturing (7.7 percent); professional and business services (6.7 percent); and construction (4.8 percent) (EDD 2007).



Castle Rock NWR location map.



Castle Rock seen from overhead. Aerial photograph taken on 25 February 2006 by D. Jaques from a U.S. Coast Guard helicopter.

3.6. Overview of Castle Rock NWR

3.6.1. Castle Rock NWR Geographic/Ecosystem Setting

Castle Rock is the largest, most structurally diverse island on the California coast north of Southeast Farallon Island. It is unique among the more than 1,000 offshore rocks and islands in the state in that it has so many types of habitat on one large island within an extremely productive region of the Pacific Ocean. Castle Rock NWR's habitat features include relatively deep topsoil, vegetated terraces, sheer rock cliffs, talus slopes, a tiny beach of small cobble (greater than 1 centimeter diameter), a small patch of pebble sand, and reef habitat. These features allow it to host more than 100,000 breeding seabirds of 11 species, as well as provide haulout grounds for pinnipeds and a secure night roost for Aleutian cackling geese.

Castle Rock NWR supports one of the largest populations of nocturnal cavity-nesting seabirds in California and one of the most important colonies of common murres on the Pacific coast (Carter et al. 1992, USFWS 2005). It is one of only five sites in the California Current System that supports more than 100,000 nesting seabirds. One species of shorebird, the black oystercatcher, also nests at Castle Rock NWR. The island is important to non-breeding seabirds as well. It serves as a communal roost for thousands of brown pelicans during migration, and has become one of the most important resting sites for State and federally listed species on the northern California coast.

Four species of pinnipeds occur regularly at Castle Rock NWR and its associated reef. Two seals, the elephant seal and harbor seal, breed there. The island represents the northernmost colonial site in the Pacific Ocean where elephant seals regularly and successfully breed. In addition, Castle Rock NWR is part of one of the largest haul-outs for California sea-lion in northern California, and a key haulout for a local breeding population of the federally endangered Steller sea-lion.

Castle Rock NWR is fringed by a lush intertidal zone and surrounded by waters rich with marine resources. This intertidal zone and near shore habitat provide rich feeding grounds for seabirds and pinnipeds that also use the island.

Table 8. Monthly and annual precipitation data for Crescent City, CA (near Castle Rock NWR), from 1948 through 2007 (adapted from WRCC 2007).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	54.0	55.7	56.9	59.1	62.0	64.9	66.9	67.4	67.7	64.2	58.4	54.8	61.0
Average Min. Temperature (F)	39.6	40.5	41.0	42.5	45.3	48.3	50.6	50.9	49.1	46.2	42.8	40.2	44.7
Average Total Precipitation (in.)	11.68	9.90	8.97	5.40	3.49	1.60	0.45	0.61	1.86	5.24	9.86	11.61	70.66
Average Total SnowFall (in.)	0.4	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Period of Record : 1/ 1/1893 to 12/31/2007
Percent of possible observations for period of record.
Max. Temp.: 95.2% Min. Temp.: 95.1% Precipitation: 97.4% Snowfall: 99.7% Snow Depth: 99.7%
Source of data: http://www.wrcc.dri.edu/summary/Climsmnca.html

3.6.2. Castle Rock NWR Physical Geography and Climate

The coastal habitats of Del Norte County have a Mediterranean climate, characterized by moderate temperatures and heavy precipitation with many foggy days throughout the year (HC 2001). The area receives over 50 inches of precipitation annually, with the majority occurring from October through April (WRCC 2007). Table 8 displays the average monthly and annual precipitation data for Crescent City (WRCC 2007). Prevailing winds during spring and summer are from the north and northwest (WRCC 2007). Winter storms can bring winds, generally from the south or southwest, sometimes exceeding 55–75 miles per hour.

Ocean Climate and the California Current System

The California Current System, which extends from Baja Mexico to British Columbia, is a complex and extremely productive system of currents, counter currents, undercurrents and other oceanographic processes, such as upwelling, that supports millions of breeding and seasonally migrating seabirds. Surface flow along the northwest California coast (north of Point Conception) is generally northward during winter, but during the spring there is a dramatic reversal, or "spring transition," as the current shifts to predominantly southward. Upwelling of cold, nutrient-rich waters along the coast is greatest in spring and summer, coincident with seabird breeding seasons. Contours of the coastline, ocean floor topography, and weather all contribute to spatial and temporal variability in the system, such as variable upwelling. Murres, gulls, and shearwaters are the most abundant seabirds in the California Current System.

Large Scale Oceanic and Climate Processes

El Niño, La Niña, the Southern Oscillation, and currents are linked via changes in global pressure systems of the southwestern Pacific Ocean (Southern Oscillation). The connection of El Niño and La Niña with the Southern Oscillation has led to the acronyms, ENSO (El Niño Southern Oscillation) and LNSO (La Niña Southern Oscillation). Declines and increases in zooplankton, squid, and fish populations that compose the food webs of most seabirds in the Pacific Ocean can be linked directly to a variety of physical oceanographic changes that occur during ENSO events. Periodic El Niño ocean warming conditions occur every 4–7 years. During El Niño, biological productivity in the upper water column declines markedly, with resulting negative effects on survival and reproduction of seabirds. The inverse of El Niño is La Niña, a periodic condition that results in ocean cooling. During La Niña, enhanced upwelling has positive effects on food web development and seabird productivity.

Seabird responses can vary in relation to the intensity and timing of each El Niño. Life history and demographic parameters affected by El Niño and La Niña include reproductive success, adult mortality, mortality of hatch-year birds, colony attendance, and breeding effort. Starvation is the likely cause of increased mortality of young and adults, but direct evidence of this mechanism is often lacking. El Niño has been linked to the population dynamics of seabirds, suggesting an important natural mechanism for understanding seabird population changes. In contrast, strong La Niña years may result in the production of exceptionally large cohorts which can sustain seabird populations for decades.

Pacific Decadal Oscillation

In addition to ENSO/LNSO there are other natural oceanic climatic cycles that occur on time scales of decades or centuries. In the North Pacific, one of these long cycle marine climate shifts is called the Pacific Decadal Oscillation (PDO). The PDO can be thought of as an El Niño-like event that operates on a time scale of decades, with a 50–60 year periodicity of warm and cold phases.

Biological communities have historically responded to PDO-related ocean warming and cooling in the Pacific Ocean. There have been few studies of the effects of long-term ocean climate shifts on seabirds. In California and Hawaii, some seabirds showed long-term declines in productivity, while others did not after the PDO shifted from a cool to a warm phase in 1976–1977. However, after a hypothesized shift back to a cool era in 1998–1999, colony data from the Farallon Islands NWR clearly demonstrated an increase in productivity for six species of seabird.

Functional relationships between seabird life history parameters, demographic traits, and environmental conditions have rarely been documented, yet knowledge of such relationships is critical to understanding the causes of seabird population fluctuations in relation to climate variability and change. Developing an understanding of the relative effects of anthropogenic and natural factors on ocean warming at multiple temporal scales remains a serious conservation challenge.

3.6.3. Castle Rock NWR Climate Change and Sea Level Rise

Castle Rock NWR is a 14-acre island, which offers essentially no opportunity for geographic migration by terrestrial plant communities. If the ambient climate becomes intolerable for a resident plant species, then local extirpation of that plant species is very likely.

Much of the productivity of the California's open coastal habitat is directly or indirectly related to upwelling caused as currents and winds move water offshore (Hunt 1995). Upwelling is a wind-driven process in which colder, nutrient-rich waters from the depths are brought to surface waters where plankton utilize the nutrients for growth, fueling increased productivity in higher trophic levels. If historic changes in the upwelling, and resulting productivity of the California Current System, occur and are amplified by global climate change, then impacts to seabird and marine mammal food sources could be substantial. Little evidence is available to accurately predict changes to the California Current System over time as the climate warms. However, fluctuations in upwelling can produce major impacts on biological productivity. Impacts on productivity, correlated with reduced upwelling, include large-scale seabird deaths recently observed along the coasts of California and Oregon (CSG 2007). One flood hazard scenario map produced by researchers at the Pacific Institute, with support from the California Energy Commission, California Department of Transportation, and the Ocean Protection Council (see Appendix P, Crescent City quadrangle) shows the extent of the coastal base flood elevation (approximate extent of a 100-year flood) plus a sea level rise of 1.4 meters (55 inches). The map of this scenario shows relatively little sea level rise on Castle Rock NWR due to the steep rocky cliffs on the island.

3.6.4. Castle Rock NWR Geology, Hydrology, and Soils

Castle Rock NWR is located within the geographic boundary of the Coast Range of northern California. The Coast Range geological province is located along the coastal portion of the Klamath ecoregion from Sonoma County to the Oregon border. It includes the entire watershed of most of the smaller coastal streams, as well as portions of the Smith River and Klamath River hydrobasin. It consists of a system of north and northwest trending mountain ridges and valleys formed by folding and faulting. The geologic history of this province is complex. The exposed stratigraphy suggests long periods of marine deposition, plutonic intrusion (igneous rocks that solidify below the earth's surface), and intermittent volcanic activity and orogeny (mountain building from plate tectonics) (Cooperrider and Garrett 1998). The predominant formation in the Coast Ranges is the Franciscan Complex of Upper Jurassic (~160 to 136 million years ago) and Lower Cretaceous (beginning ~136 million years ago) age. Franciscan Complex rocks include graywacke, metagraywacke, argillite, greenstone, chert, blueschist, and associated ultramafic rocks and serpentine. Over millennia, these rocks have undergone periods of intense folding, faulting, and deformation associated with the complex process of tectonic plate movement. The rivers of this province mostly run south/north or north/south paralleling the underlying rock formations and fault lines.

Castle Rock is associated with the Smith River Plain and emerged marine terrace (Osborne 1972, USFWS 1978). The plain covers an area of about 60 square miles and is composed of geologic formations from the Jurassic age to recent times. Castle Rock is of the Franciscan Formation. It has a base of pillow basalt which extends 200 feet high on the west end. The east end of the island is largely graywacke and shale. The south and west aspects of the island are largely barren cliffs. The northwest portion of the island slopes downward to the water at a 30 degree angle. There is soil on the northern and eastern slopes of the island. A rocky yellow-sandy subsoil exists on the relatively flat portions of the island. This soil layer is reportedly up to 25 feet deep and is the product of late Pleistocene era deposits. The topsoil above this has been described as a dark organic humus layer 6–12 inches deep (Osborne 1972).

There are faults in the island running north-south which have been eroded by waves forming large caves on the southern side. Near the east side of the island, one of these faults has collapsed forming an open "pit" 100 feet in diameter and connected to the sea by a cave.

3.6.5. Castle Rock NWR Minerals

There are no known mineral deposits on Castle Rock NWR. Prior to the purchase by the Nature Conservancy in 1979, speculators were contemplating guano mining and rock quarrying on the island.

3.6.6. Castle Rock NWR Paleontological Resources

No known paleo-faunal remains occur within the approved refuge boundaries of Castle Rock NWR.

3.6.7. Castle Rock NWR Water Resources

There are no permanent water resources on Castle Rock NWR. Plant communities survive on water supplied through precipitation and fog.

3.6.8. Castle Rock NWR Hazardous Materials

No area within the Castle Rock NWR is listed as a hazardous waste site by the U.S. Environmental Protection Agency.

3.7. Castle Rock NWR Biological Resources

3.7.1. Castle Rock NWR Ecoregional Context

The California North Coast Ecoregion represents the southern extension of the temperate rain forests of the U.S. Pacific Northwest (TNC et al. 2005). The cool, foggy coastal climate supports coastal redwood forests and the resident flora and fauna that depend on these forests.

3.7.2. Castle Rock NWR Fish and Wildlife

Castle Rock NWR, and portions of the surrounding environment, is an important stopover for migratory birds, as well as important breeding habitat for resident birds.

In addition to providing breeding habitat for many species of birds, Castle Rock NWR and the surrounding sea rocks and reefs offer haulout sites for resident and migratory pinnipeds, including species of seal and sea-lion. Given the sensitivity of Castle Rock's bird nesting habitat, no formal surveys for resident terrestrial mammals, reptiles, or amphibians have been completed so information about such groups is historic, speculative, or anecdotal.

3.7.3. Castle Rock NWR Plant Communities

Osborne (1972) developed a rough map of the major cover types (Figure 11), and listed the most common plant species on Castle Rock based on island visits in 1970. John Sawyer visited the island in 1984 and developed a plant list (modified in Appendix J: Plant list for HBNWRC). Both investigators described apparent trends in plant community composition and soil erosion.

In the early 1970s, Osborne (1972) found two primary plant cover types on the eastern flat (meadow) and northern slopes, an area dominated by maritime goldfields (*Lasthenia maritima*), annual blue grass (*Poa annua*), sand spurrey, and lesser swine cress (*Coronopus didymus*), and an area covered with a dense growth of Pacific reedgrass (*Calamagrostis nutkaensis*) and a host of mixed herbs. In 1984, Sawyer noted that the meadow was covered with sand spurrey and goldfields. Clumps of Pacific reedgrass on the plains in areas with deeper soils were intermixed with other coastal scrub plants, such as coast angelica (*Angelica hendersonii*), rush, and sedge.

Plants growing in rocky areas during the surveys included bluff lettuce (*Dudleya farinosa*), brome (*Bromus* sp.), seaside daisy, and leather leaf fern (*Polypodium scouleri*). The protected portion of the north side of the island supported miner's lettuce (*Claytonia perfoliata*, syn. *Montia perfoliata*), snow queen (*Synthris reniformis*), and leather leaf fern, with a few pockets of salt grass.

Changes in Castle Rock NWR Plant Communities

Over the last century, the area covered with reedgrass has receded and been replaced with goldfields and sand spurrey. The cause of the decrease in reedgrass has been attributed to the increase in the Brandt's cormorant breeding population on Castle Rock (Osborne 1972). Osborne observed cormorants using reedgrass almost exclusively for nesting material when it was readily available. He also suggested that Canada geese might be having some impacts on vegetative changes at Castle Rock. At that time, only up to 600 geese were using the island for roosting and grazing (compared to up to 20-25,000 currently). Sawyer (1984) stated that the loss of reedgrass was indicative of a more extensive problem of heavy erosion of the habitat overall.

In recent years, thousands of roosting Aleutian cackling geese and breeding seabirds have appeared to impact the short-term status of vegetation at Castle Rock NWR, with long-term impacts likely. The geese cause a general browning of the spring vegetation due to trampling, foraging, and intensive fecal output. The vegetation greens up and grows back lushly by the peak incubation time of most seabirds. Breeding seabirds, and lack of summer rain, cause a second death of vegetative growth due to use of island plants for nest material, trampling, and effects of guano. By mid to late summer, the island appears more white and brown than green. Temporary vegetation loss is likely to affect long-term soil erosion on the island (Osborne 1972,

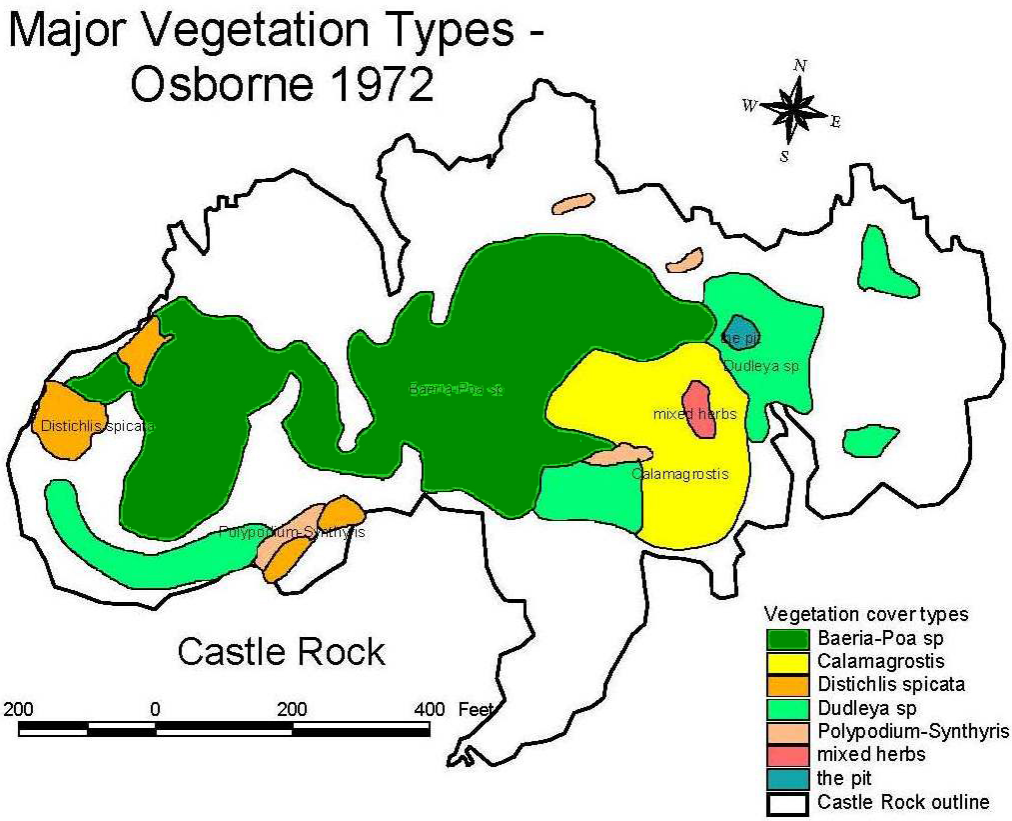


Figure 11. Historic vegetative cover map of Castle Rock. (Note: Baeria has been renamed Lasthenia.) Figure adapted from Osborne (1972) and converted into ArcView format by D. Jaques.

Sawyer 1984, Jaques and Strong 2001), particularly during the rainy season. Accelerated soil erosion could have long-term negative impacts on burrow-nesting seabird habitat.

There has been no recent assessment of the ratio of native versus non-native plant communities at Castle Rock NWR. The USFWS Seabird Conservation Plan (2005) states that non-native plants can displace native plants and may limit or degrade seabird nesting habitat. Non-native plants may have shallow root systems that do not stabilize the soil as well as native vegetation and consequently effect burrow stability.

3.7.4. Castle Rock NWR Seabirds

Castle Rock NWR provides habitat for one of the largest, most diverse, and densely populated seabird breeding colonies in the California Current System (Tables 9 and 10). It is one of only five sites in the California Current System that supports more than 100,000 nesting seabirds. Castle Rock NWR is known as the second largest seabird colony south of Alaska, after Southeast Farallon Island. This ranking is based on population levels that include rough historical estimates for nocturnal cavity nesting seabirds, whose status is currently unknown. Common murres comprise the majority of the breeding seabird population at both Castle Rock NWR and SEFI. Due to annual variability in murre breeding effort between the two sites, Castle Rock NWR may be the largest seabird colony south of Alaska in some years.

The relative importance of Castle Rock NWR on a statewide and regional scale has been established by large-scale inventories. Two statewide surveys of all breeding species have been conducted in California, in 1975–1980 (Sowls et al. 1980) and in 1989–1991 (Carter et al. 1992). The last statewide inventories of all species in Oregon and Washington were conducted in 1988 and 1978–1982, respectively (Speich and Wahl 1989, USFWS in prep). More recently, large-scale inventories have focused on aerial surveys of only murres and cormorants.

Castle Rock NWR was the second largest seabird colony in California, following closely behind the Farallon Islands NWR during the last statewide

survey. The total breeding population estimate at Castle Rock NWR was 122,000 birds in 1989, compared to about 128,000 at SEFI (Carter et al. 1992). In 2004, the Castle Rock NWR murre estimate alone was over 138,000 birds (Capitolo et al. 2006). Castle Rock supports about 8,600 breeding birds per acre, compared to about 1,300 birds per acre at SEFI. Eleven species of seabirds breed at Castle Rock NWR, which represents all of the island breeding seabird species in California north of Point Reyes. Five are surface nesters: the common murre; Brandt's, pelagic, and double-crested cormorants; and western gull. The remaining six species are cavity nesters: fork-tailed and Leach's storm-petrels; Cassin's and rhinoceros auklets; pigeon guillemot; and tufted puffin. One species of shorebird, the black oystercatcher, also breeds on the island. Castle Rock NWR is the site of the largest common murre colony in California (Capitolo et al. 2006) and supported substantial portions of the California total of six species during the last statewide survey: fork-tailed storm petrel (24 percent), leach's storm-petrel (19 percent), common murre (31 percent), Cassin's auklet (10 percent), rhinoceros auklet (58 percent), and tufted puffin (30 percent) (Carter et al. 1992).

Table 9. Complete seabird breeding population estimates on Castle Rock, 1970 to 1989.

	Estimated Number of Nesting Birds		
Species	**1970 (a)**	**1979-80 (b)**	**1989 (c)**
Fork-tailed Storm-petrel	<200	100	100
Leach's Storm-petrel	5,000	5,000	1,646
Brandt's Cormorant	1,758	2,200	2,490
Pelagic Cormorant	100	340	392
Black Oystercatcher	2	6	4
Western Gull	1,200	1,350	1,370
Common Murre	80,000	126,000	108,318
Pigeon Guillemot	250	800	360
Cassin's Auklet	3,600	3,600	5,638
Rhinoceros Auklet	150	200	1,034
Tufted Puffin	50	100	82
TOTAL	**92,310**	**140,596**	**121,434**

Data from Osborne (1972) (a), Sowls et al. (1980) (b), and Carter et al. (1992) (c).

3.7.5. Castle Rock NWR Nesting Seabirds

Fork-tailed Storm-petrel

The fork-tailed storm-petrel is widely distributed throughout the North Pacific. It is separated into two subspecies; *Oceanodroma furcata plumbea* breeds along the west coast of North America from southern Alaska to northern California (Osborne 1972, Harrison 1983). There are about 5,000 breeding birds on the west coast of the U.S., excluding Alaska, with an estimated 400 pairs in California (USFWS 2005). The fork-tailed storm-petrel is a pelagic seabird that feeds primarily offshore, near the continental shelf break in summer, and further offshore in the non-breeding season (Briggs et al. 1987). Its diet consists of planktonic crustaceans, and fish and animal detritus from the ocean surface (Boersma and Silva 2001). It breeds colonially in crevices and burrows on rocky islands, and is nocturnally active at breeding colonies (Boersma et al. 1980).

Castle Rock NWR is near the southern limit of the fork-tailed storm petrel species range and, according to very limited historic information, appears to be the second largest fork-tailed storm-petrel colony in California (Carter et al. 1992). The fork-tailed storm petrel breeding population at Castle Rock NWR has never been scientifically assessed due to inherent survey difficulties. Their presence on Castle Rock NWR has been established through mist-netting as well as auditory cues. In 1970 (16 May), Osborne captured two FTSPs, and suggested that the total population was probably fewer than 100 pairs. The next mist-netting effort took place in 1989 (Sept. 12–13), when six fork-tailed storm petrels were captured in a mist-net located in the "saddle" of the meadow. FTSPs also were heard calling near the east end of the island on 21–22 August. Until new information is collected, the only definitive statement that can be made is that they were present in the early 90s.

The fork-tailed storm petrel is one of the earliest breeding seabirds in northern California. First landfall at Little River Rock was February 25 (Harris 1974). Egg dates range from March 22 to June 18 (Clay 1925, Dawson 1923, Harris 1974). Local chick records range from June 11 to August 9 (Osborne 1972).

Leach's Storm-petrel

The Leach's storm-petrel is one of the most widely distributed procellariform (in the order Procellariiformes, or tube-nosed seabirds) species in the northern hemisphere. They breed from Japan to Guadalupe, Mexico, in the Pacific, and also in the Atlantic (Huntington et al. 1996). The subspecies in northern California is *Oceanodroma leucorhoa leucorhoa.* The population estimate for the U.S. west coast, excluding Alaska, is nearly 500,000 birds, with about 90 percent of these breeding in Oregon. The number of storm petrel colonies in California north of Cape Mendocino was reduced from 11 historic sites to five known sites by 1969 (Harris 1974). There is evidence of a continued decline of this species in California (Carter et al. 1992). The Leach's storm petrel is a pelagic seabird that is most abundant seaward of the continental shelf, and closer to shore during the breeding season. Its diet includes plankton and small nekton, concentrated at the surface. These petrels nest in burrows or crevices. They feed during the day and move to and from breeding colonies only at night.

Leach's storm petrels arrive at northern California breeding colonies and begin courtship activities early in the spring. The earliest landfall detected in the region was 12 February (Osborne 1972). Harris (1974) found courtship and intensive burrow construction from March to May. Eggs have been reported from 7 May to 24 July (Clay, unpubl.). Small numbers of birds may be found at northern California colonies as late as October (Osborne 1972).

Leach's storm petrels at Castle Rock have been strongly associated with reed grass vegetation on the east end of the island. Osborne (1972) estimated 2,500 pairs of Leach's storm petrels nesting under the grass, and found their burrows nowhere else on Castle Rock NWR. That vegetation now appears to be extirpated from the island. The vegetation on Castle Rock NWR is directly affected by surface-nesting seabirds and non-breeding Aleutian cackling geese.

Double-crested Cormorant

The double-crested cormorant on the Pacific coast is one of five subspecies recognized in North America. The breeding range of this subspecies extends from Mexico to Canada. Post-breeding dispersal occurs along the Pacific coast, but major migratory movements have not been described. The continental population has been estimated at about two million birds (USFWS 2003b). Since the 1970s, numbers of this species have increased significantly in many regions of North America. Many negative impacts have been associated with this increase, prompting legal and illegal actions to control numbers in various places of the U.S. (Wires et al. 2001).

On the California coast the total number of double-crested cormorants nests in 2001–2003 was about 6,500 at 42 colonies (~940 (1975-80), 4,300 (1989-91), and 6,160 (2001-03); Capitolo et al. 2004b). Most of the increase in northern California between 1990 and 2003 was due to two new colonies in Arcata/Humboldt Bay (Teal Island and Arcata Bay Sand

Table 10. Population estimates for surface nesting and diurnal cavity nesting species at Castle Rock, 1979-1999.

	Estimated Number of Nesting Birds				
Species	**1997 (a)**	**1998 (a)**	**1999 (a)**	**2003 (b)**	**2004 (b,c)**
Common Murre	75,246	51,138	97,996	104,381	138,104
Pigeon Guillemot	288	269	260	nd	324
Tufted Puffin	12	6	24	nd	9
Brandt's Cormorant	1,638	1,380	1,208	2,068	3,122
Double-crested Cormorant	44	58	80	272	116
Pelagic Cormorant	372	80	308	nd	534
Western Gull	nd	662	698	nd	nd
TOTAL	77,600	53,593	100,574	106,721	142,209

from Jaques and Strong (2001) (a), Capitolo et al. 2006 (b), and Jaques (2004) (c). The murre estimate is the raw count times a correction factor of 1.67; the cormorant estimate is derived from the number of nests directly counted times 2.

Island) This nest count was 48 percent higher than in 1989–1991 and almost six times higher than in 1975–1980. One of the three largest colonies in northern California is located just north of Castle Rock at Prince Island.

The double-crested cormorant uses a variety of nest habitat types. It constructs nests of vegetation in trees, islands, and a variety of artificial structures. It is known to denude vegetation and have negative effects on habitats shared with other species. Double-crested cormorants nest earlier than other coastal cormorants (Ainley and Boekelheide 1990, Carter et al. 1992). Egg laying may begin as early as late March in northern California; hatching takes place from late April to mid-August (Sowls et al. 1980).

Double-crested cormorants were first documented nesting at Castle Rock in 1997 (Jaques and Strong 2001). The colony increased from 29 nests in 1997 to an estimated 136 nests in 2003 (Capitolo et al. 2004b).

In 1997, double-crested cormorants were observed building nests in tall vegetation at the southeastern rim of the island (Jaques and Strong 2001). After 1997 it was not possible to see all nests from shore. Large chicks were observed creching in the nesting area in mid to late July each year from 1997–1999.

Since at least 2001, double-crested cormorant nesting has moved from exclusively at the eastern rim of Castle Rock NWR to various regions, including the western peak of the island (P. Capitolo, UCSC, pers. comm.). Capitolo et al. (2004b) reported that it is difficult to distinguish double-crested cormorant nests from those of Brandt's cormorant in the aerial photographs of Castle Rock because few stick nests were obvious there. Jaques (2004) observed that cormorants use vegetation from the island itself to build nests, and that there was no tall vegetative growth remaining on the eastern rim by 2004.

Double-crested cormorant productivity and chronology is relatively immune to variability in ocean conditions compared to other cormorants (see Capitolo et al. 2004a). The double-crested cormorant was one of only two seabird species breeding on Castle Rock NWR that did not demonstrate a negative response to ENSO conditions in 1998 (Jaques and Strong 2001). There was no apparent effect of the 2003 ENSO on this species' breeding status in California (Capitolo et al. 2004a). The consistent increase in the double-crested cormorant population in northern California likely reflects the fact that double-crested cormorants forage opportunistically in estuaries and fresh water bodies, as well as coastal waters of the region (Ainely and Boekelheide 1990, Carter et al. 2001, Jaques and Strong 2001, Capitolo et al. 2004a).

Brandt's Cormorant

The Brandt's cormorant breeds only along the west coast of North America. Approximately 75 percent of the population breeds in California and Oregon. Some small colonies have occurred as far north as Alaska, and others exist as far south as southern Baja California. Post-breeding dispersal takes place out of central California, but no consistent movement pattern or direction has been established (Briggs et al. 1987). The total population has been estimated at more than 100,000 birds (USFWS 2005). A statewide nest count in California in 2001–2003 totaled 27,000 nests at 97 active colonies. These data indicated a 29 percent decline in the population between 1989–1991 and 2001–2004, but were similar to numbers reported in 1975–1980 (Capitolo et al. 2004a).

Brandt's cormorants nest in colonies on islands or cliffs with relatively flat ledges (Wallace and Wallace 1998). Nests are made of terrestrial plants or seaweed collected from the land or sea, or stolen from other nests. Nest building in northern California generally begins in April, and eggs are laid in May (Osborne 1972, Carter et al. 1992). Breeding chronology may be related to the onset of upwelling at different locations (Boekelheide et al. 1990). Nesting can be significantly depressed during ENSO and post-ENSO years; the degree of response has been related to intensity and timing of warm events. Brandt's cormorants will abandon nest sites en masse if food supplies decline midseason (Boekelheide et al. 1990).

Castle Rock NWR supported the third largest colony of Brandt's Cormorant in California during the last series of statewide surveys in 2003 (Capitolo et al. 2004a). This was a decrease of about 9 percent since the 1989 survey. The statewide population reportedly declined 25 percent from 1989 to 2003. In 2004, the numbers of Brandt's cormorant nests at Castle Rock increased. There were 1,561 nests present (Capitolo et al. 2006), which was the greatest number of nests ever recorded at the island.

Jaques and Strong (2001) reported much lower Brandt's cormorant nest counts at Castle Rock in 1997–1999 (604–819 nests), but breeding during much of that period was strongly affected by ENSO conditions. Major nest abandonment occurred in 1998. Nest counts at Castle Rock in 1970 and 1980 totaled 879 and 1,100, respectively (Osborne 1972, Sowls et al. 1980). These data probably

reflect fluctuation in the population related to oceanographic variability and availability of prey (Capitolo et al. 2004). No major disturbances or oil spill impacts have been documented for this breeding population.

Brandt's cormorants roost on Castle Rock NWR in March, and begin forming colonies as early as the first week of April. Roosting Aleutian geese and Brandt's cormorants overlap during this period, but Jaques (2004) found no evidence of direct interference between geese and cormorants.

Brandt's cormorants use vegetation growing on Castle Rock to build nests (Osborne 1972, Jaques and Strong 2001, Jaques 2004). Historically, Brandt's cormorants preferred Pacific reedgrass, but as it is no longer available they use maritime goldfields and other plants. A major loss of protective vegetation and soil was reported at Castle Rock NWR in the early 1970s by Osborne (1972), who believed that the primary cause of the habitat degradation was removal of vegetation by nesting Brandt's cormorants.

Pelagic Cormorant

The pelagic cormorant breeds from northern Baja California to the Bering Sea, and south in the Northwest Pacific to Japan (Hobson 1997). The subspecies *Phalacrocorax pelagicus resplenens* breeds from Baja to British Columbia. About 29,000 birds, more than 40 percent of the global population, breed in Washington, Oregon, and California (USFWS 2005). Pelagic cormorants nest on cliff ledges on islands and mainland shores, and occasionally use artificial structures (Carter et al. 1992, Hobson 1997). Pelagic cormorants are very sensitive to changes in oceanographic conditions, such as ENSO events, and breeding effort and success can vary greatly on an annual basis (Ainley and Boekelheide 1990). Food supply also influences laying dates and variations in hatching and fledging dates in California (Boekelheide et al. 1990). Pelagic cormorants are extremely vulnerable to human disturbance at breeding areas (Verbeek 1982, Siegel-Causey and Litvinenko 1993).

Pelagic cormorants breed on cliff ledges all around the shoreline of Castle Rock NWR. Breeding activity has increased greatly since 1970 when only about 50 nests were reported (Osborne 1972). A record 267 nests was found during the most recent survey in 2004, indicating a breeding population of 534 birds (Jaques 2004 unpublished data). The breeding population ranged between 300-400 birds during 5 surveys conducted from 1979 to 1999, with the exception of 1998 (Sowls et al. 1980, Carter et al. 1992, Jaques and Strong 2001). In 1998, only 25 nests were built, probably due to ENSO conditions that year (Jaques and Strong 2001).

Western Gull

The western gull is endemic to the west coast of North America, and breeds from central Baja California to southern Washington (Pierotti and Annett 1995). There are two subspecies, with *Larus occidentalis occidentalis* occurring on the outer Pacific coast. The total subspecies population has been estimated at 80,000 to 126,000 breeding birds (USFWS 2005), including about 62,000 in California (Carter et al. 1992). Numbers have increased in California since the early 1900s (Pierroti and Annett 1995). The statewide survey in 1989–1991 indicated that the population has continued to grow since 1975–80 (Carter et al. 1992). Most California western gulls breed on the Channel Islands and Southeast Farallon Island NWR. Their relatively small population size and limited range make them a vulnerable species worthy of regional management concern (Pierotti and Annette 1995, USFWS 2005).

Castle Rock NWR supports the largest western gull colony in California north of the Farallon Islands, and represented 2 percent of the statewide breeding population with 1,370 breeding birds in 1989 (Carter et al. 1992). This was a slight increase over 1970 and 1979–1980.

Common Murre

The common murre is one of the most abundant seabirds in the Northern Hemisphere, with a breeding population of 13 to 21 million birds (Ainley et al. 2002). It is also one of the most intensively studied avian species in the world. Five subspecies are recognized; *Uria aalge californica* breeds from British Columbia to central California. Common murre breeding populations in California have been monitored more thoroughly than any other coastal nesting seabird in the state. Common murres in central California have been depressed due to gill net fisheries, oil spills, and ENSO events (Carter et al. 2001). The most recent surveys of sample colonies indicate that the common murre population in northern California is currently experiencing a general long-term population increase (Capitolo et al. 2006).

Castle Rock NWR supports the largest common murre breeding colony in the state of California. These birds comprise about 90 percent of the total seabird population. Recent aerial survey data suggest that the population has fluctuated since 1989, but has not declined over the longer term. Murre numbers at Castle Rock NWR and other northern California colonies were low during 1997–1999, a period of anomalous ocean conditions

(Jaques and Strong 2001, Capitolo et al. 2004). Murres counts were comparable to 1989 numbers during 2001 and 2003 (Capitolo et al. 2006). The most recent raw count in 2004 was significantly greater than any counts over the past few decades (Capitolo et al. 2006), indicating a healthy, possibly growing, breeding population of murres on Castle Rock NWR. Adjusting the raw count of birds by a standard correction factor (Carter et al. 2001) results in an estimate of over 138,000 murres present in 2004.

Murres reside at Castle Rock NWR throughout the winter, beginning by mid-November, but residence patterns have not been methodically evaluated. Pre-breeding season presence at the colony was monitored in 2004 in conjunction with observations of roosting Aleutian geese (Jaques 2004). Murres were present at dawn each morning in March and April and overlapped with thousands of geese departing the roost.

Pigeon Guillemot

The pigeon guillemot is endemic to the North Pacific and occurs from Alaska to southern California (Ewins et al. 1993). There are five recognized subspecies; *Cepphus columba eureka* breeds in Oregon and California. The California breeding population was estimated at about 15,500 nesting birds at 235 colonies during the most recent statewide survey in 1989 (Carter et al. 1992). Pigeon guillemot are a diurnally active, cavity-nesting species (Ewins et al. 1993).

The statewide pigeon guillemot population appeared to be stable from about 1979 to 1989, however, estimates for Del Norte and Humboldt County had decreased by about 40 percent over the 10 year period (Carter et al. 1992). Competition for nest sites and an expanding rhinoceros auklet population may cause declines in pigeon guillemot numbers where nest sites are limited (Ainley and Boekelheide 1990).

Castle Rock NWR supports the largest pigeon guillemot colony in northern California and has accounted for 2 percent of the statewide population (Carter et al. 1992). Pigeon guillemot nest in rock crevices as well as burrows in the soil at Castle Rock NWR. The greatest concentration of birds occurs in the talus slope on the east end of the island.

Cassin's Auklet

The Cassin's auklet breeds from the Aleutian Islands in Alaska south to Baja California. During the non-breeding season, these alcids (birds in the Family Alcidae) spend most of their time at sea, often seaward of the continental shelf (Manuwal and Thoresen 1993). Individuals may visit the breeding colony in any month at southerly breeding colonies. They feed primarily on small crustaceans, as well as squid and fish. Cassin's auklets nest in shallow burrows, small rock crevices, or under trees on the ground. They move to and from nest sites at night to avoid predation. There are two subspecies; the northerly population, *Ptychoramphus aleuticus aleuticus,* occurs in the California Current System. The core of the population breeds in British Columbia. Population declines have been reported in Canada and California. Introduction of predators and changes in food supply are cited as major causes of population change. The species will accept artificial nest boxes, which have been used as a research tool.

The presence of Cassin's auklets at Castle Rock NWR was first noted by Clay in 1934. Thoreson found a juvenile Cassin's auklet in a burrow in late August, 1958 (Thoreson 1964). Thoreson placed 25 artificial burrows constructed of wood on Castle Rock in October 1958, and returned on 26 April 1959 to find that none of the boxes were occupied. An inspection of five burrows on the same date found two Cassin's auklets incubating eggs. Thoreson discontinued further investigations on Castle Rock due to hazardous landing conditions on the island and because "none of the auklet burrows was sufficiently shallow to observe without great disturbance and certain desertion by the birds."

Rhinoceros Auklet

The rhinoceros auklet breeds in the North Pacific from the Channel Islands in southern California up through the Aleutian Islands and south to Japan (Gaston and Dechesne 1996). The North American population is roughly estimated at about one million birds. About 73 percent of this population breeds in British Columbia. The species was historically extirpated from Oregon and California; recolonization of islands in the region began in the 1960s and 1970s. The most recent estimate for California was about 1,800 birds at 32 colonies (Carter et al. 1992). Rhinoceros auklets move south after breeding, and the majority of the eastern Pacific nesting population appears to winter in central and southern California (Briggs et al. 1987).

Tufted Puffin

Tufted puffins have historically bred from the Channel Islands in southern California along the Pacific coast to the Aleutian Islands and down to Japan (Piatt and Kitaysky 2002). The world breeding population is estimated at nearly three million birds, about 80 percent of which nest in North America. Puffins were historically far more abundant in California than they are now (Ainley

and Lewis 1974, Ainely and Boekelheide 1990, McChesney et al. 1995). The California population is estimated at less than 300 breeding birds (Carter et al. 1992), compared to about 5,000 in Oregon and 22,000 in Washington (Piatt and Kitaysky 2002). Tufted puffin numbers are declining throughout the coasts of California, Oregon, Washington, and British Columbia, but increasing in Alaska. Causes for recent declines have not been determined. However, tens of thousands were killed in offshore fishing nets from the 1950s to 1990s (DeGange and Day 1991). An unknown level of fisheries bycatch continues off of Alaska, Russia, and Japan (DeGange et al. 1993). Tufted puffins winter offshore throughout the North Pacific. Winter and spring population peaks offshore in California were estimated at 10,000 to 20,000 birds (Briggs et al. 1987).

The tufted puffin is a diurnally active cavity nester. Nests are typically excavated in deep vegetated soil on steep slopes or plateaus, but birds will use rocky crevices for nesting when available (Piatt and Kitaysky 2002). Populations are monitored by direct counts of birds, as well as burrow/plot counts.

Castle Rock NWR supported an estimated 50 percent of the California tufted puffin population in 1979–80 (Sowls et al. 1980). This refuge was thought to be the largest tufted puffin colony in California in 1989–1991, with an estimated 82 breeding birds (Carter et al. 1992). The sporadic record of direct counts for tufted puffins at Castle Rock indicates a gradual decline since at least 1970. In 1970, up to 56 puffins were counted (Osborne 1972), compared to a peak count of 24 birds in 1999 (Jaques and Strong 2001) and 9 birds in 2004 (Jaques 2004). The trend suggests that the species may soon become extirpated as a breeding bird at Castle Rock NWR.

Changes in prey conditions, competition with rhinoceros auklets (Ainley et al 1994, McChesney et al. 1995), and habitat degradation due to soil erosion have been cited as possible causes for tufted puffin population suppression in central California and Oregon. These factors may be relevant at Castle Rock NWR as well. Rhinoceros auklet numbers at Castle Rock NWR increased greatly from 1979–1989 (Carter et al. 1992). In addition, western gulls interfere with tufted puffins at Castle Rock NWR (Jaques and Strong 2001). Large gulls are one of the primary problems for puffins in other areas (Nettleship 1972, Vermeer 1979). Tufted puffins rely on vegetation to help shield them from diurnal interference and piracy from gulls. Changes in vegetation cover and height have occurred at Castle Rock NWR due to geese, surface-nesting seabirds, and sea-lions. Soil erosion in burrow-nesting areas has occurred in denuded areas. Thus, other native species may be degrading the quality of the habitat for tufted puffins, and indirectly exacerbating problems with western gulls.

Tufted puffins arrived at Castle Rock during the first week of April in 2004 (Jaques 2004). The birds occupy nest habitat about 1 week after arriving (Piatt and Kitaysky 2002). Eggs are expected to be laid at Castle Rock by early to mid-May, and the incubation period is estimated at about 42–43 days based on other studies (Boone 1986, Ainley and Boekelheide 1990). Hatching is expected in late June. The average nestling period is 48 days (Piatt and Kitaysky 2002), with fledging from Castle Rock expected in August.

3.7.6. Castle Rock NWR Other Bird Species

Aleutian Cackling Goose

Aleutian cackling geese use Castle Rock NWR as a night roost and minor foraging area during migration and staging in the Crescent City area. Woolington documented use patterns at Castle Rock from fall 1975 to spring 1977. These studies revealed that the entire known Western Aleutian Islands population staged in the Crescent City area during late March to early April prior to migration to Alaska, with Castle Rock their primary night roost. The Service's proposal to acquire Castle Rock in 1978 was, in part, motivated by knowledge of its critical importance to the goose (USFWS 1978).

Goose-use of the Crescent City area, including Castle Rock NWR, declined as the population increased in Humboldt Bay and southern Oregon (Bachman and Nelson 2005). Peak counts of 27,570 and 27,200 birds were recorded roosting on Castle Rock in March 1999 and 2000, respectively (Strong and Jaques 1999, Lyon 2000). In comparison, the peak count in 2004 was about 20,000 birds (Jaques 2004).

American Black Oystercatcher

The American black oystercatcher is a traditional breeding species at Castle Rock NWR, and is present in the nearby Point St. George area for much of the year. Black oystercatchers were first noted at Castle Rock in 1934 by Fraser (Osborne 1972). These birds nest in small numbers on the rocky shores of the island. The number of nesting pair ranged from 2–3 in surveys conducted from 1979–1998 (Sowls et al. 1980, Carter et al. 1992, Jaques and Strong 2001).

Peregrine Falcon
The peregrine falcon is a common visitor and historic breeder at Castle Rock NWR. Breeding was first documented by Clay in May 1934. The nest site was described as located on the top edge of a steep, grassy slope against a sheer overhanging rock wall on the east slope of the island. A three-week-old chick was present at the eyrie. A peregrine falcon nest with petrel wings around it was documented by Talmage in 1940 (Osborne 1972). Aerial courtship has been seen over Castle Rock in recent years (Jaques and Strong 2001), but breeding has not been documented.

Peregrine falcons forage from various high perches on Castle Rock, and have been noted to chase pigeon guillemots and flush common murres during the breeding season (Jaques and Strong 2001). They can be seen at Castle Rock NWR during all times of year, but seem to be less common during summer (Jaques 2004) when they presumably retreat to breeding territories. Peregrine falcons can be an important predator on seabird colonies (Drost and Lewis 1995), and may have been a historical predator when nesting at Castle Rock. There is a strong potential for re-establishment of breeding on the island, which may have ecological implications for Castle Rock NWR.

Barn Owl
Barn owls were historically present at Castle Rock, but their present status is unknown. A barn owl was found in the shepherd's cabin by Fraser in 1934 (Osborne 1972). The cabin has been reduced to a pile of wood on the ground, and there have been no recorded detections of barn owls since then. The barn owl is a potential predator on storm-petrels and other seabirds at Castle Rock NWR.

Common Raven
Common ravens (*Corvus corax*) occur regularly on Castle Rock NWR. A raven nest was observed on the western cliffs of the island in 1999. Active predation by a raven on murre eggs was observed in 2004 (Jaques 2004). It is not known how ecologically important this predator/scavenger is to seabirds at Castle Rock NWR.

3.7.7. Castle Rock NWR and Surrounding Area Use by Marine Mammals

Four species of pinnipeds regularly occur at Castle Rock NWR: Steller sea-lion, California sea-lion (*Zalophus californianus*), Pacific harbor seal, and northern elephant seal (*Mirounga angustirostris*). Harbor and elephant seals breed on the island, and both California and Steller sea-lions use the island regularly as a seasonal non-breeding haulout. The Steller sea-lion is the only ESA-listed endangered marine mammal that utilizes Castle Rock NWR habitat. The northern fur seal (*Callorhinus ursinus*) could occur at Castle Rock NWR rarely, but the species has not been documented hauled out on the island. North American river otter are common on the beaches and ocean waters just off Point St. George, but have not been documented on Castle Rock.

Gray whales (*Eschrichtius robustus*) and harbor porpoises are the most common cetaceans inhabiting the waters surrounding Castle Rock NWR. Gray whales are relatively abundant in the area during migration, and sightings of small numbers of these whales occur year round. Gray whales have been observed feeding within two miles offshore in the Crescent City area (Jaques and Strong unpublished data), and likely feed in the waters immediately surrounding Castle Rock NWR.

Pacific Harbor Seal
The eastern North Pacific subspecies of harbor seal (*Phoca vitulina richardsi*) ranges from Baja California, Mexico, to the Pribilof Islands in Alaska. Three separate stocks have been identified for management purposes: 1) inland waters of Washington, 2) Oregon and Washington coast, and 3) California. Harbor seals are generally non-migratory, but move locally in relation to factors such as tides, weather, season, food availability, and reproduction (Carretta et al. 2004).

Harbor seals occur in nearshore coastal and estuarine habitats. They feed in marine, estuarine, and, occasionally, fresh waters. They haul out on relatively flat substrates, including rock reefs, sandspits, and mudflats. Peak numbers haul out at low tides, particularly in the afternoon (Le Boeuf and Bonnell 1980). Harbor seals display strong fidelity for haulout sites (Carretta et al. 2004).

Pacific harbor seal breeding takes place from March to June in California, with peak pupping occurring in April and May. Courtship and mating appear to take place in the water. Females give birth on land, often at low tide. Pups are able to swim at birth. After pups are born, the females form nursery areas away from the main colony for about 2 weeks. Pups are nursed for 4–6 weeks. Adult seals may breed again soon after weaning (Knudtson 1974, Shaughnessy and Fay 1977, Loughlin 1978, Newby 1978).

Pacific harbor seal populations have increased since the passage of the Marine Mammal Protection Act (MMPA) in 1972. The California stock may have reached its environmental carrying capacity (Carretta et al. 2004). Harbor seals are not

considered depleted or strategic under the MMPA. Based on the most recent harbor seal counts (Lowry and Maravilla-Chavez. 2005), and a correction factor developed by the CDFG, the harbor seal population in California is estimated at 34,233 animals (Carretta et al. 2005). Castle Rock is a year-round haulout, nursery area, and probable breeding site for the Pacific harbor seal. Castle Rock NWR was one of 563 haulout sites documented for the species in California during the 2004 statewide survey (Lowry and Maravilla-Chavez. 2005) (Table 11). The haulout on Castle Rock NWR (109 seals) was larger than the statewide average (51.1 animals), and was one of the largest haul-outs in northern California. Pupping has been documented on the reef adjacent to Castle Rock NWR, but not on Castle Rock NWR itself. Small numbers of harbor seals, including some nursing pups, regularly haul out around the rim of Castle Rock NWR in summer (Jaques and Strong unpublished).

Northern Fur Seal

Northern fur seals range widely in the North Pacific. Less than 1 percent breed in California (Carretta et al. 2004), with the majority breeding in Alaska. Fur seal rookeries in California have been gradually recovering from near extinction by the fur seal trade.

Northern fur seals may have historically occurred at Castle Rock NWR, and may occasionally haul out at Castle Rock NWR. An unusual influx of fur seals occurred in the Crescent City area during winter 2006–2007. Seven malnourished northern fur seal pups were recovered in the Crescent City area from November to January 2007. The pups were taken in for rehabilitation at the North Coast Marine Mammal Center. Fur seals are negatively affected by strong El Niños (Melin and DeLong 2000), and the pup starvation event along the north coast probably reflected a year of particularly poor ocean conditions rather than increased association with the nearshore environment. A return of fur seals to other historical breeding rookeries in northern California, besides the Farallons, is possible. Careful pinniped monitoring at Castle Rock NWR might reveal more information about the species' population status in this region.

California Sea-lion

California sea-lions of the subspecies *Zalophus californianus californianus* range from southern Mexico to British Columbia. They breed mainly on offshore islands, ranging from southern California's Channel Islands south to Mexico. There is a fall northward migration along the coast and more rapid southward migration in spring.

The U.S. stock was most recently estimated at 138,881 animals (Carretta et al. 2004). The population has experienced an annual growth rate of ~6 percent since at least 1975. The species is not listed under the ESA and is not depleted or listed as a strategic stock under the MMPA.

California sea-lions occur primarily on rocky islands within a few miles of shore. They are able to climb to the upper reaches of many islands, and can affect vegetation and erosion on islands with fragile topsoil. California sea-lions on the U.S. Pacific coast are primarily from the stock that breeds on islands in southern California, although males that breed in Baja California, Mexico, may also spend most of the year in the U.S. (Carretta et al. 2004).

Castle Rock NWR is used by California sea-lions year round (Mate 1973, Griswold 1985). It was historically the northernmost haulout site during the breeding season (Mate 1973) and the southernmost overwintering site in northern California (Griswold 1985). Bonnell et al. (1981) identified Castle Rock NWR and associated shoals as one of the largest California sea-lion haulout grounds in central and northern California. Use of Castle Rock NWR by

Table 11. Counts of harbor seals in the Castle Rock vicinity in 2004 (from 126 mm format aerial color photographs).

Location of haulout site	Date	Time	Tide height	Count of seals onshore	Count of seals in water
Vicinity of Castle Rock, Crescent City	5-Jul-04	10:49	-0.03	61	1
Vicinity of Castle Rock, Crescent City	5-Jul-04	10:39	-0.03	109	4
Vicinity of Castle Rock, Crescent City	5-Jul-04	10:38	-0.09	13	0
Vicinity of Castle Rock, Crescent City	5-Jul-04	10:46	-0.03	513	3

Data are from Appendix 1, Carretta et al. 2005.

non-breeding sea-lions has likely increased along with the overall west coast population. Data appear to indicate that numbers of sea-lions at Castle Rock in early July are very low, but that post-breeding influx to the island begins by mid-July. Griswold (1985) made 72 censuses of pinnipeds at Castle Rock during 1984, with July the period of lowest abundance. Numbers increased in August and were highest in fall and winter, then dropped again in April. The mean count in July was 11 animals, compared to about 280 on average during September through October. Historic counts made by Bonnell et al. (1983) were higher, with about 1,500 and 570 animals present in October and January, respectively.

The most recent non-breeding season counts of pinnipeds at Castle Rock NWR were made in 1994–1995 (Table 12). Jaques and Strong (1995) conducted aerial photographic surveys of sea-lions in March 1994 and January 1995. In January, a total of 1,277 California sea-lions were counted, with the majority of the animals (83 percent) on the main island rather than the associated reef. Sea-lions climb up to the top of the eastern edge of Castle Rock NWR during winter weather conditions, and can be crowded together on the upper areas of "the pit" during storms and high swells (Griswold 1985).

California sea-lions haul out primarily on the east side of Castle Rock NWR, particularly on the beach, outer slopes, and rim of the pit, as well as rock outcrops associated with the cover on the south side of the island. Accelerated erosion of any soil-covered areas used by sea-lions is to be expected, particularly sloping areas, such as the area used to access haul-outs.

Steller Sea-lion

Steller sea-lions range along the North Pacific rim from northern Japan to central California. The species was divided into two distinct population segments (DPS) in 1997 (NOAA Fisheries Service 2006). Castle Rock NWR occurs in the range of the eastern stock (eastern DPS), which includes the population from the central California coast north to Cape Suckling in southeast Alaska. Both the eastern and western stocks were listed as ESA threatened in 1990 (55 FR 49204); the western stock was subsequently upgraded to endangered status in 1997. The Steller sea-lion is also listed as depleted under the MMPA, and is classified as a strategic stock. Critical habitat was designated in 1993.

Steller sea-lions historically occurred at five major rookeries in California, from the Channel Islands to the St. George Reef (NOAA Fisheries Service 2006). The Steller sea-lion eastern DPS population is currently between 45,000 and 51,000 animals, and has been increasing at 3 percent per year for the past 30 years, with variation in trends within the range (NOAA Fisheries Service 2006). Numbers have decreased at the southern extent of the range in southern and central California, but have increased in northern California and Oregon (NOAA Fisheries Service 2006).

Table 12. Counts of California sea-lions at Castle Rock and reef during July 2000-2004 (from 126 mm aerial color photographs taken by NOAA Fisheries Service).

Location name	Date	Sea-lion Count
Castle Rock	8-Jul-00	37
Castle Rock	17-Jul-01	380
Castle Rock	9-Jul-02	2
Castle Rock	12-Jul-03	644
Castle Rock	5-Jul-04	2

Data from Carretta et al. 2005.

Steller sea-lion breeding areas are typically located on remote offshore islands and reefs, and require adequate areas above high water levels where young pups can survive weather conditions (NOAA Fisheries Service 2006). Female sea-lions appear to select haulout birthing habitat that is gently sloping and protected from waves. Birthing occasionally takes place at haul-outs, but more commonly occurs at a rookery where 25–50 pups are born each year. Sea-lions use traditional locations from year to year. Factors that influence habitat suitability include substrate, exposure, proximity to food resources, oceanographic conditions, season, and human activities (NOAA Fisheries Service 2006).

Steller sea-lion pupping and breeding season extends from late May to early July (NOAA Fisheries Service 2006). Adult females give birth to a single pup and then breed with territorial males about 11–14 days postpartum. Females with pups begin dispersing from rookeries to haul-outs when the pups are about 2.5 months of age. Adult males that breed in California move north after the breeding season. They are rarely seen in California or Oregon except from May through August. Females tend pups for several months following dispersal from breeding rookeries. Juveniles part with their mothers and begin to disperse at about 8 months of age (NOAA Fisheries Service 2006). While Steller sea-lions are not known to migrate, they may disperse widely outside of the breeding season (NOAA Fisheries Service 2006).

Castle Rock NWR and its adjacent shoals are a traditional seasonal haulout for the Steller sea-lion (Table 13). The species is present year round at Castle Rock NWR and associated shoals where haulout habitat is relatively protected from winter conditions (Griswold 1985, Jaques and Strong 1995). Castle Rock NWR is one of 41 haulout sites noted in California (NOAA Fisheries Service 2006). Data from aerial surveys over the period 2000–2005 indicate that use of Castle Rock is variable and possibly increasing. A high count of 918 individuals occurred at Castle Rock NWR and associated shoals collectively in July, 2004 (M. Lowry pers. comm.). The NOAA Fisheries Service data indicate that 716 of these animals were on Castle Rock itself. On the same date, 1,092 non-pups and 444 pups were recorded nearby on the St. George Reef. Most of the Steller sea-lions using Castle Rock NWR are either immature animals or nursing females with dependent pups (Jaques and Strong 1995). Only a few winter counts of the species are available. Jaques and Strong (1995) counted 203 Steller sea-lions from aerial photographs in January 1995, including 36 females with nursing pups. Griswold (1985) had a peak count of about 200 Steller sea-lions at Castle Rock in November.

The growing Steller sea-lion breeding population at Point St. George Reef is near its physical capacity and may be on the verge of expanding to nearby sites (R. Brown pers. comm.). Castle Rock NWR offers suitable habitat for a new colony in this vicinity. The potential for future breeding on Castle Rock NWR by this ESA-listed species seems high, and may represent a positive step forward in recovery of the eastern population.

Prevention of disturbances to Steller sea-lions during the pre-breeding and breeding season would be a step towards encouraging establishment of the island as a rookery.

Table 13. Steller sea-lion count data for the St. George Reef and Castle Rock, July 5-17, 2000-2004.

Location	2000	2001	2002	2003	2004
NW Seal Island	334	335	175	220	354
SW Seal Island non-pups	532	455	541	583	738
SW Seal pups	293	338	367	458	444
Castle Rock and shoals	12	66	692	100	918

Preliminary data from M. Lowry, NOAA Fisheries Service, Southwest Fisheries Science Center.

Northern Elephant Seal

Northern elephant seals in the California stock range from Baja California to the Gulf of Alaska. They breed and give birth in California and Baja California, primarily on offshore islands (Stewart et al. 1994) from December to March (Stewart and Huber 1993). Populations of northern elephant seals in the U.S. and Mexico were all originally derived from a few tens or hundreds of individuals that survived in Mexico after being hunted to near extinction (Stewart et al. 1994). The current population estimate is over 100,000 animals in California alone (Carretta et al. 2005). As the population recovered, breeding colonies formed along the California coast. Most of the stock in the U.S. currently breeds on the southern California Channel Islands, with about 20 percent of the pups born in central California in recent years (Carretta et al. 2005). The breeding range expanded as far north as Oregon by 1993 (Hodder et al. 1998). Based on trends in pup counts, northern elephant seal colonies were continuing to grow in California through 2001, but appear to be stable or slowly decreasing in Mexico (Stewart et al. 1994.)

Male elephant seals feed in the Gulf of Alaska near the eastern Aleutian Islands, and females feed further south, south of 45°N (Stewart and Huber 1993, Le Boeuf et al. 1993). Adults return to land between March and August to molt, with males returning later than females. Adults return to their feeding areas again between their spring/summer molting and their winter breeding seasons.

Elephant seal breeding rookeries occur on relatively flat sand beaches either on islands or relatively isolated coastal mainland areas. Females give birth first when 3–5 years old (Barlow et al. 1993). Males reach prime breeding condition at 9–12 years of age. Pregnant females come ashore to give birth from December through February. The seals mate about 24 days after birthing. Pups are abandoned on beaches when they are about one month old, but remain at the rookery for another one to three months prior to going to sea. Juveniles and adults return to molt from March to August. Most elephant seals return to their natal rookeries when they start breeding (Huber et al. 1991).

Elephant seals breed on Castle Rock and the associated shoals, but the population has not been regularly monitored by NOAA Fisheries Service or any other entity. Although breeding was evident as early as 1978 (Griswold 1985), aerial surveys to confirm that the island was a breeding rookery did not take place until 1994–1995 (Jaques and Strong 1995) (Table 14). No surveys have taken place since

Table 14. Northern elephant seals at Castle Rock and Castle Rock shoals in 1994-1995.

	Elephant Seal Status	Castle Rock	Castle Rock Shoals	Total
20-Jan-95	Bull	1	*	1
	Subadult male	6	*	6
	Female	34	11	45
	Pup	3		3
	Total	44	11	55
4-Feb-95	Bull	1	1	2
	Subadult male	4	*	4
	Female	24	17	41
	Pup	4	7	11
	Total	33	25	58
17-Mar-94	Adult	2	3	5
	Pup	9	2	11
	Total	11	5	16

Counted from aerial photographic surveys; from Jaques and Strong 1995.

that date. The breeding area on Castle Rock NWR is largely out of view from the mainland shore or boat.

The first record of elephant seals on Castle Rock was made by Osborne (1972), who observed six elephant seals there in 1970. A young elephant seal pup washed up a nearby Crescent City beach in 1978 (Griswold 1985). Bonnell et al. (1983) counted four elephant seals on Castle Rock NWR, and speculated that one pup may have been born there that year. Pre-weaned pups have washed up on the mainland regularly since about 1985 (D. Wood, pers. comm.). Sightings of tagged animals indicate that it was initially colonized by immigrants from Año Nuevo Island.

Aerial surveys in 1994–1995 confirmed that the elephant seal breeding population at Castle Rock NWR was relatively small, and that breeding takes place on both the main island and inner reef (Jaques and Strong 1995). Up to 52 nonpups and 11 pups were counted at the rookery in January 1995. Most elephant seals on Castle Rock NWR were on the flat beach inside the pit. There is very little suitable elephant seal habitat on Castle Rock NWR and this factor likely limits the size of the breeding population. Pup mortality appears to be high, as evidenced by the number of pups that wash off the site during winter storms.

3.7.8. Castle Rock NWR Mammals

Bats
Bats were historically present in the shepherd's cabin (Osborne 1972), but their current occurrence is not known.

Rodents
Osborne (1972) reported seeing two deer mice (*Peromyscus maniculatus*) on Castle Rock in 1970. The current status of this native mouse at Castle Rock NWR is not known. The house mouse is a non-native species that may be present on Castle Rock NWR. One dead specimen was observed on the island's eastern shore by Osborne (1972).

River Otters
River otters are common along the mainland shore adjacent to Castle Rock, but have not been seen on the island itself. An otter was observed preying on birds at sea between Castle Rock and Point St. George (D. Jaques, unpublished field notes). River otters are a suspected predator on Leach's storm petrels nesting at Prisoner Rock in Humboldt County (Osborne 1972, Sowls et al. 1980, Carter et al. 1992) and at other seabird colonies in the northeastern Pacific (Duffy 1995).

3.7.9. Castle Rock NWR Amphibians and Reptiles

No information is available on possible habitation of Castle Rock NWR by amphibians and reptiles.

3.7.10. Castle Rock NWR Invertebrates

The intertidal region around Castle Rock NWR is rich with invertebrates. However, no surveys have been conducted around or on the island.

3.7.11. Castle Rock NWR Special Status Species

Federal Endangered Species Act Listed Species
Two species using Castle Rock NWR are protected by the Federal Endangered Species Act: the California brown pelican and the Steller sea-lion (Table 15). The marbled murrelet (*Brachyramphus marmoratus*) is an ESA-listed threatened species, but it uses habitat outside Castle Rock NWR, including the waters surrounding Castle Rock. The Aleutian cackling goose and gray whale were both formerly listed, but now are recovered species.

California Brown Pelican
The brown pelican became endangered on the U.S. Pacific coast due to pesticide contamination of marine waters near breeding colonies in southern

California (USFWS 1983). Breeding populations have generally recovered, and both the State of California and the USFWS are conducting a status review of the species. Non-breeding pelicans roost communally on Castle Rock NWR, but have never been known to nest north of Monterey, California (USFWS 1983). They can be found from April to December, but are most abundant at Castle Rock NWR in fall. As many as 3,660 pelicans have been counted on the island. Castle Rock NWR is a key night roost for pelicans in the Crescent City area.

Peregrine Falcon
(*See Other Bird Species That Use Castle Rock NWR*).

Birds of Conservation Concern
Three bird species recognized as USFWS Species of Conservation Concern occur at Castle Rock NWR: peregrine falcon, black oystercatcher, and Cassin's auklet (*see Other Bird Species That Use Castle Rock NWR*).

Steller Sea-lion
(*see Castle Rock NWR and Surrounding Area Use by Marine Mammals.*)

California State Species of Special Concern (SSC)
California Species of Special Concern is a designation that CDFG can give to vertebrate species because of declining population levels, limited ranges, and/or continuing threats that may make the listed species vulnerable to extinction. Four SSC birds (CDFG 2007) breed on Castle Rock NWR: rhinoceros auklet, tufted puffin, fork-tailed storm-petrel, and double-crested cormorant (*see Other Bird Species That Use Castle Rock NWR*).

3.7.12. Castle Rock NWR Non-native Wildlife

There has been no assessment of non-native plant or animal species on Castle Rock NWR. Non-native rodents and plants can have a detrimental impact on seabird colonies.

3.8. Castle Rock NWR Cultural Resources

There are no known Native American cultural resources on Castle Rock NWR. The wood remaining from the shepherd's cabin might be considered a historic relic or cultural resource.

3.8.1. Prehistoric Use of Castle Rock and Surrounding Area

In aboriginal times, the Tolowa people lived along the extreme northern coast, from the southwestern corner of what is now Oregon to ~15 miles south of the shoreline adjacent to Castle Rock (Cramblit

Table 15. Threatened or Endangered species that occur or have occurred at Castle Rock NWR or adjacent marine waters.

Common Name	Scientific Name	Federal Status	California State Status	Notes
brown pelican	*Pelecanus occidentalis californicus*	FE 10/13/70	SE 6/27/71	State and Federal status review in progress
Aleutian cackling goose	*Branta (Canadensis) leucopareia*	Delisted 3/20/01 FT 12/12/90 FE 03/11/67		
American peregrine falcon	*Falco peregrinus tundrius*	Delisted 8/25/99 FE 6/2/70	SE 6/27/71	
marbled murrelet *	*Brachyramphus marmoratus*	FT 9/30/92	SE 3/12/92	Surrounding waters only
Steller sea-lion	*Eumatopius jubatus*	FT 4/5/90		
gray whale *	*Eschrichtuius robustus*	Delisted 6/15/94 FE 6/2/70		Surrounding waters only

** indicates adjacent waters only*

2007). Humboldt Bay was home to the Wiyot people, an Algic-speaking group that fished and hunted on the California coast from Trinidad Head to the Eel River (Fredrickson 1984). The coastal areas between the Wiyot and Tolowa people was home to the Yurok peoples (Cramblit 2007).

The Tolowa people who originally inhabited what is now Crescent City, California (Cramblit 2007), are an Athabascan tribe (UO 2007). Linguistically they were closer to the Rogue River tribes to the north than to tribes inhabiting the south (UO 2007).

The Tolowa resided in permanent villages along the coast in winter, and in late summer moved inland for salmon and acorns. Their house types were low peaked redwood plank dwellings with gable end entrances. Tolowa society was associated with acquisition of wealth, usually dentalium shells, obsidian blades, and woodpecker scalps. Ceremonialism associated with the taking of the first salmon and sea-lion suggests that they belonged to the northern Californian 'World Renewal' complex of the Karok, Yurok, and Hupa type.

'Ee-nii-k'wvt' was the name given to Castle Rock by the Tolowa, which translates to "Ground there upon" (L. Bommelyn pers. comm.). The Tolowa had a subsistence relationship with Castle Rock, but were not known to ever reside on the island. During the 1800s, the Tolowa occupied a large village site on the headland adjacent to Castle Rock at Point St. George. An intensive study of the village site was made by Gould (1966), which incorporated archaeological evidence, oral history, and historical data in an attempt to reconstruct the culture of the people living at Point St. George.

"Ta'giatun" or "Land laying outward place" is one of the names given to Point St. George, and is described as a "…place for shellfish gathering; also camping place for sea-lion expeditions…" (Gould 1966). The intertidal regions surrounding the Point were used by the Tolowa for gathering shellfish and seaweed. The people also engaged in sea-lion hunting expeditions offshore. Dugout canoes, 30–40 feet long, were used for regular trips to the St. George Reef and, presumably, Castle Rock. Marine mammal species included in the native diet at the village on the Point were whales, sea otter, Steller sea-lion, California sea-lion, northern fur seal, and harbor seal. The Steller sea-lion was the most common mammalian species found in archaeological digs at the site, and appeared to be of major importance to the people. Gould stated that birds were clearly part of the regular diet and were taken whenever possible. At certain times of year bird eggs and immature birds were harvested in large numbers. The most common bird bones found were those of immature cormorants.

Oral history describes the seasonal taking of flightless cormorants from nesting islands around Point St. George in more recent times (Gould 1966). At Castle Rock, May was egg gathering time (Calla et al. 2005). Men in canoes made expeditions to the island, scaled the cliffs, and marked a circular area with stones. They then threw all the eggs inside the area off the cliff. Ten days later they would return and collect the new eggs, knowing they were fresh. The eggs were probably common murre. Eggs were also blown and used for ornamental purposes, strung in a garland to decorate homes.

EuroAmerican settlement of the Crescent City area began in the 1850s. The general destruction of the native American population followed rapidly. By 1856 there were only an estimated 316 Tolowa survivors (Gould 1966). The village at Point St. George was abandoned about the mid-1850s, prior to intensive white settlement of the area, but use of Point St. George for subsistence continued after the village was abandoned. Shell middens are present at Point St. George, but there are no recorded archaeological sites on Castle Rock itself (USFWS 1978).

3.8.2. Castle Rock NWR History

EuroAmerican Settlement of Crescent City and Use of Castle Rock

The overland explorations of Jedediah Smith were probably the first contacts between Tolowa peoples and EuroAmericans. Intensive white settlement of the larger region came after the gold rush of 1850 (UO 2007). The Tolowa people probably numbered more than 1,000 prior to EuroAmerican contact. However, the census of 1910 registered only 121 Tolowa, likely as a result of diseases and numerous attacks by EuroAmericans on their settlements (UO 2007). Two small reserves, called Rancherias, at Crescent City and Smith River, continue to be home to some Tolowa descendants, reportedly numbering 37 and 113 respectively in 1945 (UO 2007).

The only recorded uses of Castle Rock by EuroAmerican people were sheep grazing and egg-collecting. The island was initially claimed by the U.S. Government around the turn of the century. A private shepherd grazed sheep on the island from about 1900 to about 1920 (Osborne 1972). Sheep were periodically transported to and from the island by boat during extreme minus tides. A small wooden cabin was constructed on the east end of the island. Fraser, an early ornithologist/egg collector, reported

that no sheep were present by the time of his visit, in the 1930s (Osborne 1972).

Several egg collectors visited the island from at least 1917 to 1961. These early oologists left valuable notes in some cases. Clay (1901-1953) visited the island at various times from 1917-1934. Talmage visited in the mid-1930s but lost all of his field notes and specimens in a fire (Osborne 1972). Early ornithological accounts were also provided by Zerlag and Fraser (1940).

Castle Rock was purchased from the U.S. Government in 1937. The intent of the first private owners was to quarry the island for rock to build coastal highways and jetties. Rock quarrying did take place on the mainland on Point St. George during the 1950s and 1960s. The southwest tip of the point was dynamited to supply the U.S. Army Corps of Engineers with material for the breakwater at Crescent City Harbor. As late as the 1970s, speculators were contemplating guano mining, rocky quarrying, and construction of a tourist attraction on Castle Rock, (Sowls et al. 1980), but for various reasons none of these plans ever proceeded (USFWS 1978).

In 1979, The Nature Conservancy (TNC) purchased Castle Rock. The U.S. Fish and Wildlife Service bought the island from TNC in 1980 for ~$41,250.

3.9. Castle Rock NWR Social Environment

Castle Rock is in Del Norte County, California, ~1 mile off-shore from Crescent City. Del Norte County was founded in 1857 from part of the territory of Klamath County, which ceased to exist in 1875. The name of the county signifies "the north," derived from its location in California.

Del Norte County is the northwesternmost county in California. It is located on the Pacific coast, and bordered by Oregon to the north. The county seat is Crescent City, the county's only incorporated city. Del Norte County is noted for its redwood forests and the wild Smith River National Recreation Area.

3.9.1. Del Norte County Demographics

As of 2007, there were 29,341 people residing in Del Norte County (CDOF 2007). According to the U.S. census of 2000, the population density is 27 per square mile. There are 10,434 housing units at an average density of 10 per square mile. The racial makeup of the county is 78.9 percent white, 4.3 percent black or African American, 6.4 percent native American, 2.3 percent Asian, 0.1 percent Pacific islander, 3.9 percent from other races, 4.1 percent from two or more races, and 13.9 percent of the population Hispanic or Latino of any race.

As of 2000, there were 9,170 households, of which 33.5 percent had children under the age of 18 living with them, 50 percent were married couples living together, 13.6 percent had a female householder with no husband present, and 31.4 percent were non-families. 25.3 percent of all households were made up of individuals and 10.1 percent had someone living alone who was 65 years of age or older. The average household size was 2.6 and the average family size 3.1.

In Del Norte County the population was spread out with 25.1 percent under the age of 18, 8 percent from age 18 to 24, 32.2 percent from age 25 to 44, 22.3 percent from age 45 to 64, and 12.5 percent who were 65 years of age or older. The median age was 36 years. For every 100 females there were 123 males. For every 100 females age 18 and over, there were 130 males.

3.10. Castle Rock NWR Social and Economic Conditions

3.10.1. Castle Rock NWR Social and Economic Regional Overview

Del Norte County has historically been a very productive timber region (TNC et al. 2005). However, over the past 20 years the timber industry in California has undergone a major downturn, economically impacting the industry as well as the local community (TNC et al. 2005). One major factor in the downturn is a reduction in supply due to prior intensive harvest. In addition, an inconsistent domestic housing market, declining Asian markets in the 1990s, and an increasing foreign lumber supply with relatively lower cost from Canada, Brazil, Chile, and Russia have had negative impacts (TNC et al. 2005). In 2005, Del Norte County timber production was 22,500,000 board feet, just 1.3 percent of California's total production (CDOF 2007).

As of 2000, agricultural employment in Del Norte County was just 370. Agricultural products such as livestock and livestock products, as well as plant products, had a value of over $41 million (in year 2000 $) (CDOF 2007).

The majority of non-agricultural employment in Del Norte County is in a few sectors including State and local government; trade, transportation and utilities; educational and health services; and leisure and hospitality.

3.10.2. Castle Rock NWR Regional Land Use

Del Norte County Land Use

Del Norte County is less than half the size of Humboldt County and comprises 644,990 acres. More than 32,000 residents reside in more than 9,100 households, including over 3,300 prisoners in Pelican Bay State Prison. The county is rural, consisting of Crescent City and several small unincorporated towns such as Smith River, Gasquet, Hiouchi, and Klamath. As of 2005, there were over 417 miles of streets, roads, and highways in the county (CDOF 2007). In 2002 there were 89 farms, comprising over 13,300 acres (CDOF 2007). Field crops, vegetables and fruits, nursery stock, timber, and livestock all continue to be produced throughout parts of Del Norte County, with trends of increasing nursery stock and livestock (DNC 2003).

Del Norte County historically had 43 large lumber mills; by 1994 the last one closed. With this closure Del Norte County began a regional economic transition. The establishment of Redwood National and State Parks in the early 1970s, and the Smith River National Recreation Area in the late 1980s, put more than 75 percent of the county land area in NPS, U.S. Forest Service, or other publicly owned land.

3.10.3. Castle Rock NWR Local Land Use

Crescent City is a mixture of natural area preserves, a long coastline, and creeping urbanization. Highway access is provided by U.S. Route 101, which runs directly through the city, and extents to Brookings, Oregon, to the north and Eureka to the south.

In 2007 there were 7,762 people residing in Crescent City (CDOF 2007). Census data from the year 2000 indicate that the population density is over 2,500 per square mile in Crescent City, orders of magnitude higher than the rest of Del Norte County. There are over 1,700 housing units with an average density of over 980 per square mile. Pelican Bay State Prison, located on 275 acres near Crescent City, opened in 1989 principally to house the growing population of maximum-security and high-security risk inmates in the California prison system. The Del Norte County airport covers 500 acres ~3 miles northwest of Crescent City (Mead and Hunt 2005). The airport consists of two intersecting runways with regular flights over Castle Rock NWR. To date, no collisions have been reported between planes and nesting birds.

3.10.4. Castle Rock NWR Local Economy and Employment

When Crescent City became the county seat of Del Norte County in 1857, most of the inhabitants worked in the nearby mines. As the mining industry waned, it was largely replaced by logging and fishing industries during the early twentieth century. Although these industries have also experienced recent decline, forestry product processing continues, and the Crescent City Harbor still serves as a commercial fishing boat basin for salmon, shrimp, tuna, cod, and Dungeness crab commercial fishing vessels. The harbor is also home to multiple fishing and non-fishing related businesses and harbor governmental offices. The Crescent City Harbor has several pleasure boat docks.

The median income for a household in Crescent City is $20,133, and the median income for a family is $22,058. Males have a median income of $36,667 versus $19,922 for females. The per capita income for the city is $12,833. Over 34 percent of the population, and over 33 percent of families, are below the poverty line.

3.10.5. Castle Rock NWR Management Economics

There are no staff or base budget funds specifically allocated to Castle Rock NWR. Management of Castle Rock NWR is covered by the staff and budget at Humboldt Bay NWR. Recent work there on research and visitor services/outreach has been paid for primarily with special programmatic and grant funding. Annual costs to maintain this level of effort would be ~$30K.

National Wildlife Refuges contribute funds to local counties through revenue sharing programs that are intended to cover unrealized tax revenues for either lands purchased in fee title or lands reserved from the public domain. To mitigate the loss in property taxes, Del Norte County receives an annual payment in accordance with the Refuge Revenue Sharing Act of 1964. The county receives either 0.75 of 1 percent of the value of Castle Rock, annually (~$4,000).

3.10.6. Castle Rock NWR Environmental Justice

There are no minority or low income populations that would be affected by any management alternatives on Castle Rock NWR.

3.11. Castle Rock NWR Public Access and Recreation

3.11.1. Castle Rock NWR Traffic, Public Access, and Recreation

Crescent City can be accessed from the north and south on Highway 101, and from the east on highway 199. There is no public access to Castle Rock NWR.

3.11.2. Aesthetics of Castle Rock NWR

The primary viewing area for Castle Rock NWR is from Pebble Beach Drive and the mainland at Point St. George. The area surrounding Castle Rock NWR contains other, smaller rocks and offers majestic views of California's coastline.

3.12. Castle Rock NWR Public Use

Castle Rock NWR is currently closed to all public access and is very unlikely to ever be opened. Sensitive cavity nesting bird and other habitats would be irreparably damaged by visitor use of Castle Rock NWR.

Periodic visits to the island are conducted only by Complex staff and academic researchers accompanied by staff, to install and maintain remote sensing wildlife cameras or to conduct other forms of monitoring and research. A remote viewing site and interpretive panels are provided on shore immediately adjacent to Castle Rock NWR, on Pebble Beach Drive. With binoculars or, better yet, a spotting scope, visitors can see seabirds and resting pinnipeds from this remote viewing location.

3.12.1. Castle Rock NWR Environmental Education and Interpretation

Interpretive signs are provided at a rest stop along Pebble Beach Drive, from which the public can safely view Castle Rock NWR and learn more about its wildlife (Figure 12).

Real-time video of Castle Rock NWR and associated seabirds is available over the internet, through a partnership between the USFWS, HSU, and the NPS.

3.12.2. Castle Rock NWR Trends

Kayaking, jet skiing, and other recreational boating occur in the waters around Castle Rock NWR, but the island is posted with signage indicating that landing is not permitted. No trend data about these uses is currently available, but non-motorized boating (especially the use of sea kayaks) has increased substantially in the last 10 to 15 years.

3.12.3. Castle Rock NWR Management and Monitoring

Since establishment, Castle Rock NWR has been passively managed by preventing disturbance of refuge wildlife. Because Castle Rock NWR is so rich with sensitive wildlife species and fragile habitat, only very limited access for research, monitoring, and management can be allowed while fulfilling the purposes for which it was established. Limited remote observation of Castle Rock NWR has been allowed for research purposes. The Complex collaborates with partners such as HSU, AFWO, and NOAA Fisheries Service to conduct photo surveys of birds and marine mammals utilizing Castle Rock NWR and associated habitat.

Estimates of the abundance of common murres, cormorants, pigeon guillemots and tufted puffins on the refuge can be obtained using aerial photos or other means. However the burrow-nesting nocturnal species (rhinoceros and Cassin's auklets, fork-tailed and Leach's storm-petrels) are not easily

Figure 12. Castle Rock NWR interpretive panels along Pebble Beach Drive, Crescent City. Photo: USFWS

seen because they are out in the ocean feeding during the day and only come to the island between sunset and sunrise to attend to their young. Human activity on the island is very restricted because the burrow systems can be destroyed or badly damaged when stepped on by people. Therefore, they have posed a very difficult challenge to study. Based on past surveys, it is suspected that Castle Rock still hosts substantial numbers of these burrow-nesting species, but their current status is not known. With advanced technology we can now use cameras to view the seabirds without the disturbance associated with having people present. Our intent is to establish a long-term, forward looking monitoring program on this very important seabird island.

The camera system installed on Castle Rock NWR sends video signals to an antenna on top of the NPS building in Crescent City, then to a digital video recorder, and finally to a screen. This system allows us to gather information on the number of birds in a certain area, the percentage of burrows occupied by which types of birds, when the birds are there, how often they bring fish back, when eggs are laid and hatch, when young birds leave the nest, and other data that help us determine how the populations are doing. Additionally, the video from the camera will be available to the public "live," either by high quality TV in the Crescent City visitor center of the NPS, or via an internet connection to the web at http://www.humboldt.edu/~rtg1/research/castle_rock.html

4. Issues, Challenges, and Opportunities

4.1. Issues and Challenges Identified by the Public and the Service

Based on input from the public, agencies, tribes, and elected officials, as well as internal scoping, the Service summarized the following planning issues to guide the development of alternatives. A third planning update, summarizing the results of the CCP scoping process, was sent out to over 600 interested stakeholders on September 14, 2007. In addition, a fourth planning update was sent out during spring of 2008.

4.1.1. Potential Impacts of Global Climate Change on the Complex

The recent warming trend of the global climate is confirmed by observations of increases in global average air and ocean temperatures and rising mean sea level (IPCC 2007). Since Humboldt Bay NWR is located adjacent to the Pacific Ocean, it is likely to be impacted by both increased temperature and sea level rise (see section 3.1.2 for further discussion).

Given the height of Castle Rock NWR above mean sea level, its habitat for nesting sea birds and roosting birds is unlikely to be impacted by rising sea level in the near term. More likely impacts to resident and migrant wildlife are any changes in the supply of marine prey that could result from changes in ocean temperatures or ocean currents.

4.1.2. Staffing Needs for the Complex

The Complex currently has six permanent full time equivalent (FTE) employees; five positions are stationed at the Visitor's Center, while one permanent employee and one term employee are stationed at the office at the Lanphere Dunes Unit. In 2008 the refuge received additional base funding for a permanent Visitor Services/Outreach position to be shared with the Arcata Fish and Wildlife Office. When filled, the shared position will be stationed at the Salmon Creek Unit of the Humboldt Bay NWR. Since 2002 the Complex has had a graduate Student Career Experience Program (SCEP) position (two different students) that has helped with the Complex's biology program. The Complex has also periodically had one or two six-month temporary contract positions that have assisted primarily with Visitor Services, and a Youth Conservation Corps Crew Leader and Crew.

4.1.3. Aleutian Cackling Goose Habitat Management

The recovery of the Aleutian cackling goose population from endangered (~800 birds in 1974) to thriving is one of the signature success stories of the Federal Endangered Species Act.

To the best of current knowledge, Aleutian cackling geese historically used Castle Rock NWR in Del Norte County, but did not use the Humboldt Bay area, as a spring staging area. This historic use pattern is consistent with historic vegetation conditions around the bay. However, since 2001, the use of private and public grasslands around Humboldt Bay and the lower Eel River by Aleutian cackling geese has increased significantly. The Humboldt Bay area now receives the majority of use by 50,000 to 80,000 Aleutian cackling geese from mid-January to late March. The Pacific Flyway objective for this population is 60,000. However, the current population is ~100,000 and is likely still increasing (see Figure 3 and Table 9). Use of habitat in Humboldt County by Aleutian cackling geese has already increased to the point where local ranchers are reporting financial losses due to forage removed by geese and therefore unavailable for livestock (Nelson pers. comm., Mini 2005). At this time, direct compensation for adverse effects caused by Aleutian cackling goose are not available nor is it foreseen to be within the life of this CCP (15 years). An Aleutian cackling goose working group continues to explore the best possible options to solve these goose management issues. As long as ranchers are suffering these losses without any compensation, they look to the public agencies to make the public land available for goose forage. However, one of the challenges is that most public lands around Humboldt Bay and the Eel River are former tidelands and therefore potential habitat for listed salmonids and tidewater goby. Any acre of land managed for geese is land that can not or is not being managed for salmonids and gobies, see below.

4.1.4. Estuarine Habitat Restoration on Humboldt Bay NWR

The Salmon Creek, White Slough, and Hookton Slough units of Humboldt Bay NWR consist primarily of diked former salt marsh and, to a lesser extent, brackish marsh. Humboldt Bay has lost ~90 percent of its salt marsh since EuroAmerican settlement through diking and draining as well as filling for development. Of the remaining salt marsh, 95 percent has been invaded by introduced dense-flowered cordgrass, which displaces native plant communities resulting in a loss of biodiversity and unknown impacts to marsh function and productivity. Much of the former salt marsh around the bay still supports seasonal wetlands, including "agricultural wetlands" used primarily for grazing and hay production. In other areas where there is substantial freshwater input, including the Salmon Creek, Hookton Slough and White Slough units, there are fresh to brackish marshes and riparian areas supporting native plant communities. Restoration of some former tidelands to tidal influence is desired by the Service as well as some other resource agencies and community members both to restore function as well as to provide habitat for native plant and animal communities, some of which are listed.

However, the restoration of tidal influence to former salt marsh is also constrained by a number of factors. Some residents and private ranch owners are opposed to tidal restoration because it removes land from agricultural production. The use of grazed, short-grass agricultural grassland by increasing numbers of migrating Aleutian cackling geese has resulted in the need for public landowners to retain some amount of this grazed habitat to support these populations and to remove geese grazing pressures from private lands. Restoration of salt marsh and brackish marsh is also constrained by the substantial subsidence that has occurred in most of these former tidelands. The majority of these lands may be two to three feet below the elevation needed to establish salt marsh, and three to four feet below the elevation required to establish native plant communities instead of dense-flowered cordgrass-dominated communities. Both cost and the need to model and experimentally test methodologies constrain the potential conversion of these areas to a condition that supports native salt marsh vegetation, either through raising elevations or establishing muted tidal influence. In addition, the presence of relatively uncommon native brackish to fresh marsh communities on some of these lands may affect the desirability of restoration. Since bay-wide vegetation mapping has not occurred, and little research has been devoted to the habitat values and functions of these wetlands, it is difficult to precisely quantify the impact of converting these vegetation types.

Lastly, but certainly not least is the fact that additional constraints exist due to proximity and exposure of adjacent infrastructure to flooding, including: Highway 101, Hookton Road, private lands and the refuge headquarters.

4.1.5. Replacement of Eucalyptus Trees with Native Vegetation

Blue gum (*Eucalyptus globulus*), a tree native to Australia, was introduced in California in the mid to late 1800s. A variety of reasons are listed as to why these trees were planted all along the coastal and interior valleys of California, such as crop trees, wind breaks, lumber, firewood, medicine, and shade. In the 1920s an approximately one mile long strip of blue gum was planted on the Humboldt Bay NWR, north of what is now the Visitor Center, by McBride family ranch hands probably as a wind break. Blue gum and other non-native trees, such as Monterey pine (*Pinus radiata*) and Monterey cypress (*Cupressus macrocarpa*), were also planted in this area. Currently this area is ~85 percent blue gum. Blue gum stands tend to be monotypic, largely due to their rapid growth and the toxins released by leaves and in the surrounding soil, which inhibit the growth of other species.

Although some wildlife, such as raptors, European starlings (*Sturnus vulgaris*), skunk, and deer use this area in general for resting and in some limited cases foraging and breeding, blue gum is recognized to be largely detrimental to wildlife. All birds that naturally evolved with this tree species have long bills and are typically not diminutive songbirds. A few of the species of songbirds that would typically inhabit the native trees in winter are Anna's (*Calypte anna*) and Allen's (*Selasphorus sasin*) hummingbirds, yellow-rumped warblers (*Dendroica coronata*), and kinglets (*Regulus* sp.). These birds have short bills and small nasal openings relative to the species that have evolved with the blue gum. The gum (thick nectar) and pollen of these winter blooming trees tends to clog the nasal openings of these birds, which can lead to starvation. In addition, hummingbirds that nest in these trees typically have low nesting success as their nests blow out of trees five times more often than in native vegetation. Although blue gum are used by some birds, the diversity and number of birds and other wildlife that uses native riparian habitat is far greater.

Removal of the non-native trees was recommended in the original 1989 Management Plan for the

refuge. Due to the lower habitat value of these monotypic stands of eucalyptus, the Management Plan recommends that blue gum be replaced with native vegetation such as Sitka spruce, alders (*Alnus* sp.), and willows (*Salix* sp.). Sitka spruce and willows have thrived when planted elsewhere on the Salmon Creek Unit. Incremental removal has taken place, primarily by the California Conservation Corps (CCC), after approval of the 1989 Management Plan. Removal of the remaining eucalyptus would take place over a 5-year period. Downed trees are then donated to programs that distribute the wood to seniors and other needy citizens. This program is scheduled to continue in cooperation with the Humboldt Fish Action Council (HFAC).

4.1.6. Potential Water Quality Concerns with Increased Public Use in Mad River Slough

In the last 20 years, non-motorized boating has increased dramatically both nationally and on Humboldt Bay. To help accommodate this increasing use around the Bay, in 2008 the Service proposed construction of a non-motorized boat launch on the Ma-le'l Dunes Unit. The oyster growers in Mad River Slough expressed concern about the proposal for opening the Ma-le'l Dunes Cooperative Management Area (MDCMA) for public use, especially related to potential impacts on water quality (Figure 13). Their primary concern is that if the California Department of Public Health (CDPH) will not certify the waters of Mad River Slough, the oyster growers may be prohibited from harvesting oysters due to the potential for violations of water quality standards for aquaculture. Both growers and CDPH are concerned that increased public use in the area can potentially jeopardize the water quality.

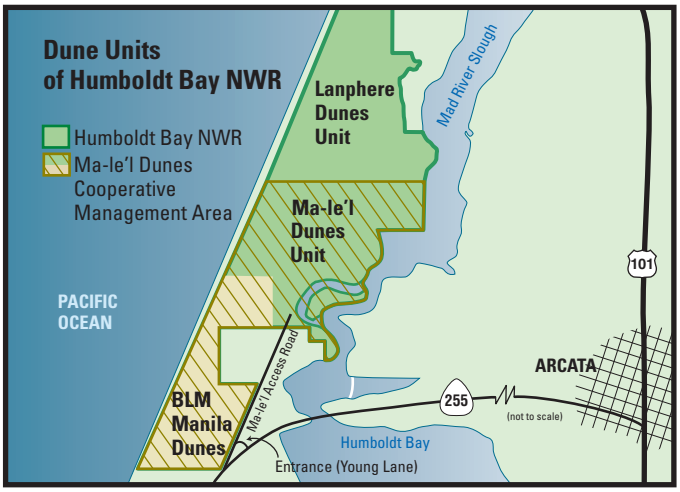


Figure 13. Dune Units of Humboldt Bay NWR.

To address these concerns, refuge and SCC staff have met with the oyster growers and HBHRCD. The California Department of Public Health's (CDPH) April 18, 2008 comment letter to the California State Coastal Conservancy on the "Ma-le'l Dune Cooperative Management Area and Revised Environmental Review Documents and Access Plan," the CDPH documented their concerns with the proposed non-motorized boat launch as follows:

The CDPH letter indicated that "unpredictable pollution events cannot be managed, therefore commercial shellfish growing is not allowed in areas that experience these types of potential impacts [to water quality]....Pollution sources in Humboldt Bay can directly impact water quality in the commercial shellfish growing areas and affect the classification." The CDPH letter indicated that if a non-motorized boat ramp was installed at the Ma-le'l north parking and picnic area along the Mad River Slough, the associated increased boating activity in the Mad River Slough that they expected as a result of installing a boat launch, and the anticipated increase in visitors and pets would present the following potential non point pollution sources: bacterial and viral pathogens and runoff of improperly deposited waste, especially along the banks of the Mad River Slough. Further, the CDPH letter stated that the ramp, associated increased boating activity in the Mad River Slough, and the anticipated increase in visitors to that location would create an "unmanageable potential source of human pathogens that is not consistent with the current use as an aquaculture site. CDPH will be required to take action if [the non-motorized boat ramp] is completed. Regulatory actions [by CDPH] could include harvest restrictions during periods of peak activity, permanent reclassification of the growing area to *Prohibited* (no shellfish harvesting allowed), or a temporarily harvest closure with increased microbiological sampling of the certified growing areas until the water and shellfish quality impacts can be assessed." If the CDPH reclassified the Mad River Slough area to prohibit shellfish harvesting, this would adversely affect the oyster growers in the area because they could no longer harvest or sell shellfish.

The Service continues to be committed to maintaining water quality standards in Mad River Slough. During the last several years a working group including the HBHRCD, SCC, and RCAA have gathered public input and developed prioritized locations for boat launches and water trails for non-motorized boats. Due to the aforementioned water quality

concerns and elevation at mid and lower tides, the Mad River Slough site was not a priority location. A boat ramp at Ma-le'l Dunes is not proposed as a part of this CCP or the MDCMA Plan.

4.1.7. Invasive Plant Species on Humboldt Bay and Adjacent Lands

An invasive species is a non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health (E.O. 13112, 3 February 1999). Invasive species are widely considered to be the greatest threat to natural areas after habitat loss. They negatively affect 35 to 46 percent of endangered species. There are 2.3 million acres of Refuge System lands infested with invasive plants and this number is increasing. The Biological Integrity Policy (601 FW 3) specifies that the Refuge System manages non-native invasive species by the use of integrated pest management strategies, which can include mechanical, chemical, biological, and cultural techniques. The ecosystem of the south bay units has been highly altered through human manipulation and invasive species, which are widespread within these units. Many of these species are in an incipient stage of infestation, occurring only in a few small areas.

Invasive species infestations are not limited by ownership boundaries. Identifying the threat of an invasive species at an ecosystem level improves the ecological and economical effectiveness of the control methods. The Humboldt Bay NWR is committed to cooperatively work with adjacent landowners and the Humboldt-Del Norte Weed Management Area to control the spread and impact of invasive species. This cooperation will enhance the effectiveness of control strategies on Humboldt Bay NWR lands and will reduce the ecological impacts of invasive species on those lands and the surrounding ecosystems.

4.1.8. Flooding of Highway 101

During heavy rain events Salmon Creek goes out of its bank on a regular basis, both above and below the Highway 101 bridge. Salmon Creek overtops its banks primarily because it has been channelized in its lower portion and over time silt has aggraded in the lower channel of the creek. The elevation of the creek bottom at the Hookton Road bridge is now ~5 feet higher than it was historically due to aggraded sediment. This elevated creek bottom acts as a "dam" in the creek. During large storm events the creek comes out of its channel on the east side of Highway 101 and can flood the east side of the Hookton Road interchange and just to the north where Cattail Creek runs under Highway 101. This occurs less often than flooding of the west Hookton exits and the Humboldt Bay NWR entrance road. This flooding impacts access for many people in the Tompkins Hill and Table Bluff area.

Parts of Phase I of the Salmon Creek restoration should reduce this problem. Two new tidegates installed during summer 2007-08 will improve fish passage, estuarine conditions, sediment, and flood flow transport. Phase II of the project is designed to help remove aggraded material in the lower creek channel and to further improve the objectives of Phase I.

4.1.9. Legal Jurisdiction of Tidelands

Federal ownership and management of "State tidelands" has long been an issue in Humboldt County and affects refuge management in multiple places around the bay. While the county assessors parcel map may show Service ownership, the State Lands Commission has determined that all tide and submerged lands, as well as navigable rivers and sloughs, are impressed with the Common Law Public Trust. The Public Trust is a sovereign public property right held by the State or its delegated trustee for the benefit of all the people in the State. This right limits the uses of these lands to waterborne commerce, navigation, fisheries, open space, recreation, or other recognized Public Trust purposes. Most of the bed of Hookton Slough is located within the lands that the State acquired and patented as Swamp and Overflow lands. Any state interest in the project area has been legislatively granted to the Humboldt Bay Harbor, Recreation, and Conservation District (HBHRCD) pursuant to Chapter 1283, Statutes of 1970, as amended, with minerals reserved to the State. The HBHRCD has indicated that their management boundary extends to "mean higher high water". That is, the CCP and the management documents in the CCP appendix pertain to areas of Hookton Slough and other waterways within the refuge boundary that are above the elevation of mean higher high water (7.06 feet NGVD).

4.1.10. Hunting Regulations on Humboldt Bay NWR

The sport hunting plan for Humboldt Bay NWR used prior to finalizing this CCP is over 17 years old and was due for an update (see Appendix C). There have been relatively large land acquisitions for Humboldt Bay NWR since 1990, including some historically hunted salt marsh islands associated with the Ma-le'l Dunes Unit.

In 2005, portions of the former Buggy Club (private land) were transferred to the Service from the Center for Natural Lands Management (CNLM). The lands had been purchased by the California Coastal Conservancy and donated to CNLM to hold until the Service could complete the National Environmental Policy Act (NEPA) process. These lands were then combined with the southernmost portion of the Lanphere Dunes Unit (also known as the Fernstrom-Root parcel) to create the Ma-le'l Dunes Unit. The Ma-le'l Dunes Unit, along with the BLM's Manila Dunes parcels, now form the Ma-le'l Dunes Cooperative Management Area. Interim compatibility determinations (CD) were done for established authorized priority public uses and boating, but not hunting because it was not a recognized and authorized public use.

The previous draft Public Access Plan included the formal closure of some areas that while not officially authorized had been traditionally hunted. Hunting on those areas was considered incompatible. A previously used (1990–1994) trail along the shoreline was planned to be used again, which would make hunting in close proximity to this location a safety issue.

Because any refuge areas proposed to be newly opened to hunting require NEPA compliance and no other new public uses were proposed to the area, it was decided to address hunting in this area through the CCP process and it was excluded from the final Cooperative Area Management Plan. The Coastal Conservancy and the Service have had multiple discussions with hunters and their representatives and have proposed the following adjustments that would partially accommodate the hunters' position(s):

1. Allow hunting, but no blind construction on the portion of the Fernstrom-Root Island owned by the Service;
2. Allow retrieval only on the island adjacent to the trail, areas of Ma-le'l Island within the Service's jurisdiction;
3. Post educational materials on hunting and avoiding conflict between user groups.

In summary, the Service believes that the adjustments outlined above reflect a viable balance and compromise between priority refuge uses that sometimes conflict.

At the Jacoby Creek Unit, only boat-in access is provided to Jacoby Creek. Visitors accessing Jacoby Creek have illegally parked and camped on Highway 101 and the railroad rights of way, especially during hunting season. Parking, camping and vehicle access at Jacoby Creek Unit is prohibited without a special use permit. The Service recognizes the desire for vehicle access at Jacoby Creek, but due to safety along the rights of way and jurisdictional constraints, it is not allowed at this time.

4.1.11. Sport Fishing Regulations on Humboldt Bay NWR

The sport fishing plan for Humboldt Bay NWR used prior to finalizing this CCP is over 17 years old, and there have been many changes in infrastructure and management of refuges units during that time. Internal scoping motivated the creation of an updated Sport Fishing Plan for Humboldt Bay NWR (see Appendix D).

4.1.12. Non-Wildlife Dependent Visitor Services on Humboldt Bay NWR

Since the emphasis of visitor services for Humboldt Bay NWR is on wildlife-dependent recreation, other uses such as dog walking, horseback riding, bicycling, and jogging/running are currently not allowed, with the exception of the use of bikes on the paved entrance road. Any other proposed uses must be analyzed and found by the refuge to be compatible before they can be allowed. The process of evaluating proposed uses is discussed in Chapter 1 of this CCP under Legal and Policy Guidance.

4.1.13. Traditional Tribal Uses on Humboldt Bay NWR

Increased communication with the Wiyot Tribe, Blue Lake Rancheria, and Bear River Band of Rohnerville Rancheria is very important to the Complex. For reported thousands of years, the lands from Little River south along the coast to Bear River and inland to the first set of mountains were Wiyot territory. This area includes all of the existing units of the Humboldt Bay NWR. The Wiyot hunted wildlife, fished, and gathered plants for food, medicine, and basketry. Many of these uses are still practiced today. The Native American Policy of the Fish and Wildlife Service states that "The Service will provide Native Americans reasonable access to Service managed or controlled lands and waters for exercising ceremonial, medicinal, and traditional activities recognized by the Service and by native American governments. The Service will permit these uses if the activities are consistent with treaties, judicial mandates, or Federal and tribal law and are compatible with the purposes for which the lands are managed" (USFWS 1994).

4.1.14. Mosquito Integrated Pest Management on Humboldt Bay NWR

Mosquitoes are a natural component of wetland ecosystems. Both adult and larval forms are a food source for a variety of wildlife, such as birds, mammals, fish, and other invertebrates. Mosquitoes are also associated with being a nuisance species and vectors of disease-causing microorganisms, such as West Nile Virus (WNV). Five species of mosquitoes are known to inhabit the Humboldt Bay NWR and surrounding areas (*Culex tarsalis, Culesita particeps, Aedes increpitus, Aedes dorsalis,* and *Aedes vexan*). These mosquitoes can breed in and inhabit salt and freshwater marshes, riparian areas, and any objects that retain open water. Adult mosquitoes appear as early as April and persist until late summer, depending on the species. Although adults of individual species are relatively short lived, there are certain years when they experience natural periodic population explosions. In Humboldt County, *Culex tarsalis* transmits WNV, but is not the most numerous species found around the county.

The virus responsible for WNV entered California from the eastern U.S. in 2003 and was first reported in Humboldt County in 2004. WNV is found locally in corvids (crows and ravens), and raptors such as hawks and owls. To date, no human cases of WNV have been reported in Humboldt County. The young, old, and those with compromised immune systems are the most susceptible to being affected by WNV. Not all who contract the disease die from it, but fatalities from WNV have been recorded across the country.

In 2003 the county began implementing the Humboldt County West Nile Virus Monitoring and Response Plan. This program involved public education, media outreach, breeding source abatement, disease surveillance, and identification of mosquito species. Currently the county is not an abatement district, but is set up to become one if voted on by the County Supervisors. The state's Department of Public Health just released Best Management Practices for mosquito control on California State properties, the Service's Draft Mosquito Abatement Policy and Humboldt County's Mosquito Abatement Policy have similar methods and approach this issue in similar ways. The key to maintaining seasonal and estuarine wetlands with a minimum of mosquito production is to avoid conditions where pockets of water become isolated. If wetlands are connected to larger water bodies then most mosquito larvae are consumed by predators. Appendix F includes a compatibility determination for Mosquito Control for Humboldt Bay NWR.

4.1.15. Management of Older Buildings on Humboldt Bay NWR

The Humboldt Bay NWR has several old buildings on site. All are located on the Salmon Creek and Lanphere Dunes units. Disposal through sale, donation, recycling, demolition, or a combination thereof is currently the desired goal for the old Complex quarters/office, and at least the south part of the large barn, and possibly the quarters at Lanphere Dunes.

The refuge is planning to restore and maintain the old hunting cabin and much of the large barn if they pass a safety review. Both of these buildings have historic value locally and could add greatly to the refuge's connection with the local public.

4.1.16. Potential Humboldt Bay NWR Acquisitions

The refuge has recently worked with the Service's Region 8 realty staff to complete environmental compliance documentation for several small properties adjacent to the Hookton Slough Unit and one larger property adjacent to the Lanphere Dunes Unit. Other potential acquisitions in the foreseeable future could include several tracts within and/or adjacent to the Lanphere Dunes Unit, tidelands in both North and South Bay, and tracts adjacent to the Salmon Creek Unit. Lands are only acquired from willing sellers. Depending on the preference of each landowner, and according to Service's policy, the USFWS protects lands by acquiring the least amount of "interest" in a property necessary to accomplish refuge goals. This may include technical assistance, cooperative agreements, easements, fee title acquisition, and donations.

4.1.17. Potential Management Options for the Hookton Slough Unit

The Hookton Slough Unit was historically tidally influenced with freshwater contributions coming from Salmon Creek during floods, runoff and perennial springs from Table Bluff. In the 1800s, it was split by a road that led to what was a docking point for sailing ships that were taking crops from the Eel River Valley to other places of commerce. This road still exists and serves as a dam that separates the unit hydrologically, except during the largest flood events. In later years, the rest of the area was diked and managed as short-grass pasture until purchased by the refuge in the 1970s. Livestock was removed shortly after refuge acquisition. During the 1980s and 1990s, the refuge removed two large barns, a small residence, and a

small shack at the slough's edge while at the same time constructing a parking area and trailhead that leads to a 1.5-mile trail with interpretive panels, vault restrooms, and a fishing dock/launch area for non-motorized boats.

During the early-1980s, when the refuge was still being managed from South San Francisco due to budget constraints, the decision was made to repair the outer dike along the edge of Hookton Slough. The dike was rip-rapped and tidegate structures were replaced. In 2002, the two water control structures to the west of the parking lot failed and were replaced. In fall 2006, both the concrete box culvert east of the parking area and the 36-inch water control structure at the terminal end of the slough were modified with side-hinged gates to improve estuarine connection and fish passage. In January 2006, storm-driven tides topped this dike in several places and relatively minor repairs are necessary.

Because of the proximity of the Hookton Slough Unit to Salmon Creek, the potential value of these marshes as off channel rearing habitat for salmonids is very high (compared to the White Slough Unit, for instance). The Hookton Slough Unit also has high potential as tidewater goby habitat and is designated as critical habitat in the recovery plan for this species.

Existing issues/constraints to wetland connection and management options include:

- the aforementioned road,
- two homes along Hookton Road on the east side,
- at least two areas where Hookton Road would be inundated (if dikes were breached for tidal restoration),
- a relative lack of hydrologic, topographic, and ecological information,
- drainage issues of adjacent landowners, and
- potential for mosquito production and impacts.

The area is currently a mixture of fresh and brackish marsh and introduced grasses. The vegetation on Hookton Slough Unit has recently been mapped and there are some unique wetland vegetation associations. Current wildlife use is primarily by small birds, mammals, and invertebrates; however, cattail swamp is a relatively rare wetland type around Humboldt Bay and is used extensively by bitterns, rails, marsh wrens and red-winged blackbirds. Much of the unit (especially the west side) is currently not conducive to use by waterfowl or shorebirds due to vegetation and/or water conditions.

The original 1989 refuge management plan called for separating the Hookton Slough Unit into three management sections. The section east of the parking area would have been managed as freshwater marsh. The west side was to be split by a low contour dike constructed on the west side of an existing drainage ditch. The west side of this was proposed to be managed as more brackish and the middle area would be muted tidal marsh. This management was not implemented due to concerns over the constraints mentioned previously, permitting issues and other priorities. If the above mentioned constraints can be addressed, the options for management would be expanded.

4.1.18. Dioxin and Pentachlorophenol Contamination

Several dioxin and pentachlorophenol contamination sites have been identified by others near Ma-le'l and Lanphere Dunes Units, adjacent to Sierra Pacific Industries Mill; Jacoby Creek Unit, adjacent to the former Bracut Mill location; and Indian Island, not owned by the Service, but within the refuge's approved boundary. Existing contamination of these areas is part of the existing condition that is likely to be present throughout the life of the CCP (15 years). The Service will continue to review and participate in regional planning activities sponsored by Humboldt County and local municipalities, such as the cities of Eureka and Arcata and the HBHRCD, that address water quality in and around Humboldt Bay. An analysis of the effects of dioxins and pentachlorophenol is included in the 2004 National Research Council (NRC) review of a 2003 draft document by the Federal Environmental Protection Agency entitled, Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds (NRC 2004). NRC recommended that EPA augment its reassessment further. Regulation or remediation of effects from dioxin and pentachlorophenol from existing or future contamination by others are not within the jurisdiction of the Service or the scope of this document and therefore are not discussed further.

4.1.19. Habitat Management on Castle Rock NWR

A major concern on Castle Rock NWR is loss of vegetative diversity, structure, and soil erosion. The concern about vegetation is primarily due to potential impacts on burrow-nesting species. Management intervention may be needed to maintain or restore healthy populations of burrow nesting species.

Vegetative changes on Castle Rock NWR occur annually due to grazing and roosting activities by geese and breeding activities by cormorants. Concern about the potential impacts of geese on vegetation and seabird habitat at Castle Rock were first mentioned by Osborne (1972) following the observation of 600 Aleutian Canada Geese on the island in 1970. Visible changes in the island's vegetation and declines in numbers of some breeding seabird species prompted management concern regarding potential negative impacts of the growing population of geese on the island's seabirds and sensitive habitats (Carter et al. 1992, Jaques and Strong 2001). Jaques (2004) conducted a preliminary examination of spatial and temporal relationships between selected breeding seabirds and roosting geese and suggested that night roosting geese are probably not a significant concern for surface nesting seabirds, but may represent an important negative impact on burrow-nesting species such as the tufted puffin. Changes in vegetation and soil erosion due to goose/cormorant use of Castle Rock NWR may be affecting other species including the Leach's storm-petrel and Cassin's auklet. Although eliminating or deterring geese from using Castle Rock has been suggested, the effects of the geese have not yet been adequately documented and there is no currently feasible management option to allow the Service to eliminate or deter geese from Castle Rock without adversely affecting other protected species and their habitat, such as the burrow-nesting seabirds. The first step in addressing these issues is to establish baseline vegetation and erosion monitoring to better determine what, if any, changes are actually occurring due to geese and cormorants.

Mice can be a harmful predator for burrow-nesting seabirds. In addition to native mice, house mice (*Mus musculus*) have been found on Castle Rock NWR and could have ecological impacts if a breeding population exists.

4.1.20. Protection of Castle Rock NWR from Disturbance

Very few human disturbance events have been documented at Castle Rock NWR. However, due to its close proximity to shore and the Del Norte County airport it is vulnerable to disturbance from recreational boaters, low-flying aircraft, and other potential sources. Disturbance to seabird colonies during the breeding season can cause lowered reproductive success, breeding failure, and even colony abandonment.

4.1.21. Educational Outreach Regarding Castle Rock NWR

Educational outreach may help the public to generate voluntary support to reduce disturbance on and around Castle Rock NWR and to promote stewardship of the island resources by the local community.

Educational outreach and interpretation partnerships have been or could be developed with some of the following organizations to improve effectiveness: the U.S. Coast Guard (USCG), the Del Norte County Airport, Del Norte County Planning Department and Department of Parks, Del Norte County School System, kayaking guides/groups, and the sport and commercial fishing industries. The Aleutian Goose Festival held annually in Crescent City provides an excellent opportunity for educational outreach to the local and visiting public.

4.1.22. Seabird Monitoring on Castle Rock NWR

There is a need to establish a consistent seabird monitoring program at Castle Rock NWR to better inform population management for species that use its habitat. Management questions associated with this need include: how to accomplish the necessary monitoring without causing undue disturbance to sensitive island resources; what the monitoring frequency and techniques should be for given species; how can monitoring be funded; what parameters should govern the issuance of special use permits for research and monitoring; and how can Castle Rock NWR make the most of interagency relationships and larger-scale monitoring programs that are already in place.

5. Refuge Complex Goals, Objectives, and Strategies

This chapter presents the refuge goals based on the vision statements described in Chapter 1. The management objectives and strategies to achieve the goal are listed after each goal.

Humboldt Bay NWR Goals, Objectives and Strategies

Goals are descriptive, open-ended, and often broad statements of desired future conditions that convey a purpose, but do not define measurable outcomes. Goals translate refuge purposes into management direction. Each goal is supported by one or more specific, measurable, achievable, results-oriented, time-fixed objectives with specific strategies needed to accomplish the objectives. Objectives are designed to be accomplished within 15 years. Actual implementation may vary as a result of available funding or other resource limitations.

Currently, the Service manages approximately 35 percent of the lands within the approved Humboldt Bay NWR boundary. This CCP presents goals and objectives primarily for those lands that are or will soon be managed by the Service, as well as limited voluntary cooperative land management with adjacent and regional landowners. The restoration objectives identified here are consistent with the restoration goals identified in the 1989 Humboldt Bay NWR Management Plan, described in Chapter 1.

Although invasive plant species are an integral part of managing salt marsh and other habitat types, prevention and control of invasive species are addressed in Goal 3, Objectives 3.1 through 3.3.

Note: Acreages given are approximate.

Goal 1. Conserve, manage, restore, and enhance estuarine and palustrine wetland habitats representative of the Humboldt Bay area to benefit their associated native fish, wildlife, plants, and special status species.

Objective 1.1 - Salmon Creek Delta Restoration:

- Adaptively manage ~60 acres of Salmon Creek overflow and ~50 acres adjacent to the main channel to meet the goals of Phase I of the Salmon Creek Restoration project.
- Within 3 years, meet the goals of Phase II of Salmon Creek Restoration project.
- Within 5 years, connect the new Salmon Creek channel to salmonid rearing habitat (Cattail Creek), and enhance habitat in upper section of Hookton Slough.

Rationale - Salmon Creek Delta Restoration:

The entire Salmon Creek watershed has been significantly impacted by logging in its upper reaches, agricultural development in the lower portion, and road building throughout. All of these activities have cumulatively altered the natural hydrology and topography of the Salmon Creek watershed and the delta in particular. Much habitat diversity has been lost, converted, or simplified due to historic diking, ditching, and removal or lack of recruitment of large woody debris to the system. Logs and rootwads that historically came down the creek and were integral components of the delta and marsh habitat have either been removed or cannot pass through smaller culverts or under low bridges.

Following refuge goals established in the previous management plan, Phase I of the Lower Salmon Creek Delta Salmonid Habitat Enhancement Opportunities Project (PCFWWRA 2003, 2008) has been underway since 2002. The goals of this project are to improve fish passage, fish habitat, and water quality, create additional estuarine habitat, improve sediment transport, and reduce flooding upstream of the refuge. The first phase included replacement of the Lower Salmon Creek tidegate and installation of a second tidegate at the west end of the Salmon Creek overflow. In addition, two smaller tidegates on the Hookton Slough Unit were modified and some excavation work done to connect adjacent ponds to the creek to prevent fish stranding (PCFWWRA 2003).

Phase II of the Salmon Creek Restoration project includes:

- Relocate the reach of Salmon Creek channel within the refuge that currently flows through a linear ditch. A new channel will be constructed in the upper reach of tidal influence, and include a stable channel form, historic habitat complexity and sinuosity, and improved routing of sediment and flood waters.
- Construct off-channel estuarine wetlands and side-channels in upper reach for salmonid rearing habitat and channel maintenance.
- Screen existing high-flow water diversion to eliminate stranding.

Many special status fish species use Salmon Creek during some stages of their lifecycle. Steelhead, Coho, and Chinook salmon are all Federal ESA-listed threatened species, which migrate upstream through Salmon Creek between fall and early spring (HBWAC, RCAA 2005). The tidewater goby, a Federal ESA-listed endangered species, uses the brackish, slower moving portions of the creek (USFWS 2006).

Large woody debris has been shown elsewhere on the west coast to be a key habitat component for salmonids in estuaries, providing them both feeding areas and refuge from predators (Simenstad et al. 2003). Currently, Hookton Slough (and the rest of the Bay) is almost completely lacking in habitat diversity due to diking and no large woody debris. Recent research has increasingly demonstrated the importance of tidal estuaries and low gradient freshwater wetlands in the life history of salmonids (Cornu and Sadro 2002, Wallace pers. comm. 2006).

Increasing natural estuarine function at the lower end of Salmon Creek will help to restore habitat used by protected fish species. Truly functional estuarine habitat around Humboldt Bay is rare. It is a goal of the Complex to restore estuarine habitat to the maximum extent practicable on the Humboldt Bay NWR.

Refuge staff will continue to use the principles of adaptive management to restore natural function, conditions, and processes to the extent practicable on refuge lands without harm to adjacent landowners. This has been the goal since refuge acquisition of these lands in the 1980s.

Strategies - Salmon Creek Delta Restoration:

1.1.1. Continue to adaptively manage during all phases of the Salmon Creek Restoration project (monitor species, including juvenile salmonids and amphibians, and habitat use, changes in channel cross-sections, sediment transport, water quality, etc., and use results to guide future management). Report to CDFG annually the findings of species monitoring.

1.1.2. Continue to develop and implement restoration projects with the staff of the Partners for Fish and Wildlife and Coastal Programs at the Arcata Fish and Wildlife Office. Also coordinate restoration projects with the NOAA Fisheries Service, USACE, and other regulatory agencies.

1.1.3. Implement Phase II of the Salmon Creek Restoration project, including excavation and restoration of 1,500 linear feet of meandering channel and other features as described in PCFWWRA (2003).

1.1.4. Establish a permanent tidal elevation station on Hookton Slough to quantify tidal change over time and assess managed conditions (i.e., how creek level upstream of the dike reflects tidegate parameters).

1.1.5. Work with appropriate bay management partners and permitting agencies to develop and implement a plan to place large woody debris in Hookton Slough to improve habitat diversity for salmonids and goby and reduce predation.

1.1.6. Use excavated material from Phase II for salt marsh restoration and/or dike maintenance.

1.1.7. Install fish screen(s), ladder(s), or other measures acceptable to NOAA Fisheries Service at appropriate locations on the Salmon Creek Unit to allow diversion to seasonal wetlands without adverse effects to salmonids or other listed species.

1.1.8. Seek opportunities to work with upstream private landowners on habitat improvement projects.

1.1.9. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

1.1.10. Develop Habitat Management Plan and Resource Inventory and Monitoring Plan for all refuge units.

1.1.11. Excavate 500 linear feet to connect the new meandering Salmon Creek channel to salmonid rearing habitat (Cattail Creek) and secure large woody debris in the upper section of Hookton Slough to increase habitat, if feasible.

Objective 1.2 - Salt Marsh Habitat:

- Within 15 years, maintain 313 acres of existing salt marsh habitat and remove western dike on Table Bluff Unit.
- If feasible, restore 235 acres (90 acres at the Hookton Slough Unit, 45 acres on White Slough Unit, and 100 acres on Table Bluff Unit) to native salt marsh habitat.

Rationale - Salt Marsh Habitat:

Salt marsh was historically the most widespread wetland type around Humboldt Bay, but only ~10 percent remains, largely due to diking from the late nineteenth to the early twentieth century. The majority of land within the Humboldt Bay NWR boundary was historically tidally influenced, comprising large areas of salt marsh. Most of the lands were diked to prevent tidal water exchange and to promote agricultural practices. Many changes in the topography, hydrology, soils, and plant species composition have taken place since these lands were diked.

Native salt marsh is a threatened habitat type in Humboldt Bay and throughout the United States. Salt marsh contributes invaluable nutrients to the estuarine ecosystem; provides important habitat for fish, invertebrates, many shorebirds, and some other waterbirds; filters out pollutants; and buffers adjacent lands from flood tides and storms. Salt marshes may provide habitat for the endangered tidewater goby; several species of threatened salmonids; and eulachon, a CDFG California Species of Special Concern. Because of extensive diking, the Humboldt Bay estuary has sustained significant losses of salt marsh, primary productivity, and natural hydrology resulting in changes to sedimentation, deposition, currents, habitat for estuarine plant and animal species, and water quality.

Currently, the Humboldt Bay NWR includes 205 acres of salt marsh in North Bay distributed among the Lanphere and Ma-le'l Dunes units adjacent to Mad River Slough (46 acres) and the Jacoby Creek (73 acres) and Eureka Slough (86 acres) units, and a total of 108 acres of salt marsh in South Bay within the Salmon Creek (36 acres), Hookton Slough (26 acres), White Slough (11 acres) and Table Bluff (35 acres) units.

Several units of the refuge may provide some of the few remaining opportunities to regain some of the lost salt marsh around Humboldt Bay, including the Hookton Slough, White Slough, and Table Bluff units, which are all diked former salt marsh. However, there are substantial challenges including subsidence, lack of information on sedimentation rates and locations, invasive plants, and potential sea level rise. Refuge staff will use the principles of adaptive management to restore natural function, conditions, and processes to the extent practicable on refuge lands.

Possibilities for salt marsh restoration range from a managed muted tidal exchange through tidegates to completely natural and unmanaged tidal flow. The Table Bluff Unit mudflat and Teal Island are similar environments in that both were diked former salt marsh that have now had tidal flow re-established but have converted to mudflat due to subsidence. Methods employed for restoration to salt marsh here would necessitate fill being placed on existing mudflat to raise elevations. The Hookton Slough and White Slough units contain diked former salt marsh that is now subsided freshwater or brackish marsh. On these sites there is the possibility of managing for muted tidal exchange in order to avoid the necessity of elevation increases. Alternatively, if appropriate material was available, these sites could also be raised in elevation and subject to full tidal exchange. Potential methods to bring substrate up to the appropriate level include use of excavated or dredged materials, both of which have been used in San Francisco Bay and other coastal locations. Other factors to be considered during restoration planning include: impacts on threatened, endangered, and other species, values and uniqueness of existing habitat types, feasibility, and cost. While each coastal location presents a unique set of challenges, refuge managers can learn from other sites and projects, employ an adaptive approach, and restore estuarine habitats on the refuge to the extent practicable.

Strategies - Salt Marsh Habitat:

1.2.1. Continue to develop and implement restoration projects with the staff of the Partners for Fish and Wildlife and Coastal Programs at the Arcata Fish and Wildlife Office. Also coordinate restoration projects with the NOAA Fisheries Service, USACE and other permitting agencies.

1.2.2. Do maintenance on tidegates and low points of dikes on the White Slough Unit in 2009-2010 in order to preserve the opportunity to have a managed restoration.

1.2.3. Gather existing information and pursue funding to assess existing elevations on refuge units and sedimentation rates and locations in South Bay with respect to salt marsh restoration.

1.2.4. Repair and modify the White Slough tidegate to improve estuarine and brackish marsh conditions on the inside of Salmon Creek dikes.

1.2.5. Collect data needed to model sea level rise for HBNWR using SLAMM (Sea Level Affecting Marsh Management), including sedimentation rates. Update National Wetland Inventory (NWI) maps for HBNWR to be used as basis for SLAMM models. Continue to keep informed of the latest research on sea level rise and other salt marsh restorations, especially in Humboldt Bay, SF Bay, and in the Pacific Northwest, and factor information into restoration plans.

1.2.6. Assess possibilities of using clean dredge spoil or excavated materials to increase tidal elevation prior to restoration (HBHRCD, Caltrans, etc.).

1.2.7. Facilitate research projects related to salt marsh function (efficient restoration techniques, value to wildlife, influence on hydrology, functions).

1.2.8. Adaptively manage restoration of salt marsh habitat and maximize experimental value of all projects using adequate monitoring.

1.2.9. Collect native salt marsh vegetation prior to raising elevations, stockpile and re-plant vegetation after topsoil has been replaced on raised elevation site.

1.2.10. Raise the marsh plain elevation of Salmon Creek overflow by placing a layer of native, appropriate fill soil.

1.2.11. If feasible, use the dike material and additional appropriate fill from local sources on the White Slough Unit to raise the marsh elevation.

1.2.12. Use the dike material on the west side of the Table Bluff Unit to fill in the adjacent borrow ditch.

1.2.13. Use existing contractors and/or work with Humboldt Botanical Garden and Humboldt Fish Action Council to propagate salt marsh species for revegetation in restored salt marsh areas.

1.2.14. Coordinate with the North Coast Railroad Authority to open tidegates on the north end of the White Slough Unit to allow muted tidal action.

1.2.15. If feasible, import local topsoil layer or dredge spoil as fill to increase the elevation on the Table Bluff Unit to restore native salt marsh.

1.2.16. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

1.2.17. Develop Habitat Management Plan and Resource Inventory and Monitoring Plan for all refuge units.

1.2.18. Work with HBHRCD, California State Lands Commission, and DOI Solicitor's Office to pursue a lease or other written agreement for the management of tidelands (including salt marsh, mudflats, and open water) consistent with wildlife habitat restoration on lands within the USFWS's jurisdiction.

Objective 1.3 - Freshwater and Brackish Marsh (FBM):

- Within 15 years at the Salmon Creek Unit (SCU) (not including Salmon Creek restoration area), maintain 630 acres of seasonal FBM, maintain 270 acres of short-grass pasture, and of the 270 acres restore 100 acres to improve short-grass pasture for Aleutian cackling geese and other species. At the Hookton Slough Unit maintain 150 acres of FBM, within 2 years at the White Slough Unit repair perimeter dike and maintain 50 acres of FBM, at the Table Bluff Unit maintain 25 acres of FBM and restore 13 acres of non-native pasture grasses and weedy species to FBM.
- At the White Slough Unit maintain 7 acres of FBM.

Rationale - Freshwater and Brackish Marsh:

Freshwater and brackish marsh are relatively rare and extremely valuable habitat types for a large variety of birds, and contribute to the abundance and diversity of wildlife found at the refuge. These two habitat types help sustain a variety of waterfowl, shorebirds, passerines, and waterbirds, as well as the raptors that prey upon them and other animals. In addition, otters, weasels, frogs, salamanders, and invertebrates use these habitats. Sloughs lined by brackish marsh are used by threatened salmonids and endangered tidewater gobies. Historically, there would have been a natural continuum or gradient of wetland habitats based on the salinity of the water from the bay's eelgrass and mudflats to salt marsh, brackish marsh, freshwater marsh, swamp, and riparian zones as the habitats progressed upstream. To the extent practicable on refuge lands, refuge staff will use the principles of adaptive management to restore these natural functions, conditions, and processes to refuge lands.

On the Hookton Slough Unit, restoring freshwater and brackish marshes at the east and west ends of the unit will allow for fish passage and increase rearing habitat for species such as threatened

salmonids, listed endangered tidewater goby, and other associated species.

On the White Slough Unit, maintaining brackish marsh, enhancing and restoring freshwater riparian/swamp habitat, and restoring a continuum of freshwater to brackish to salt marsh in the northwestern portion of the unit will optimize estuarine conditions.

A unique situation has developed regarding the management of Aleutian cackling geese. Aleutian cackling geese are a recovered (previously endangered) species. The geese use short-grass habitat around Humboldt Bay during the winter and spring. Currently, the geese have reached a population level (100,000+) where they are having depredation impacts on ranchers and farmers from the Eel River in northern California to the New River in southwestern Oregon. Enhancing grasslands on the Humboldt Bay NWR for Aleutian cackling goose forage can help reduce goose grazing pressure on adjacent agricultural lands and provide valuable short-grass habitat for many species of wildlife. Short-grass habitat also supports other wildlife such as invertebrates, some amphibians, small mammals, and migratory birds, including many species of shorebirds. Studies done on both the refuge and local ranches show that these geese prefer feeding on annual and perennial rye grasses, white clover, and berseem clover (USFWS unpubl. report).

Strategies - Freshwater and Brackish Marsh:

1.3.1. Continue to develop and implement restoration projects with the staff of the Partners for Fish and Wildlife Program and the Coastal Program at the Arcata Fish and Wildlife Office. Also develop and coordinate restoration projects with the NOAA Fisheries Service, USACE, and other permitting agencies.

1.3.2. Continue to work with Aleutian Goose Working Group on goose depredation and management issues.

1.3.3. Develop detailed designs to facilitate permitting on all South Bay Units restoration work.

1.3.4. Implement Phase II of the Lower Salmon Creek Restoration Plan.

1.3.5. Implement best management practices to minimize mosquito breeding habitat on all units.

1.3.6. Continue to use a cooperative land management agreement (CLMA) with local ranchers to manage short-grass pasture through a combination of grazing and haying.

1.3.7. Continue to update soil testing approximately every five years, and add lime when necessary to raise soil pH.

1.3.8. Continue seasonally appropriate mowing to maintain short-grass pasture and control thistle.

1.3.9. Assess implementation of Aleutian cackling goose study recommendations for management of short-grass pasture.

1.3.10. Use seasonally appropriate mowing to encourage growth of short-grass species favorable to Aleutian cackling geese on the Salmon Creek Unit and Hookton Slough Unit.

1.3.11. Study long term effects of disking and water management on wetland vegetation.

1.3.12. Enhance drainage (by cleaning ditches and maintaining water control structures) to create conditions more favorable to short-grass species and less favorable to salt grass and other non-target species such as drier and less saline tolerant species on the Salmon Creek Unit and Hookton Slough Unit.

1.3.13. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

1.3.14. Maintain and enhance existing native grass populations, including *Deschampsia caespitosa* and *Leymus triticoides,* through seeding and other cultivation activities on the Hookton Slough Unit.

1.3.15. On the Hookton Slough Unit, use existing and/or new water control structures to allow for muted tidal exchange and fish passage in eastern and western areas without loss of freshwater and brackish marsh.

1.3.16. On the White Slough Unit, work with Caltrans to dechannelize Chism Creek so that it enters the west White Slough Unit area to maximize freshwater/salt marsh continuum.

1.3.17. Develop wetlands around Headquarters Unit and adjacent to Long Pond on the Salmon Creek Unit.

1.3.18. On the Salmon Creek Unit (near the duck ponds), install a low contour dike to impound water, or for a more stable wetland habitat excavate and use excavated materials for a contour dike.

1.3.19. On the Hookton Slough Unit, develop and implement a hydrologic model and restoration plan that allows for at least partial tidal restoration in the central area (see Salt Marsh alternatives), with muted tidal influence to eastern and western areas such that native freshwater to brackish vegetation is preserved while allowing for fish passage, salmonid rearing, and tidewater goby habitat.

1.3.20. Construct a 1/4 mile low contour dike along Hookton Road to allow muted tidal flooding on the Hookton Slough Unit.

1.3.21. Develop Habitat Management Plan and Resource Inventory and Monitoring Plan for all refuge units.

Objective 1.4 - Riparian Swamp Habitat:

- Within 15 years, manage 35 acres of existing riparian/swamp habitat, plant native riparian/swamp vegetation in agricultural wetlands, and within 5 years replace 20 acres non-native tree community (including eucalyptus, Monterey pine, and Monterey cypress) on Salmon Creek Unit with native riparian vegetation. Species that may benefit from riparian swamp habitat restoration include the bank swallow (a California ESA-listed as threatened bird) and Vaux's swift (a California bird species of special concern).

- Restore approximately 3 acres of riparian habitat on the White Slough Unit.

Rationale - Riparian Swamp Habitat:

Riparian habitat is very rare now compared to what existed historically in the Humboldt Bay area. This diverse plant community provides valuable travel corridors for wildlife and habitat supporting biological integrity and environmental health on the refuge. Riparian forests provide rich habitat for a wide variety of plant species, mammals, reptiles, amphibians, and especially migrating and nesting songbirds, and improve conditions for fish by contributing nutrients, shade, and cover to streams. Riparian/swamp plant communities in the region are largely composed of red alder, willows, Sitka spruce, salmonberry, twinberry, California blackberry, wax myrtle, ladyfern, woodfern, sword fern, small-fruited bulrush, skunk cabbage, and associated species in wetter areas. Since refuge acquisition in the late 1980s, much effort has been put into development of riparian habitat. However, much of the restored riparian habitat on the refuge lacks a complex understory and has limited species diversity. Although some wildlife, such as raptors, birds, and mammals use the existing stands of non-native eucalyptus trees for resting and in some limited cases foraging and breeding, blue gum eucalyptus is recognized to be largely detrimental to wildlife. Although blue gum are used by some birds, the diversity and number of birds and other wildlife that uses native riparian habitat is far greater. Gradual removal of the eucalyptus trees and replacement with native vegetation such as Sitka spruce, alders, willows and the appropriate native understory plants will improve riparian swamp habitat value and increase species diversity.

Strategies - Riparian Swamp Habitat:

1.4.1. Continue selective removal of non-native trees as resources allow.

1.4.2. Use a combination of IPM techniques to control non-native tree communities.

1.4.3. Enhance riparian/swamp habitat by planting native understory plants, and provide deer protection until establishment.

1.4.5. If feasible, implement cooperative agreements with interested parties to remove non-native eucalyptus trees over a 5-year period. See also strategy 3.2.6.

1.4.6. Continue to partner with local habitat restoration groups and volunteers (California Trout, Fortuna Creeks, CCC, Master Gardeners, FHBNWR, College of the Redwoods, Humboldt State University, Humboldt Fish Action Council and Botanical Garden Foundation to complete riparian restoration projects.

1.4.7. Use local native plant genotypes for restoration.

1.4.8. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

1.4.9. If the railroad authority declines to open tidegates on the White Slough Unit, assess possibility of restoring northern 16 acres to riparian habitat.

Objective 1.5 - Eelgrass and Mudflat Habitat:

- Over 15 years, participate in ongoing partnerships and create new partnerships to conserve and manage mudflat/eelgrass habitat for long term health.

Rationale - Eelgrass and Mudflat Habitat:

Maintaining healthy eelgrass beds is essential to the health and productivity of Humboldt Bay fish and wildlife. Eelgrass is a key component of the lifecycle of many bay species. Among waterfowl, the Pacific Flyway population of brant is dependent upon eelgrass throughout the Flyway. Humboldt Bay is a critical spring staging area for brant because it has the greatest amount of eelgrass between their wintering areas in Baja California and Willapa Bay in Washington, their next most important stop after Humboldt Bay during spring migration.

Currently, refuge staff coordinates with researchers monitoring eelgrass beds in Humboldt Bay. Monitoring eelgrass beds is important because many human land use activities can impact the survival and health of eelgrass communities. In addition, non-native dwarf eelgrass (*Zostera japonica*) has been introduced to Humboldt Bay and the Eel River estuary. Detecting and controlling new or previously unidentified infestations of dwarf eelgrass will be an important part of maintaining healthy native eelgrass beds.

Some restoration activities have the potential to affect eelgrass beds. To help ensure that restoration activities are not adversely affecting eelgrass beds, the refuge will pursue new partnerships to assist in monitoring and management of eelgrass beds in south Humboldt Bay. Some examples of how restoration activities may effect eelgrass beds include (Thayer et al. 2005):

- siltation can entirely smother plants or increase turbidity, lowering available radiation for photosynthesis
- high levels of nutrients in run-off can cause increases in algal growth and subsequent eutrophication detrimental to eelgrass
- mechanical damage to eelgrass can result from fishing, anchoring, and dredging
- oil spills can cause direct mortality of plants

Transplanting eelgrass rhizomes with shoots can be a successful way to restore eelgrass beds if the habitat requirements of eelgrass are met (Thayer et al. 2005). Perhaps the greatest threat to eelgrass in the longer term is sea level rise, and for this both local and regional monitoring will be needed.

Strategies - Eelgrass and Mudflat Habitat:

1.5.1. Work with partners including HBHRCD to monitor potential impacts of Salmon Creek restoration projects on eelgrass beds.

1.5.2. Continue partnership with the Humboldt Bay Ecosystem Program (HBEP) for studying the bay ecosystem, including mudflat/eelgrass habitat, and continue collaboration with Humboldt State University and USFWS/USGS to study eelgrass/brant/sea level rise interrelationships.

1.5.3. Continue partnership with CDFG, University of California Sea Grant, and Humboldt Bay Harbor, Recreation, and Conservation District (HBHRCD) for continued monitoring of and research on invasive species that may impact eelgrass.

1.5.4. Pursue additional funding for research on the ecology and conservation of eelgrass, including effects of sea level rise, through the PCJV and the Service's coastal program.

1.5.5. Pursue an MOU with the HBHRCD and CDFG, which have special regulatory and legal jurisdiction over the bay, to conserve inter-tidal areas within the approved refuge boundary.

1.5.6. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

1.5.7. Work with HBHRCD, California State Lands Commission, and DOI Solicitor's Office to pursue a lease or other written agreement for the management of tidelands (including salt marsh, mudflats, and open water) consistent with wildlife habitat restoration on lands within the USFWS's jurisdiction.

Objective 1.6. - Floodplain Management:

- Manage Humboldt Bay NWR floodplain lands in a manner consistent with local, State, and Federal flood management, sediment, and erosion control and water quality objectives as required by local, State, and Federal guidelines, and within 10 years work toward achieving the North Coast Basin Plan objectives for inland surface waters, enclosed bays, and estuaries for the benefit of fish and wildlife resources.

Rationale - Floodplain Management:

Refuge restoration and management will be consistent with Federal, State, and local flood guidelines. Compliance with guidelines can largely be achieved by operating the Humboldt Bay NWR consistent with the North Coast Regional Water Quality Control Board (NCRWQCB) Basin Plan. Water quality control basin plans provide a basis for protecting water quality throughout California

(NCRWQCB 2007). The goal of the Basin Plan is to provide a definitive program of actions designed to preserve and enhance water quality and to protect beneficial uses of water in the North Coast Region.

A water quality monitoring program can be used to further education and outreach efforts with local landowners and agricultural landowners. Current threats to the water quality of the refuge and bay include bacterial quality concerns, and to a lesser extent include sediment, nutrients, bacteria and pesticides from agricultural runoff; impacts from forestry activities; urban runoff; and spill sites around the bay (NCRWQCB 2007).

Strategies - Floodplain Management:

1.6.1. Implement Humboldt Bay NWR habitat improvement projects and strategies in a manner that does not exacerbate local or regional flooding, water quality, or erosion effects on adjacent or nearby landowners or residents.

1.6.2. Within 10 years, work to achieve the relevant water quality objectives as described in Section 3 of the North Coast Basin Plan (as described in NCRWQCB 2007).

1.6.3. Review and participate in regional planning activities sponsored by Humboldt County and local municipalities, such as the cities of Eureka and Arcata, which may affect flooding regimes or water quality in and around Humboldt Bay.

1.6.4. Work with the appropriate entities, such as California Department of Public Health, to develop a long-term water quality monitoring program to assess the effects of non-point sources of pollution entering the Humboldt Bay NWR and contaminant levels in fish and other biota (especially in Mad River Slough, above the oyster rafts).

1.6.5. Work with the appropriate entities to develop a long-term water quality monitoring program to assess the impact of sediment flushing from Salmon Creek on eelgrass beds in southern Humboldt Bay and potential non-point source pollutants adjacent to Mad River Slough.

1.6.6. Work with partners to develop strategies to inform people within the watershed about non-point sources of pollution and the benefits of reduced pollutants entering Humboldt Bay.

1.6.7. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

1.6.8. Work with HBHRCD, California State Lands Commission, and DOI Solicitor's Office to pursue a lease or other written agreement for the management of tidelands (including salt marsh, mudflats, and open water) consistent with wildlife habitat restoration on lands within the USFWS's jurisdiction.

Goal 2. Conserve and restore globally rare dune and dune forest habitats, associated native plant and animal species, and support recovery of threatened, endangered, and endemic species dependent upon these rare habitats.

Objective 2.1 - Dune Mat/Foredune Grassland:

- Within 5 years, restore the Ma-le'l Dunes and Table Bluff units dune mat/foredune grassland habitat.
- Over 15 years, create ongoing experimental dune blow-outs in late successional, low diversity dune mat (to mimic natural disturbances), and assess impacts on existing habitat and special status plants on the Lanphere Dunes Unit.

Rationale - Dune Mat/Foredune Grassland:

Dune mat habitat on the Humboldt Bay NWR is some of the most pristine habitat of its type on the west coast of the United States, containing native plant communities that are globally declining (Pickart and Barbour 2007). Humboldt Bay wallflower and beach layia are listed as endangered species under the Federal ESA. California Native Plant Society 1B list plants (rare or endangered in California and elsewhere) in the dune mat/foredune grassland plant community include dark-eyed gilia and pink sand verbena. Due to the isolation of dune habitats, many rare species occur there, and many potentially endemic or rare species may not have yet been scientifically documented. Under-studied species of globally endangered lichens, endemic insect populations, and endemic mycorrhizal fungi exist in unknown quantities in this rare habitat type. Foredune plant communities are globally rare, and the Lanphere Dunes represent some of the most pristine dunes left on the west coast of the United States.

Due to a combination of natural succession and possibly some human-induced impacts, early successional vegetation found at the Lanphere and Ma-le'l Dunes Units is succeeding to more stable, less diverse communities in many areas. It is likely that dune mat and foredune grasslands evolved with dune blow-outs (rapid shifts in tall dunes) as a factor in their constant regeneration (Pickart and

Barbour 2007). The refuge proposes to experiment with the use of heavy equipment to mimic large scale disturbances such as blow-outs to stimulate localized sand movement to sustain early successional communities. By creating blow-outs and monitoring the effects on plant communities, the refuge will increase the understanding of the best methods to manage these communities over time.

Strategies - Dune Mat/Foredune Grassland:

2.1.1. Continue to work with the Humboldt County Dunes Cooperative to contribute to managing Humboldt County dunes as an ecosystem.

2.1.2. Conduct experiments with heavy equipment to create and monitor blowouts in strategic areas where foredunes are stable and species diversity is declining.

2.1.3. Repeat vegetation sampling done in 1987 to quantify dunemat/foredune grassland succession rate and impacts to Humboldt Bay wallflower.

2.1.4. Conduct research on interactions between endemic solitary bees and biotic soil crusts (cryptogamic crusts).

2.1.5. Conduct Humboldt Bay wallflower population viability assessment (PVA) using existing demographic data set for Lanphere Dunes.

2.1.6. Develop a cooperative agreement with adjacent private landowners to collect native dune grass propagules, and plant out to increase population of *Leymus mollis* at Lanphere and Ma-le'l units.

2.1.7. Develop a Habitat Management Plan and Resource Inventory and Monitoring Plan for all refuge units.

2.1.8. Inventory wildlife species, including invertebrates, in dune mat/foredune grassland habitats.

2.1.9. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

2.1.10. Continue to conduct metapopulation sampling of Humboldt Bay wallflower North Spit populations. Expand to include South Spit and Elk River spit populations. Track population size, reproductive rate, size class distribution, and disease incidence by geographic areas on a 9- or 10-year interval.

2.1.11. Develop partnerships to conduct habitat restoration, caging of reproductive plants to protect from deer, and to collect Humboldt Bay wallflower seed from South Spit, with the goal of increasing this subpopulation size. Reintroduce seeds from this subpopulation to restored habitat on Table Bluff Unit.

2.1.12. Disperse seeds of Humboldt Bay wallflower from Lanphere Dunes and Ma-le'l dunes subpopulations to unoccupied, restored habitat on Ma-le'l dunes and monitor results.

2.1.13. Continue annual monitoring of *Layia carnosa* on northern dune units. Map and begin monitoring of Table Bluff Unit subpopulations.

Objective 2.2 - Dune Swale:

- Within 10 years, restore ~67 acres of dune swale plant communities on all dune units. Species that may benefit from dune swale habitat restoration include northern red-legged frog (a California species of special concern), black-capped chickadee, yellow warbler, and Cooper's hawk and a variety of mammals.

Rationale - Dune Swale:

Dune swales are a relatively rare vegetation type, occurring strictly in dune systems and primarily north of the central coast of California. Swales provide valuable habitat for several species of reptiles and amphibians, including the northern red-legged frog, a California Species of Special Concern (SSC). Several bird SSC also use dune swale habitat, including black-capped chickadee, yellow warbler, and Cooper's hawk. Many mammal species use this habitat for foraging and cover, as well as for breeding by small mammals. As with other rare dune habitats, pristine dune swales are rare on the west coast of the United States, occurring only north of the central coast in California (Pickart and Barbour 2007). Compared with the coniferous forests and dune mat, swales have received relatively little management attention. Quantitative descriptions of these plant communities are needed, especially given potential changes induced by climate change.

Given the rarity of dune swale habitat and its value to wildlife, removal of invasive plant species and restoration of native plant species is necessary for the maintenance of the biological integrity, diversity, and environmental health of the dune ecosystem as well as to protect many California Species of Special Concern.

Strategies - Dune Swale:

2.2.1. Continue to work with the Humboldt County Dunes Cooperative to contribute to managing Humboldt County dunes as an ecosystem.

2.2.2. Assess need for and revegetate with appropriate native local plants after invasive plants are removed.

2.2.3. Pursue funding to complete restoration.

2.2.4. Develop a Habitat Management Plan and Resource Inventory and Monitoring Plan for all refuge units.

2.2.5. Inventory wildlife species, including invertebrates, in dune swale habitats.

2.2.6. Inventory nonvascular plants, and quantitatively sample and describe dune swale plant communities.

2.2.7. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

Objective 2.3 - Dune riparian/swamp:

- Within 5 years, restore ~33 acres of riparian/swamp habitat on the Ma-le'l and Lanphere Dunes units, and gain a more comprehensive understanding of plant and animal species that inhabit the riparian/swamp habitat on the Ma-le'l and Lanphere Dunes units. Species that may benefit from dune riparian/swamp habitat restoration include the northern red-legged frog (a California species of special concern), many species of migratory birds, several bird species of special concern, including Vaux's swift, willow flycatcher, yellow-breasted chat, and the bank swallow, a California ESA-listed as threatened bird.

Rationale - Dune Riparian/Swamp:

Dune riparian swamp habitat provides valuable habitat for several species of reptiles and amphibians, including the northern red-legged frog, a California Species of Special Concern. Many species of migratory birds use dune riparian/swamp habitat, as do several SSC bird species including Vaux's swift, willow flycatcher, yellow-breasted chat, and a California ESA listed threatened bird, the bank swallow. The SSC yellow warbler nests in this habitat type. Many mammals also make use of dune riparian/swamp habitat for foraging, cover, and breeding. Maintaining and restoring this habitat will contribute to the biological integrity, diversity, and environmental health of this rare dune habitat type.

Currently there are no complete inventories of nonvascular plants and wildlife species, including invertebrates, that are resident or migratory inhabitants of riparian/swamp habitats on the dune units. Although plant inventories have been completed, there has been no quantitative description of the vegetation of these habitats. While riparian swamps are known to be rich habitats for wildlife, the lack of adequate information on wildlife use of dune riparian and swamp habitat makes it difficult to prioritize management of this habitat when compared with other management needs of the refuge. Gaining a comprehensive understanding of vegetation, nonvascular flora, and animal species utilizing dune riparian and swamp habitat would yield information that may provide guidance to the management of these habitats for higher priority species conservation. Once comprehensive species information is obtained, managers would have a basis upon which to implement various strategies to enhance dune riparian and swamp habitats that would be more likely to benefit conservation of high priority species, and a reasonable basis for expending limited resources.

Strategies - Dune Riparian/Swamp:

2.3.1. Continue to work with the Humboldt County Dunes Cooperative to contribute to managing Humboldt County dunes as an ecosystem.

2.3.2. Develop a Habitat Management Plan and Resource Inventory and Monitoring Plan for all refuge units.

2.3.3. Inventory wildlife species, including invertebrates, in dune riparian/swamp habitat.

2.3.4. Work with Humboldt Bay Bird Observatory, the Humboldt State University wildlife department, and other partners to develop avian research objectives.

2.3.5. Continue collaborative research on neo-tropical migrant birds by Humboldt State University, Humboldt Bay Bird Observatory, or other partners.

2.3.6. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

2.3.7. Inventory nonvascular flora, and quantitatively sample and describe vegetation communities of riparian/swamp habitats.

2.3.8. To enhance dune riparian/swamp habitat, plant native dune riparian/swamp species where invasive plants were removed or gaps in native vegetation exist and are vulnerable to re-infestation by invasives, as appropriate.

Objective 2.4 - Coniferous Dune Forest:

- Over 10 years, maintain and restore 180 acres of coniferous dune forest habitat on the Ma-le'l and Lanphere Dunes units; within 10 years, gain a more comprehensive understanding of animal species that inhabit the coniferous dune forest habitat on the Ma-le'l and Lanphere Dunes units.

Rationale - Coniferous Dune Forest:

Coniferous dune forest is a globally declining habitat type. It includes a number of different plant associations, some of which are restricted in distribution or at the edge of their geographic ranges. Coniferous forest supports many of Humboldt Bay NWR's mammal species, including the rare white-footed vole, a CDFG California Species of Special Concern (CDFG 2007). Several CDFG California Bird Species of Special Concern also use coniferous dune forest habitat including Cooper's hawk, yellow warbler, osprey, and black-capped chickadee. Coniferous dune forest provides habitat for several species of amphibians and reptiles. Many specialized (including mycoheterotrophic) plant species, such as sugar stick (*Allotropa virgata*), spotted coral-root (*Corallorhiza maculata*), calypso orchid (*Calypso bulbosa*), and twayblade (*Listera cordata*), are uncommon close to the coast, and have been found only in a few locations in the coniferous dune forest habitat. Maintaining and restoring healthy native plant communities in the coniferous dune forest contributes greatly to the overall biological integrity, diversity, and environmental health of the refuge and surrounding area.

The coniferous forest at the refuge was subject to a large windfall event during the storm of New Years eve, 2005. Although wind is recognized as the structuring agent of these forests, the large losses of trees may be ecologically significant given the fragmented state of the forest. Research is needed to evaluate the effects of this event, particularly given the likelihood of increased extreme weather events with climate change.

While some information is available, currently there are large gaps in survey information of nonvascular plants and wildlife species that are resident or migratory inhabitants of coniferous dune forest habitats on the dune units, and this limits the ability to effectively manage this habitat. Restoring coniferous dune forest margins at the Ma-le'l Dunes Unit, now dominated by European beachgrass, to native coniferous forest communities will enhance habitat for many special status species. There is currently a discontinuity in forest habitat at this location. Restoring forest species will provide a corridor for movement of wildlife species and prevent the continued expansion of European beachgrass.

Strategies- Coniferous Dune Forest:

2.4.1. Continue to work with the Humboldt County Dunes Cooperative to facilitate coordinated, ecosystem management of dune forests.

2.4.2. In 5 years, inventory, remove, and restore non-designated human trails throughout the forest by planting with native coniferous dune forest species, as appropriate.

2.4.3. Develop a Habitat Management Plan and Resource Inventory and Monitoring Plan for all refuge units.

2.4.4. Pursue funding for research on coniferous dune forest ecology, including 2005 windstorm/tree fall event, and initiate longterm monitoring in forest gaps resulting from this event.

2.4.5. Pursue grant funding and research on neo-tropical migrant birds by Humboldt Bay Bird Observatory, Humboldt State University, or other partners.

2.4.6. Repeat endangered (e.g., internationally endangered *Bryoria* spp.) lichen survey and consider management; tie research into 2005 windstorm/tree fall event.

2.4.7. Inventory wildlife species, including invertebrates, in dune forest habits.

2.4.8. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

2.4.9. Grow or identify local appropriate sources for restoration plant materials.

2.4.10. Pursue grant funding to restore European beachgrass stands to coniferous forest at the Ma-le'l Dunes Unit.

Goal 3. Conserve and restore all refuge habitats through the prevention and control of invasive plants and animals.

Objective 3.1. Prevention and early detection:

- Over the next 5 years, develop and implement a Hazard Analysis and Critical Control Point (HACCP) Plan for the refuge.
- Within 10 years, develop and enhance the refuge's capacity to identify, report and effectively respond to newly discovered, localized invasive species.
- Over the next 15 years, increase organizational collaboration on invasive species issues with Federal, State, and local entities, tribes, private organizations and individuals.

Rationale - Prevention and early detection:

An invasive species is a non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health (E.O. 13112, 3 February 1999). Invasive species are widely considered to be the greatest threat to natural areas after habitat loss. They negatively affect up to 46 percent of endangered species. The USFWS's Biological Integrity Policy (601 FW 3) specifies that the Refuge System manage non-native invasive species by the use of integrated pest management strategies, which can include mechanical, chemical, biological, and cultural techniques.

Early detection and prevention are the most ecological and economical methods of invasive species control. Humboldt Bay has a regional fishing industry and commercial shipping. These boats and ships are potential carriers of invasive species. Preventive measures (similar to those used in Alaska, Hawaii, Australia) to invasive species importations would not only support the Refuge System's mission, but would support the protection of the Bay's biodiversity during the upcoming challenges that will be faced by land management agencies with global climate change. The refuge promotes preventive measures for the current and future threats to the integrity of biological diversity and natural ecosystem integrity in this region and nationally.

Invasive species infestations are not limited by ownership boundaries. Identifying the threat of an invasive species at an ecosystem level improves the ecological and economic effectiveness of the control methods. The Humboldt Bay NWR is committed to cooperatively work with adjacent landowners and the Humboldt-Del Norte Weed Management Area to control the spread and adverse effects of invasive species. This cooperation will enhance the effectiveness of control strategies on Humboldt Bay NWR lands and will reduce the ecological impacts of invasive species on those lands and the surrounding ecosystems.

The Humboldt Bay NWR has been highly altered through human manipulation and invasive species, which are widespread within the refuge's units. However, many of these species are in an incipient stage of infestation, occurring only in a few small areas. Control at this early stage of infestation is most efficient and effective. The dune units of the refuge have received extensive management for the control and eradication of invasive species beginning in the 1970s. Ongoing maintenance efforts are needed to prevent new infestations from occurring, and to locate and eradicate missed occurrences. This minimal effort protects the financial investment as well as the ecological values of these highly diverse natural systems.

In this section, the scientific names are used in cases where the use of the common name alone would not provide sufficient information to identify the plant species being discussed. Scientific names are shown in italicized text. All species presently on the refuge are included in the plant list in Appendix J.

Strategies - Prevention and early detection:

3.1.1. Develop a Hazard Analysis and Critical Control Point (HACCP) Plan for the refuge to prevent establishment of new invasive species on the refuge.

3.1.2. Continue to develop the Volunteer Invasives Mapping and Control Program at south refuge units and seek Service funding of $16,000 per year for volunteer and Friends groups' invasive plant control programs.

3.1.3. Continue coordination and collaboration on control projects with existing partners (e.g., FOD, Friends of HBNWR, Fortuna Creeks Project, CCCs, CDF, etc.).

3.1.4. Participate in the local weed management area coordination meetings.

3.1.5. Recruit local high school students to support the volunteer mapping program.

3.1.6. Develop a volunteer early detection rapid response crew that can quickly remove incipient invasive species populations at all units.

3.1.7. Provide outreach and information to adjacent landowners, cooperators and the public informing them of the complete costs of invasive plants.

3.1.8. Eradicate/control invasive species in south refuge units identified in Volunteer Invasive Species Mapping Program as early detection species: *Phalaris arundinacea*, *Phalaris aquatica*, *Echinochloa crus-galli*, *Cortaderia jubata*, *Cirsium arvense* and *Calystegia silvatica*.

3.1.9. Work with partners, including the Humboldt Bay Harbor Recreation and Conservation District, the Humboldt Bay Ecosystem Program and Humboldt County Weed Management Area to develop and fund a multi-species monitoring program for Humboldt, Eel River and Mad River estuaries to detect new infestations of high priority intertidal and sub tidal species such as dwarf eelgrass (*Zostera japonica*).

3.1.10. Continue ongoing survey, monitoring and treatment of new occurrences of previously eradicated species including English ivy and other forest invasive plants.

3.1.11. Continue the annual European beachgrass (*Ammophila*) Sweep at dunes units and expand to detect new infestations of other high priority previously eradicated species including *Cortaderia jubata* and *Cirsium vulgare*.

3.1.12. Work with partners including Friends of the Dunes to complete eradication of *Coincya monensis*, a highly invasive mustard known to only one area (in Manila) west of Mississippi and *Senecio elegans*, known in Northern California only in the Manila area.

3.1.13. Work with partners including Redwood National and State Parks to eradicate the highly invasive purple loosestrife on the South Fork Eel River to prevent infestation of Eel River estuary and Humboldt Bay wetlands.

3.1.14. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

3.1.15. Coordinate with adjacent landowners and proactively work with partners and pursue grant funding to control the spread of invasive plants onto Humboldt Bay NWR units.

3.1.16. To protect the northern red-legged frog (California species of special concern) and other native species, create a monitoring program that will detect the presence of non-native bullfrog within the Humboldt Bay NWR and control or abate its adverse effects on native species.

Objective 3.2. Control and reduce the spread of established invasive species populations in refuge habitats

- Within 15 years, monitor and strategically remove, control, or eradicate invasive plant infestations.
- Within 5 years, expand the existing the volunteer program for invasive plant control to achieve maintenance level control of high priority target invasive plant species.
- Within 10 years, use an additional contract based control program to achieve maintenance level control of all targeted invasive plants.

Rationale - Management of established invasive species:

As discussed under Objective 3.1, invasive species are among the most pressing threats to natural areas, their biodiversity, ecosystem function, and endangered species. Invasive plants directly displace native plants through competition, resulting in a loss of species diversity and creating artificially homogeneous communities. They also indirectly impact native plants by altering soils and biophysical processes, facilitating secondary invasive species, and altering the balance of plant-invertebrate, plant-microbe, and plant-fungal interactions including pollination, herbivory, and mutualism, and increasing susceptibility to pathogens. Invasive plants impact wildlife by providing inferior forage for mammals, eliminating the food base for species-specific invertebrate herbivores, and by negatively changing habitat structure. Invasive species affect ecosystem processes such as mineral, nitrogen, and carbon cycling, and hydrology. Invasive species are not generally confined to the refuge; rather, they spread to and from private and other public lands and cause the same impacts there. This presents the dual problems of protecting the refuge from adjacent impacts and protecting refuge neighbors from dispersal of invasives already on the refuge.

Partnerships and volunteer programs can be a valuable way to increase the refuge's ability to remove invasive plant species. Both types of programs offer important outreach opportunities. However, volunteer time is limited and may only allow for maintenance level control of the highest priority invasive plants. Staff oversight of an expanded volunteer invasive plant control program would either require additional staff time or would draw limited staff resources away from other projects.

The highest level of invasive species control would be achieved through a combination of expanded volunteer, partner, and supplemental contractor based programs. Invasive species control is a priority for the refuge system. This combined approach would achieve the highest level of invasive species control, but would require additional staff time, material support for volunteer programs, and resources for contract support.

Invasive plant and wildlife management would continue to occur on a project-by-project basis, with the greatest threats being prioritized. The refuge would continue to remove invasive plant species at restoration sites using physical (cutting and extraction) and chemical (herbicides) means, as appropriate based on the integrated pest management strategies described herein and the Integrated Pest Management (IPM) Plan that will be developed (in Strategy 3.2.1). Mechanical methods would continue to be used around man-made reservoirs and other open water sources to control vegetation and improve open water habitat for fish and wildlife.

Strategies - Management of established invasive species:

3.2.1. Within 4 years, complete and implement a step-down Integrated Pest Management Plan for control of all invasive plant species that threaten Humboldt Bay NWR habitats and species.

3.2.2. Control and/or eradicate invasive plants on all units, with emphasis on newly established populations including *Lotus uliginosus, Iris pseudacorus, Senecio sylvaticus*, reed canarygrass (*Phalaris arundinacea*), and *Erechtites glomerata* on the Hookton Slough Unit, and on annual grass infestations on dune units.

3.2.3. Work with Youth Conservation Corps (YCC) to eradicate/control invasive plant species, particularly *Cirsium vulgare* and *Erechtites glomerata* on the Table Bluff Unit.

3.2.4. Manage non-native pasture grass in restored areas of Hookton Slough and Table Bluff units to a maintenance level of control.

3.2.5. Systematically carry out seasonally appropriate mowing to maintain short-grass pasture and control thistle on most South Bay refuge units.

3.2.6. Develop and implement a 5-year plan to remove eucalyptus and other non-native tree communities, and restore native communities using IPM techniques for removal and control of the eucalyptus. See also strategy 1.4.5.

3.2.7. Work with California Conservation Corps and California Department of Forestry (High Rock Conservation Camp) to complete removal of *Hedera helix* and other forest invasive plants and any remaining ice plant on dune units.

3.2.8. Assess dune swale invasive plants and implement large scale experiments as appropriate (e.g., flaming, controlled burning, mowing).

3.2.9. Work with CDF to complete manual removal of European beachgrass on appropriate areas of Ma-le'l Dunes Unit in areas that were not covered under Ma-le'l CDF restoration plan.

3.2.10. Use heavy equipment to remove European beachgrass on appropriate areas of Ma-le'l Dunes Unit in areas that were not covered under Ma-le'l CDF restoration plan.

3.2.11. Work with YCC, volunteers, and contractors to plant coniferous dune forest species on Ma-le'l in areas with European beachgrass that were not included in Ma-le'l CDF restoration plan (on interior high slipfaces).

3.2.12. Address off-site source of annual grass infestation on dune units through cooperative agreements or acquisition and management of source sites.

3.2.13. Work with Ma-le'l CMA partners (BLM, Redwood Gun Club, Sierra Pacific, Friends of the Dunes, staff of the Service's Partners for Fish and Wildlife and Coastal Programs, and private landowners) to address offsite sources of invasives such as reed canary grass (*Phalaris arundinacea*), pampas grass (*Cortaderia jubata*), yellow bush lupine (*Lupinus arboreus*), and Scotch broom (*Cytisus scoparius*) using YCC volunteers. Seek funding from multiple sources such as the Coastal Program, Partners for Wildlife, and the Humboldt WMA.

3.2.14. Test use of prescribed burns on dunes to control annual grass invasions.

Objective 3.3 - Control of Spartina densiflora:

- Within 10 years, control *Spartina* on all refuge locations.
- Within 15 years, participate in a collaborative interagency effort to eradicate *Spartina* on the majority of coastal habitats of Humboldt County, if found to be feasible.

Rationale - Control of Spartina densiflora:

Salt marsh was historically the most widespread wetland type around Humboldt Bay, but only ~10 percent of those wetlands remain, largely due to diking from the late nineteenth to the early twentieth century. Remaining native salt marsh habitat is threatened by invasive dense-flowered cordgrass, (*Spartina densiflora*, hereafter *Spartina*), which was introduced from Chile in the nineteenth century in ship ballast. Native salt marsh vegetation has several State-listed plant species of special concern, including Pt. Reyes birds-beak (*Cordylanthus maritimus* ssp. *palustris*), Humboldt Bay owl's clover (*Castilleja ambigua* ssp. *humboldtiensis*). Of the estimated 970 acres of salt marsh remaining around the Bay, about 90 percent has been invaded by the non-native *Spartina*. This *Spartina* out-competes native salt marsh plants, reducing native biodiversity and converting marshes to a monoculture. *Spartina* likely changes sedimentation patterns, alters carbon cycling and productivity, and changes the estuarine food web in undocumented ways. Control of this non-native plant is important to re-establishing the native salt marsh plant and animal communities in Humboldt Bay and adjacent estuaries, as well as preventing the spread of *Spartina* to other locations on the Pacific coast that are trying to protect their own native flora and fauna. Because of *Spartina* spp. ability to spread and their threat to native fish, wildlife, and habitats, eradication of *Spartina* spp. on the west coast of the United States was identified as a high priority in the West Coast Governors Agreement that was signed in 2007. Over the past two years, the refuge has developed a successful methodology for controlling *Spartina*, although true eradication is not possible while sources of seed continue to exist outside the refuge's boundaries.

Strategies - Control of Spartina densiflora:

3.3.1. Complete and maintain *Spartina* removal at dune units using methods that have proven to be successful at the refuge (including the use of metal-bladed weed-eaters).

3.3.2. Seek funding to expand *Spartina* control to south refuge units, focusing on early infestations in Hookton Slough, Salmon Creek, and White Slough brackish marsh areas.

3.3.3. Consider effects of climate change during planning and implementation of *Spartina* control in Humboldt Bay; utilize available models to develop predictions and adaptive responses.

3.3.4. Keep informed of other *Spartina* eradication efforts, especially on the west coast.

3.3.5. To the extent feasible, build monitoring and detection efforts for other *Spartina* species into planned and future *Spartina densiflora* mapping, monitoring, and control.

3.3.6. Work with existing non-profit organizations, such as Humboldt Fish Action Council, to collect seeds and to propagate plants to be used in enhancement and restoration projects.

3.3.7. Participate with the State Coastal Conservancy in planning and outreach effort for regional *Spartina* eradication in Humboldt Bay, Eel River, and Mad River estuaries.

3.3.8. Continue to coordinate research projects related to mapping of regional *Spartina* distribution, control methods and impacts to sedimentation, soil properties, tidal creek morphology, vegetation, and rare plants.

3.3.9. Coordinate research on seed bank ecology with respect to regional control of *Spartina*.

3.3.10. Work with academic partners, including Humboldt State University and the State Coastal Conservancy, to facilitate research on salt marsh function (productivity, value to wildlife, plant animal interactions.).

3.3.11. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

Goal 4: Promote long-term viability of the Humboldt Bay estuarine and dune ecosystems through ecosystem-based management (including endangered and threatened species management across boundaries) coordinated with both public and private partners around the Bay.

Objective 4.1 - Ecosystem Management:

- Over 15 years, continue participation on ecosystem-based management collaborations as staff time and resources permit. Pursue information and activities that will help determine a long term sustainable management direction for refuge lands.

- Within 2 years, devote an additional 1/4 FTE (combined staff time) to serve an increased role in ecosystem-based management collaborations over the 15-year period.

Rationale - Ecosystem Management:

The Humboldt Bay Ecosystem Program is a relatively new program, a comprehensive process of integrated resource management that considers the entire ecosystem, including humans. It is coordinated by the Eureka Sea Grant Office in cooperation with the HBHRCD and many other partners (http://groups.ucanr.org/HumboldtBayEBM/). The program mission is "to create an integrated framework that links the needs of people, habitats, and species by increasing our scientific understanding of our ecosystem and by promoting community-wide collaboration in sound natural resource management." It also seeks to develop recommendations for establishment and maintenance of a Humboldt Bay ecosystem database and continued work on research, education, and outreach projects with an ecosystem approach.

While all Humboldt Bay NWR units conserve and/or preserve ecologically important estuarine, palustrine, and dune habitats, these habitats are part of a larger ecosystem that extends beyond the refuge boundary. Because the South Bay refuge units in particular have been altered so significantly, there is concern about the long-term sustainability of diked coastal wetlands, especially given projections of sea level rise. Sustainable efficient management of public trust resources that utilize bay/refuge habitats will require management coordination and information sharing with other landowners and partners throughout the Humboldt Bay ecosystem.

Additional staff time will increase the extent to which refuge staff can engage in collaborative management efforts for the Humboldt Bay ecosystem.

Strategies - Ecosystem Management:

4.1.1. Participate on the Humboldt Bay Ecosystem Program's Advisory Committee, the Humboldt Bay and Eel River Estuary Habitat Goals Advisory Committee, and the Humboldt Bay Harbor, Recreation Conservation District Management Plan Advisory Team.

4.1.2. Pursue and support relevant bay ecosystem studies and modeling (currents and sediment transport, hydrology, sea level rise, nutrient cycling, etc.) that would provide information needed to determine a long-term sustainable management direction for refuge lands.

4.1.3. Work with USFWS, USGS, academic institutions, other agencies, and collaborative groups to monitor and address effects of and management response to local sea level rise and other environmental changes resulting from climate change.

4.1.4. Coordinate with the AFWO Conservation Partnerships Program (Partners for Fish and Wildlife and Coastal Program) within the North Coast Initiative Area to provide technical advice to private landowners and other entities.

4.1.5. Collaborate to the extent possible with public and private partners, including but not limited to:

- local representatives of the Wiyot Tribe and the Blue Lake Rancheria and Bear River Band of the Rohnerville Rancheria
- Arcata Fish and Wildlife Office (AFWO), Conservation Partnerships, Fisheries and Endangered Species Programs
- Bureau of Land Management, NOAA Fisheries Service, NPS, Natural Resources Conservation Service, US Geological Survey, US Army Corps of Engineers
- California (CA) Dept. of Fish and Game, CA Coastal Conservancy, CA Coastal Commission, CA State Parks, Caltrans, CA Dept. of Forestry, CA Conservation Corps, CA Dept. of Corrections, CA Dept. of Health Services
- Humboldt Bay Harbor, Recreation and Conservation District; Humboldt County; local cities and communities
- Humboldt State University, UC Sea Grant, College of the Redwoods
- Humboldt County Dunes Cooperative, Humboldt-Del Norte Weed Management Area, Humboldt and Del Norte County Resource Conservation Districts
- Pacific Coast Joint Venture, Audubon Society, Ducks Unlimited, and California Waterfowl Association
- Aleutian Goose Working Group, Farm Bureau, Humboldt Bay Oyster Growers, and non-motorized boating groups
- Friends of Humboldt Bay NWR, Friends of the Dunes, Friends of Arcata Marsh, North Coast Explore, North Coast Chapter, California Native Plant Society
- private landowners
- local, regional, and national non-profits

4.1.6. Seek funding for a new FTE biologist position to assist in planning and implementing projects and strategies.

Goal 5. To provide the public (and especially children) with accessible, safe, high-quality wildlife-dependent recreation opportunities to enhance public appreciation and understanding of fish, wildlife, plants, and habitats of Humboldt Bay and associated watersheds.

Objective 5.1 - Visitor Services—Wildlife Observation and Photography:

- Within 15 years, provide 20,000 annual wildlife observation and photography visitor opportunities by land and water trails, 3/4 mile (Salmon Creek Unit-Shorebird Loop Trail out to kiosk and Ma-le'l Dunes Unit Railroad berm trail) of wheelchair-accessible wildlife viewing opportunities for all primary habitat types on the Humboldt Bay NWR.

- Provide a total of 3.7 miles of Americans with Disabilities Act (ADA) accessible trail at Salmon Creek, Hookton Slough, and Ma-le'l Dunes units.

- Within 2 years of its adoption, implement all phases of the Ma-le'l Dunes Cooperative Management Area Access Plan, which includes an expanded trail system, interpretive panels, a viewing deck, a volunteer caretaker, restrooms and, if feasible (see concerns below), a non-motorized boat launch at the Ma-le'l Dunes Unit.

Rationale - Visitor Services—Wildlife Observation and Photography:

A Visitor Services Plan has been developed concurrently with the preparation of the CCP (Appendix B). In addition, in collaboration with BLM, the CA Coastal Conservancy, and Friends of the Dunes, there has been considerable effort to provide additional public use opportunities at the Ma-le'l Dunes Cooperative Management Area, including a publicly reviewed plan. Wildlife observation and photography are two of the six priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997. Despite a small staff and a refuge of relatively small size, all six priority public uses are made available at Humboldt Bay NWR. With few exceptions, the vast majority of wildlife species found on the refuge can be viewed and/or photographed from existing trails and/or blinds. A common comment from the public at this and many other refuges is, "The trails you have are great but we would like to hike/bike/drive around the rest of the refuge." While this desire to "see the rest of the refuge" is certainly understandable, it is often not compatible when considered cumulatively with all other actions occurring on the refuge. Managers need to better clarify for the public the need for portions (often large) of the refuge to be closed to public use to conserve fish, wildlife, and habitat.

Similar to national trends, there is a large and growing desire for wildlife observation and photography opportunities on Humboldt Bay NWR. If additional staff and project resources are available, the refuge could provide increased opportunities for wildlife observation and photography from refuge facilities, if compatible.

If additional resources are available, offering increased opportunities for the public to observe wildlife would build local support and appreciation for the refuge and the natural resources it helps to conserve.

Strategies - Visitor Services—Wildlife Observation and Photography:

5.1.1. Maintain existing visitor use facilities, making all as fully accessible as possible.

5.1.2. Work with Friends groups and other partners to develop and implement FWS Initiatives (Connecting People with Nature, Schoolyard Habitats and Birding Initiatives).

5.1.3. Develop wheelchair access out to the kiosk on the Salmon Creek Unit and on the Ma-le'l Dunes Unit Tsoutsgish Trail.

5.1.4. Continue to collaborate with Friends groups and other partners to provide regularly scheduled and special event guided wildlife observation day use opportunities.

5.1.5. Continue to work with local and national wildlife photography groups (and individuals) to improve wildlife photography day use opportunities on the refuge.

5.1.6. Install a wildlife camera on the Salmon Creek Unit which will provide opportunities for "live action" wildlife observation from the closed portion of the refuge back to a large screen TV at the Visitor Center.

5.1.7. Monitor and assess disturbance caused by different public uses on Humboldt Bay NWR to both develop a baseline of use and provide the best possible management direction regarding existing and proposed future uses.

5.1.8. Work with partners to fully implement Ma-le'l Dunes Cooperative Management Area Access Plan.

5.1.9. Work with HBHRCD, Redwood Community Action Agency (RCAA), and Humboldt Bay boating groups to produce an assessment of needs for safe compatible boating experiences (including the proposed bay trail(s) on or adjacent to the refuge, and then implement recommendations.

5.1.10. Work with the same groups to produce guidelines and conduct outreach to the boating community on avoiding impacts (especially disturbance) to natural resources on and around the bay.

5.1.11. Provide both signage and brochures to explain the need to maintain high water quality, how/where to properly dispose of waste, and the need to be good stewards of the bay.

5.1.12. Assess opportunities to increase seasonal day use hiking on the Salmon Creek Unit around the hunt area or other areas normally closed to the public.

5.1.13. Work with CA Coastal Conservancy, HBHRCD, RCAA, City of Arcata, Humboldt County, and groups interested in the "Trail Around the Bay" to assess the potential and compatibility of a bay trail(s) on or adjacent to the refuge.

5.1.14. Seek funding for a new FTE Volunteer Coordinator position to assist in planning and implementing projects.

5.1.15. Increase law enforcement on the Humboldt Bay NWR by contract or hiring a seasonal law enforcement officer.

5.1.16. Assess the need to implement a fee collection program.

Objective 5.2 - Visitor Services—Environmental Education and Interpretation:

- Within 15 years, provide wildlife-dependent educational opportunities for at least 8 school or community groups per month, and 35,000 annual visitor opportunities for interpretive experiences on and off refuge to foster public awareness and appreciation of the natural heritage of the north coast.
- Develop and construct a Children's Outdoor Exploration Area on the Salmon Creek Unit.
- Within 3 years, complete the Salmon Creek Historic Hunt Cabin.
- Assess feasibility for an on-site environmental education outdoor classroom facility on the Salmon Creek Unit.

Rationale - Visitor Services—Environmental Education and Interpretation:

Environmental education and interpretation are two of the six priority visitor uses identified in the National Wildlife Refuge System Improvement Act of 1997. The Humboldt Bay NWR provides a unique opportunity for the local community to experience pristine dune habitats, native bay habitats, and wildlife in proximity to an urban area with multiple educational institutions. Refuge-based environmental educational and interpretive activities can also be integrated into both indoor and outdoor classroom curricula. Interpretive activities can introduce the public to habitat management activities and familiarize them with the conservation efforts that protect local natural resources. The activities currently offered at the refuge are primarily the result of collaboration with refuge Friends groups and volunteer efforts, which we will seek to enhance.

If additional staff and project resources are available, the refuge will work with Friends groups, volunteers, and others to provide additional environmental education and interpretation opportunities to foster public awareness and appreciation of unique Humboldt Bay and north coast natural heritage, which will ultimately help to fulfill the purposes for which the refuge was established. The refuge will look at opportunities to implement existing (Junior Duck Stamp, The Nature of Learning, Project WILD, Shorebird Sister Schools, etc.) and new (Children in Nature, Schoolyard Habitats) environmental education/interpretation initiatives from the Service and others.

Strategies: - Visitor Services—Environmental Education and Interpretation:

5.2.1. Maintain existing Visitor Services Programs and infrastructure, including completion and upgrading of interpretive exhibits, panels, and signage plans.

5.2.2. Maintain, improve, and keep updated refuge website to provide information on refuge complex history, management, visitor service opportunities, and current events.

5.2.3. Continue to offer guided bird walks by Friends of the Humboldt Bay NWR (FHBNWR) every other week and Audubon once per month.

5.2.4. Continue to offer Humboldt State University and College of the Redwoods professors, high school classes, and other local citizens access to the Salmon Creek, Lanphere, and Ma-le'l Dunes units for guided and self-guided educational tours and study.

5.2.5. Continue to partner with Friends of the Dunes to offer guided natural history walks on the dunes units (once per month).

5.2.6. Continue to coordinate with the Friends of the Dunes (FOD), which leads a restoration work day once a month on Ma-le'l Dunes or Lanphere Dunes units, and for their annual Spring Breakaway event.

5.2.7. Continue to coordinate with Friends of the Dunes for the annual lupine bash; work to increase involvement by additional partners (particularly North Coast Chapter of California Native Plant Society).

5.2.8. Continue to participate in interpretive events both on the refuge and off (e.g., Aleutian Goose Fly-Off, California Waterfowl Outdoor Adventure Day, California State Fair, Humboldt County Fair, Godwit Days, Aleutian Cackling Goose Festival, National Wildlife Refuge Week).

5.2.9. Offer a seasonal lecture series (3-6 per year) that interprets pertinent natural and cultural resources.

5.2.10. Continue to offer occasional presentations to community groups and college/university classes (four to six per year).

5.2.11. Continue to offer a self-guided trail guide, produced by FHBNWR, on the Salmon Creek Unit.

5.2.12. Build on existing Outdoor Youth Days event and offer multi-day programs during the summer (e.g., Day Camp, Jr. Ranger/Naturalist).

5.2.13. Work with refuge Friends groups to locate and develop a Children's Outdoor Exploration Area at the Salmon Creek Unit to provide unstructured environmental education/interpretation opportunities for children.

5.2.14. Work with the Regional Office, AFWO, and Friends groups to develop/implement environmental education programs that could include Junior Duck Stamp, Schoolyard Habitats, Nature of Learning, Bay to Dunes, Shorebird Sister Schools, Salmon Creek Watershed Education, and others.

5.2.15. Work with AFWO and two schools in the Humboldt Bay area to develop pilot Schoolyard Habitat Projects.

5.2.16. Complete the "Historic Hunt Cabin," which will interpret the history of the Salmon Creek Unit and how it came to be, refuge development, and the historic role of waterfowl management in Humboldt Bay NWR and the Refuge System.

5.2.17. Work with Coastal Conservancy and Friends of the Dunes to implement planned interpretive themes at Ma-le'l Dunes Unit, including Wiyot tribal heritage. (See also Strategy 6.2.1 under Strategies - Cultural Resource Management - Partnerships.)

5.2.18. Work with partners to develop and/or modify existing interpretive outreach for the public about the historical support hunters and fishermen have provided for the refuge system and conservation.

5.2.19. Assess feasibility of conversion of the barn or construction of a new covered outdoor structure for environmental education wet lab type activities.

5.2.20. Investigate grants and/or community assistance to acquire rain gear for use by K-12 visitors, and facilitate visitation by economically challenged members of the community (e.g., shuttle buses/vans, etc.).

5.2.21. Develop an off-refuge wildlife presentation for K-12.

5.2.22. Develop traveling trunks of educational materials for use by staff and/or Friends on and off site.

5.2.23. Facilitate teacher training workshops so that teachers can lead environmental education field trips.

5.2.24. Create a curriculum that corresponds to California state education standards to cultivate an appreciation for refuge resources.

5.2.25. Design training guide for volunteer docents who would like to lead environmental education activities.

5.2.26. Provide for additional program assistance through trained volunteers, friends, interns, grant funding, and other partnerships.

5.2.27. Develop and implement greening policies, and then interpret greening activities completed on the refuge.

5.2.28. Seek funding for permanent full-time Information and Education Specialist and Volunteer Coordinator positions to assist in planning and implementing projects.

Note: See also Strategy 6.2.1.

Objective 5.3 - Visitor Services—Outreach/ Friends and Partners:

- Over 15 years, refuge staff will collaborate with Friends groups and other regional partners to annually host at least two regionally based environmental education field trips, workshops, seminars, or study courses, and refuge staff will take a local leadership role in developing and strengthening partnerships.

Rationale - Visitor Services—Outreach/Friends and Partners:

Part of the mission of the Service is working with others to conserve, protect and enhance fish, wildlife, and plants, and their habitats. Staff at the Humboldt Bay NWR realize that all wildlife, plants, and habitats on the refuge are part of an interdependent ecosystem that extends beyond the refuge boundaries. Providing outreach to the public and developing partnerships is the best way to manage the Humboldt Bay ecosystem for the benefit of all. Additionally, when the public and partners are not aware of the refuge and its role in local, regional, and national conservation, they are less likely to value, appreciate, or advocate for the resources on the refuge.

If additional staff and project resources are available, the Humboldt Bay NWR should provide additional environmental education and outreach to contribute to the protection of the Humboldt Bay ecoregion.

Strategies - Visitor Services—Outreach/Friends and Partners:

5.3.1. With Friends groups, volunteers, and staff, continue to participate in interpretive events both on and off the refuge.

5.3.2. Continue to involve volunteers in a variety of refuge programs and community events to strengthen ties with the community.

5.3.3. Incorporate elements of FWS Initiatives (Connecting People with Nature and Birding Initiatives).

5.3.4. Work with Friends groups to develop and implement priority projects for the refuge (environmental education/interpretation programs, trailguide, Children's Outdoor Exploration Area, bookstore, etc.).

5.3.5. Pursue funding for permanent full-time Information and Education Specialist and Volunteer Coordinator positions to assist in planning and implementing projects to strengthen and enlarge the volunteer services program, and to provide effective training and program management of the program for a corps of 50-100 volunteers.

Objective 5.4 - Visitor Services—Hunting:

- Within 15 years, maintain and improve existing waterfowl, coot, and snipe hunting program to accommodate a minimum of 1,200 hunter opportunities per year on the Salmon Creek Unit, and continue waterfowl, coot, and snipe hunting on Table Bluff, Eureka Slough, and Jacoby Creek units, as well as Egret Island, Teal Island, and Hookton Slough, concurrent with State regulations.

- Improve information and outreach of existing regulations.

- Open the Service-owned Fernstrom-Root island portion of the Ma-le'l Dunes Unit to waterfowl, coot, and snipe hunting and retrieval. The Service would also provide 2 additional Junior-only hunting days on the Salmon Creek Unit.

Rationale - Visitor Services—Hunting:

The existing (1990) Humboldt Bay NWR Sport Hunting Plan has been revised concurrently with the preparation of the Humboldt Bay NWR Complex CCP (Appendix C).

Hunting is one of the six priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997. Currently, waterfowl hunting regulations on the Salmon Creek Unit are slightly less permissive than State hunting regulations, as follows. Hunting on the Salmon Creek Unit is permitted from legal shoot time to 3 p.m. on Tuesdays and Saturdays of the regular waterfowl hunting season (usually the last weekend in October through January). Waterfowl, coot, and snipe hunting is permitted on the Table

Bluff, Eureka Slough, and Jacoby Creek units, including Egret Island, Teal Island, and Hookton Slough, concurrent with State regulations. In the best professional judgment of the Humboldt Bay NWR Manager, restricting the number of days that hunting occurs on the Humboldt Bay NWR maintains a high quality hunting experience. Upland game hunting (e.g., deer hunting) is not permitted on the Humboldt Bay NWR due to the small size of potential hunt areas, safety issues, and likelihood for conflicts with other high priority wildlife-dependent recreational uses recognized by the Improvement Act.

The refuge acknowledges that illegal parking and camping occur on the Highway 101 and railroad rights of way to access Jacoby Creek, especially during hunting season. Camping is not allowed on the refuge. Parking, camping and vehicle access at the Jacoby Creek Unit is prohibited without a special use permit. The Service recognizes the desire for vehicle access at Jacoby Creek, but due to safety and jurisdictional constraints, it is not allowed.

Portions of the recently acquired Ma-le'l Dunes Unit adjacent to the Mad River Slough, while privately owned, were hunted for waterfowl, coot, and snipe prior to acquisition by the Service, so the refuge will be opening portions of these areas to hunting and/or retrieval from adjacent areas that are open to hunting (see Appendix C: Figure C–4). Beyond this, any further increase in total hunt area on the refuge is unlikely due to the numerous hunting opportunities that already exist around Humboldt Bay, the relatively small size of the refuge, and its proximity to Highway 101 and residential areas.

Limited junior-only hunting opportunities in the Humboldt Bay area and the high quality of waterfowl hunting on the Salmon Creek Unit justifies the addition of two days for junior-only hunts. In addition, allowing less experienced junior hunters to learn hunting skills outside of the regular hunting times will avoid reducing the quality of the hunting experience for regular, more experienced hunters.

Strategies - Visitor Services—Hunting:

5.4.1. Maintain current sport hunting program as described in the updated Humboldt Bay NWR Sport Hunting Plan.

5.4.2. Continue to fund and use MOUs with Federal, State, and local agencies for law enforcement support.

5.4.3. Follow necessary procedures to permit waterfowl hunting on portions of the island salt marsh areas of the recently acquired Ma-le'l Dunes Unit.

5.4.4. Add two junior-only waterfowl hunt days per season at the Salmon Creek Unit.

5.4.5. Improve interpretation and outreach, especially on Salmon Creek, Hookton Slough, Jacoby Creek, and Ma-le'l Dunes units to make sure that where hunting and other wildlife-dependent visitor uses come together, all users are aware and all uses are managed for maximum mutual compatibility.

5.4.6. Conduct daily bag checks (i.e., verify number and species of waterfowl), which will promote compliance with regulations and keep biological data on species harvest.

5.4.7. Improve hunt program record-keeping by improving harvest record card.

5.4.8. Improve directional signs in the hunt area on the Salmon Creek Unit.

5.4.9. Create new maps of hunting areas to improve accuracy and quality of the hunting experience and the efficiency of the hunting system.

5.4.10. Increase staffing of the hunter check station, to a minimum of two individuals per hunt day (Humboldt Bay NWR staff, temporary hires/ contractors, or volunteers) to best manage refuge hunt.

5.4.11. Modify hunting pit blinds to prevent stranding of wildlife.

5.4.12. Post additional boundary signs on the Eureka Slough, Jacoby Creek, and Table Bluff units, and Egret Island, Teal Island, and Hookton Slough.

5.4.13. Enforce boat in only regulations on Humboldt Bay NWR land on the Eureka Slough and Jacoby Creek units in order to meet the Service's safety standards.

5.4.14. Work with HBHRCD, California State Lands Commission, CDFG, and the DOI Solicitor's Office to pursue a lease or other written agreement for the management of over-water hunting in tidelands (including salt marsh, mudflats, and open water) consistent with hunting on lands within the Service's jurisdiction.

5.4.15. Increase law enforcement on the Humboldt Bay NWR, especially during waterfowl season, by contract or hiring a seasonal law enforcement officer.

5.4.16. Seek funding for permanent full-time Volunteer Coordinator positions to assist in planning and implementing projects.

Objective 5.5 - Visitor Services—Fishing:

- Maintain existing sport fisheries program. Provide fishing opportunities at the Ma-le'l Dunes Unit.
- Collaborate with CDFG and other local agencies and private entities to increase awareness of fishing and shellfishing opportunities on the Humboldt Bay NWR and/or in Humboldt Bay.

Rationale - Visitor Services—Fishing:

The existing (1990) Humboldt Bay NWR Sport Fishing Plan has been revised concurrently with the preparation of the Humboldt Bay NWR Complex CCP (Appendix D).

Fishing is one of the six priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997. Most local fishing occurs in freshwater areas that are not within the refuge boundaries. Limited fishing does occur for sharks, rays, and shellfish on Humboldt Bay NWR. Shell fishing is most popular on South Bay mudflats. Many other freshwater and saltwater fishing areas are located nearby to the Humboldt Bay NWR.

While fishing opportunities on the Humboldt Bay NWR are limited, fishing is a priority wildlife-dependent recreational use recognized by the Improvement Act and additional outreach may promote its use by the public.

Strategies - Visitor Services—Fishing:

5.5.1. Maintain current fishing program as described in the updated Humboldt Bay NWR Sport Fishing Plan (see Appendix D: Sport Fishing Plan).

5.5.2. Continue to fund and use MOUs with Federal, State, and local agencies for law enforcement support.

5.5.3. Incorporate elements of USFWS Initiatives (i.e., Connecting People with Nature).

5.5.4. Enhance outreach and education on fishing regulations and opportunities on Humboldt Bay NWR.

5.5.5. Increase signage at allowable sport fishing sites.

5.5.6. Advertise and participate in events which promote fishing (e.g., CDFG free fishing day, USFWS fishing days, etc.).

5.5.7. Conduct outreach at pertinent events, such as Harbor District Maritime Expo, etc.

5.5.8. Increase law enforcement on the Humboldt Bay NWR by contract or hiring a seasonal law enforcement officer.

Goal 6. In cooperation with tribal representatives, identify and protect tribal cultural resources on the Humboldt Bay NWR. In addition, assess and manage refuge's more recent cultural resources and structures.

Objective 6.1 - Cultural Resource Management:

- Create and implement a basic Cultural Resources Management capability at Humboldt Bay NWR to respond to the basic compliance requirements of Federal cultural resources legislation.

Rationale - Cultural Resource Management:

Three contemporary entities represent the historic Wiyot Ancestral Territories located around Humboldt Bay: the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria. Cultural resources are non-renewable resources and are protected under Federal law and Service/Refuge System policy. The Service Manual section on Cultural Resource Management (Part 614) describes Service/Refuge System policies regarding management of cultural resources on refuges.

The Service's protocol or policy for inadvertent archaeological discovery is to follow the existing laws. The Archaeological Resources Protection Act, the National Historic Preservation Act, and the Native American Graves Protection and Repatriation Act each have a provision for "discovery." NAGPRA has both "inadvertent discovery" and "intentional discovery." Essentially, each law provides the provision to codify tribal consultation procedures in case of a discovery. NAGPRA is the most specific.

Strategies - Cultural Resource Management:

6.1.1. Notify the Regional Office Archaeologist when site-specific projects are initiated so that appropriate resource assessments and coordination

with California State Historic Preservation Office (SHPO) and the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria will occur.

6.1.2. Consult with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria, and the Regional Office Archaeologist on a project-by-project specific basis to collect related cultural resources background information and develop strategies for protection and preservation of cultural resources within refuge boundaries per Section 110 of National Historic Preservation Act.

6.1.3. Within 10 years, work with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria to develop an MOU or Cultural Resources Management Plan that addresses resource management issues and inventory, evaluation and treatment of at-risk cultural places on the Complex.

6.1.4. Incorporate cultural resource values, issues, and requirements into design and implementation of the other habitat, wildlife, and public use activities and strategies conducted by the refuge.

6.1.5. Communicate and consult with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria, academic institutions, advocacy organizations, agencies, and the California SHPO for basic informational, compliance, research, and "government-to-government" purposes.

6.1.6. Develop and implement a plan to survey the Humboldt Bay NWR for newly identified cultural resources, including archaeological sites and traditional cultural properties, and previously unsurveyed areas.

6.1.7. Assess options for refuge-owned Indian Island parcels with Wiyot Tribe.

6.1.8. Identify, inventory, evaluate, and nominate to the National Register sites eligible for the National Register under Criteria A-D in consultation with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria.

6.1.9. Create a cultural resource layer in the refuge GIS that aids in the identification, planning and monitoring, and interpretation of cultural sites.

6.1.10. Complete the "Historic Hunt Cabin," which will interpret history of the Salmon Creek ranch and how it came to be, refuge development, and the historic role of waterfowl management in Humboldt Bay and the Refuge System.

6.1.11. Convert the Salmon Creek Unit barn into an environmental education/interpretation facility, if feasible. If not, maintain in present condition or remove/recycle it.

6.1.12. Restore or replace quarters and storage buildings at the Lanphere Dunes Unit.

6.1.13. Designate a refuge Cultural Resources Management coordinator.

6.1.14. Within 1 year, begin consultation with the Wiyot Tribe, Blue Lake Rancheria, and Bear River Band of Rohnerville Rancheria, to establish an Archaeological Inadvertent Discovery Protocol.

Note: See also Strategy 6.2.1.

Objective 6.2 - Cultural Resource Management—Education:

- Within 5 years of CCP approval, develop, in partnership with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, the Blue Lake Rancheria and other preservation partners, a cultural resources overview of the Humboldt Bay NWR.

Rationale - Cultural Resource Management—Education:

Cultural resources are not renewable. Thus, interpretation of cultural resources can instill a conservation ethic among Humboldt Bay NWR visitors who encounter or manage them.

If additional staff and project resources are available, the Humboldt Bay NWR should provide additional interpretation of cultural resources and history of Humboldt Bay NWR. The goals of the cultural resource education and interpretive program would be to:

- translate the results of cultural research into interpretive media that can be understood and appreciated by a variety of refuge visitors
- engender an appreciation for the Native American culture and perspective on cultural resources
- relate the connection between cultural resources and natural resources and the role of humans in the environment
- instill an ethic for the conservation of our cultural heritage

Cultural resources overview materials will aid refuge staff in explaining historical ecological conditions, the importance of restoring and/or maintaining the integrity of those conditions, and the role the native environment plays in Native American culture and history.

Strategies - Cultural Resource Management—Education:

6.2.1. Develop interpretation and education programs and information at the Headquarters Unit that illustrate indigenous lifestyles and various subsistence strategies of the Wiyot Tribe and contemporary Wiyot communities and cultural activities.

6.2.2. Consult with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria and other stakeholders to design and implement educational materials, programs, and activities that would be used to address traditional or sacred resources.

6.2.3. Update the Humboldt Bay NWR brochures and interpretive signage, as staffing and funding allow, with appropriate cultural resources information.

6.2.4. Work with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria to provide education and training to refuge staff on tribal cultural history.

6.2.5. Within 10 years, in consultation with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria, research the ethnobotany and traditional plants and periodic use locations on the refuge; and plan, fund, and implement restoration of ethnobotanical resources on the dunes units.

6.2.6. Within 10 years, in consultation with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria, conduct research on Traditional Ecological Knowledge and its contribution to habitat management on the refuge.

6.2.7. Identify and evaluate cultural resources that can educate refuge users on how humans have interacted with wildlife and habitats in the past, and consult with tribes and other stakeholders on ways to use these resources to achieve educational, scientific, and traditional cultural needs.

Objective 6.3 - Cultural Resource Management—Coordination:

- Meet periodically with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria and other concerned tribal groups to discuss land management and restoration activities planned for the future.

Rationale - Cultural Resource Management—Coordination:

The Wiyot people have lived on the shores of Humboldt Bay and surrounding areas for thousands of years. Indian Island, within the approved Humboldt Bay NWR boundary, is home to two ancient Wiyot villages: EtpidoL and Tuluwat, a National Historic Landmark. Today the Wiyot Tribe has over 600 enrolled citizens. Native peoples with Wiyot ancestry are also enrolled locally at Blue Lake Rancheria, Bear River Band of Rohnerville Rancheria, and other tribal governments on the North Coast. Fifty tribal citizens reside on Table Bluff Reservation to the south of Humboldt Bay NWR. Traditional Wiyot village sites were located on the bay and along the sloughs and rivers. The Wiyot traditionally used the dunes for implement making sites, gathering, and surf fishing.

Annual meetings would provide a forum for tribal representatives to present any of their proposals or discuss other concerns that relate to proposed management of Humboldt Bay NWR lands.

Strategies - Cultural Resource Management—Coordination:

6.3.1. Offer an annual meeting with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria to review previous projects or summarize management or restoration projects and public events that are planned by the Humboldt Bay NWR for the upcoming year, whether or not these activities will require formal SHPO consultation.

6.3.2. Work with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria on projects to restore habitats of important native plants, and to harvest (for traditional non-commercial purposes) native plant foods.

6.3.3. Review and reissue, if appropriate, any special use permits for traditional activities such as plant collecting for basket weaving.

6.3.4. Develop in consultation with the appropriate tribes procedures and information required under the Native American Graves Protection and Repatriation Act.

Castle Rock NWR Goals, Objectives, and Strategies

Goal 1. Protect and maintain habitats for migratory birds and marine mammals, with an emphasis on seabirds and Aleutian cackling geese.

Objective 1.1 - Castle Rock Research and Monitoring:

- Over the 15 year life of the plan, sustain and protect habitat for healthy breeding seabird populations, seasonally roosting Aleutian cackling geese, and marine mammals by conducting monitoring supported by remote research and preventing disturbance.

- In collaboration with partners, including Humboldt State University, the Coastal Program at Humboldt Bay managed from the AFWO, Bureau of Land Management and the NPS: Develop and Implement a seabird Research and Monitoring Plan based on the USFWS California Current Seabird Management Plan.

- In collaboration with partners, including Humboldt State University and NOAA: Develop and Implement a Research and Monitoring Plan for the marine mammals which use Castle Rock NWR.

Rationale - Castle Rock Research and Monitoring:

Breeding birds of Castle Rock NWR include: open area nesters such as common murres; double-crested, Brandt's, and pelagic cormorants, western gulls, black oystercatchers; the pigeon guillemot, a crevice nesting species; and burrow nesters including: Cassin's and rhinoceros auklets, Leach's and fork-tailed storm-petrels, and tufted puffins. A portion of the Aleutian cackling goose population (~20,000 geese) roosts at night on Castle Rock NWR from January through April. Several of the species that utilize Castle Rock NWR are California Species of Special Concern including: tufted puffin, fork-tailed storm-petrel, and double-crested cormorant.

Obviously, a thorough understanding of the biology of these seabirds is important to their conservation. As the second largest breeding colony in California, Castle Rock is a vital link in the health of these populations. Further, these birds forage in the ocean and the health of their populations is reflective of ocean conditions. Having reliable data on the common murre and other seabird populations of Castle Rock NWR is an important part of understanding the California Current System, and the effects of natural and anthropogenic change occurring along this portion of the coast.

While some species like common murres nest on rock ledges and can be observed and monitored through aerial photography; other species, such as rhinoceros and Cassin's auklets, and storm-petrels, are nocturnal and burrow into the soft soil making aerial observation impossible. These burrowing species can make tunnels up to six-feet long, into the soft and fragile ground. Any human disturbance on the surface can easily crush and destroy the underground nest of these seabirds.

Thus, a challenge of monitoring seabirds on Castle Rock is to minimize disturbing the birds and avoid the crushing of burrow nests and habitat. In 2005, in partnership between the US Fish and Wildlife Service, the Coastal Program at Humboldt Bay, Humboldt State University, the US Geological Survey, Redwood National and State Parks, and the USCG, robotic video cameras were installed as a remote sensing technique to gather data on relative abundance, burrow use, attendance and departure, nesting chronologies, and breeding behavior of seabirds on Castle Rock. Part of this project is to develop formal monitoring protocols to assist managers on the north coast to follow trends, detect disturbance, and understand the biology of the seabirds which use Castle Rock and the surrounding area.

Seabirds are not generally well understood by the public. The colonies are very sensitive to disturbance and public outreach is needed to conserve these species. We propose to use the scientific findings from this effort and interpret seabird biology on the north coast to the public. Better public access (via video) can lead to better public protection of these unique birds. As part of the project discussed above, we also successfully established a live video feed which is available (seasonally from ~March–August) to the public over the internet (see www.humboldt.edu/~rtg1/research/castle_rock.html) and in the national park visitors center in Crescent City. The live video feed available to the public will allow public observation of wildlife values that can not otherwise be viewed. We hope that soon this will also be coordinated with the California Coastal National Monument via the Arcata Field Office of the Bureau of Land Management.

Concurrent with the existing live video feed, installation of acoustic monitoring of seabirds is a cost effective means of both detecting and obtaining some index of abundance of nocturnal burrow nesting species without adding any adverse impact to the island or its natural resources. While the

existing video recording has an audio track, more can be gained by use of higher fidelity recording and/or use of parabolic microphones.

Marine mammals that use Castle Rock NWR for resting and or pupping include Steller sea-lions, harbor seals, elephant seals, California sea-lions, and northern fur seals. These species are susceptible to the same types of disturbance from humans that seabirds are, the only exception being they are often the first to react as they are generally closer to the source of disturbance (except for aerial disturbances). We seek to conserve and protect marine mammals for essentially the same reasons we seek to conserve and protect seabirds.

Strategies - Castle Rock Research and Monitoring:

1.1.1. Pursue base funding to accomplish necessary work at Castle Rock NWR annually.

1.1.2. Continue collaboration with Humboldt State University, San Francisco Bay NWR staff, AFWO, and Coastal Program staff to monitor and research seabird populations.

1.1.3. Continue photo surveys both aerially and by remote camera for population estimates.

1.1.4. Conduct further research into the monitoring frequency required and best (scientifically valid and lowest impact on species) techniques for each species as recommended in the California Current System Seabird Monitoring plan. Research will also evaluate quantity, quality, and rate of erosion of soils available for burrow nesting seabirds.

1.1.5. Develop alternative monitoring techniques to assign cost effectiveness. This task will include storm-petrel assessments, boat-based surveys, and early morning shore-based surveys to refine alternative methods.

1.1.6. Develop formal monitoring protocol for nocturnal nesting seabirds. Camera maintenance, data compilation, analysis and the addition of camera validation for nesting by rhinoceros auklets and common murres.

1.1.7. Coordinate with NOAA Fisheries Service on marine mammal issues and population estimates.

1.1.8. Increase signage, distribute brochures, and use other outreach to educate kayakers, anglers, and the commercial fishing industry to the risk of disturbance, the potential impact on seabirds and marine mammals and the illegality of trespass or disturbance to seabirds and marine mammals.

1.1.9. Provide outreach on aviation hazards as well as over-flight impacts to seabirds and ACG at Crescent City airport for commercial and private pilots and with USCG annually.

1.1.10. Implement a study to quantify sources, frequency and severity of disturbance (including research) to seabirds and marine mammals.

1.1.11. Conduct surveys for flora and fauna besides birds and marine mammals including; invertebrates, salamanders, rare and invasive plants.

1.1.12. Evaluate additional options for remote monitoring of seabird, and Aleutian cackling goose monitoring on Castle Rock NWR.

1.1.13. Assess the possibility to experiment with options for seabird habitat restoration by excluding geese from key habitat locations.

1.1.14. Concurrent with the existing video monitoring, install acoustic monitoring of seabirds to obtain an index of abundance of nocturnal burrow nesting species (using higher fidelity recording and/or parabolic microphones).

Objective 1.2 - Castle Rock NWR Wilderness Designation:

Within 15 years of the approval of the CCP, the Service would recommend a wilderness designation for Castle Rock NWR and complete the associated environmental impact statement.

Goal 2. Provide high quality environmental education, interpretive information, and outreach to the public highlighting the ecology and sensitivity of the wildlife of Castle Rock National Wildlife Refuge.

Objective 2.1 - Environmental Education, Interpretive Information, and Outreach:

- Over the 15 year life of the plan coordinate environmental education and interpretation on the seabird, marine mammal, and Aleutian cackling geese populations that use Castle Rock NWR with that of tribal, Federal, State, and local, and other California Current System seabird programs.
- Within 3 years, collaborate with Federal and State organizations to develop and provide additional environmental education, interpretation, and outreach to kindergarten through 12th grade school groups, community groups, and individuals, and participate in at least 2 community events annually.

- Continue participation in the Aleutian Goose Festival and within 3 years develop a Friends of Castle Rock NWR and/or work with local entities and NPS/BLM to coordinate something similar.

Rationale - Environmental Education, Interpretive Information, and Outreach:

Standard visitation is inappropriate for Castle Rock NWR due to the potential for sensitive wildlife disturbance and the general inaccessibility of this island refuge. However, by working collaboratively with Humboldt State University, NPS, USCG, and BLM (which manages adjacent islands as part of the California Coastal National Monument), NOAA Fisheries Service, local tribes, agencies, schools, and individuals we can still effectively and efficiently reach interested audiences and provide educational and interpretive messages about the natural resources of Castle Rock NWR. Methods of outreach include an existing web cam that is available online seasonally, associated instructional DVDs, and more traditional methods including development of interpretive panels, brochures, and outreach to local communities and schools.

As Castle Rock NWR is not a staffed refuge, developing local support via a Friends group and/or collaboration with local entities and other Federal agencies with similar interests, such as NPS and BLM, will help conserve the resources of the refuge and surrounding marine areas.

Strategies - Environmental Education, Interpretive Information, and Outreach:

2.1.1. Continue collaboration with Humboldt State University, NPS, and AFWO to provide the seabird web cam online, and improve outreach information in NPS Visitor Center.

2.1.2. Continue participation in the Aleutian Goose Festival.

2.1.3. Develop a Friends of Castle Rock NWR group and/or work with local entities and NPS/BLM to coordinate something similar.

2.1.4. Conduct outreach to educate the public, develop stewardship, and ultimately help protect the natural resources of Castle Rock NWR and integrate outreach with other programs.

2.1.5. Collaborate with Redwood National and State Parks, the chamber of commerce, and other tourism information centers to increase environmental education and community outreach through means such as newsletters, web sites, brochures, and campfire talks.

2.1.6. Develop an age group specific instruction curriculum for kindergarten through 12th grade students using video on DVD, live feed video, and science-based monitoring.

2.1.7. Work with community partners (e.g., College of the Redwoods, Marine Mammal Center, and Siskiyou Field Institute) to provide educational interpretive field trips and courses using Castle Rock NWR to showcase wildlife, seabird, and marine mammal ecology.

2.1.8. Increase signage and make brochures available to fisherman, kayakers, aircraft pilots, and the general public with information about the sensitivity of the seabirds and marine mammals to disturbance, and provide the link to the seasonally live video-stream.

2.1.9. Collaborate with local tribal entities to provide interpretation of traditional uses of Castle Rock NWR as appropriate.

2.1.10. Work with partners to provide educational and interpretive information for guided excursions around Castle Rock.

6. Management Plan Implementation

Implementation

The CCP will serve as the primary management reference document for refuge planning, operations, and management for the next 15 years or until it is formally revised or amended within that period. The Service will implement the final CCP with assistance from existing and new partner agencies and organizations and from the public. The timing and achievement of the management strategies proposed in this document are contingent upon a variety of factors, including:

- Funding & Staffing
- Completion of Step-Down Plans
- Compatibility Determinations
- Compliance Requirements
- Adaptive Management
- Monitoring

Each of these factors is briefly discussed as it applies to the CCP.

CCPs provide long-term guidance for management decisions and set forth goals, objectives, and strategies needed to accomplish refuge purposes and identify the Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for the USFWS's strategic planning and program prioritization purposes. Accordingly, the plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

Funding & Staffing

Resources are required to adequately operate any National Wildlife Refuge including initial capital outlay for equipment, facilities, labor and other expenses as well as recurring expenses. The estimated initial capital outlay to implement the strategies described in this CCP are presented in Table 16. Not all of these capital expenditures would occur in the same year as many of these expenses would be most likely implemented over the next 15 years if approval and funding is provided by Congress. The detailed descriptions of the objectives and their associated implementation strategies serve as a guide to the ideal time frame in which to implement capital expenditures. The largest costs for initial outlays are for visitor services and habitat restoration.

Annual contracts or cooperative agreements will be needed to provide specialized services beyond the core refuge functions for which staff are required. The estimated annual cost to fully implement the CCP is approximately $1 million (Table 17).

Table 17 shows both existing and new positions for the Complex. If all positions are filled, the refuges would be able to carry out all aspects of this plan to a reasonable standard. If some positions are not filled, all aspects of the Plan would not be completed or those projects may be done over a longer period of time.

Step-Down Management Plan Summaries

Some projects or types of projects require more in-depth planning than the CCP process is designed to provide; for these projects, the Service prepares step-down management plans. Step-down management plans provide the additional planning details necessary to implement management strategies identified in a CCP. Included in this document are three step-down management plans: the Visitor Services Plan, Waterfowl Hunt Plan, and Sport Fishing Plan. The CCP also proposes four new step down plans for Habitat Management, Resource Inventory and Monitoring, Waterfowl Disease Contingency and Integrated Pest Management. These plans are scheduled to be completed within four years of the completion of the CCP.

Visitor Services Plan

The purpose of the Visitor Services Plan (Appendix B) is to establish guidelines for public uses at the Humboldt Bay and Castle Rock refuges that will provide the public with a quality wildlife-dependent recreational experience. The Visitor Services Plan was developed to provide safe wildlife-dependent recreation opportunities, while minimizing adverse impacts to the wildlife resources. The plan will allow the visitor services program to be conducted in a

Table 16. Estimated initial capital outlay to fully implement the Comprehensive Conservation Plan.

Expenditure [Related Strategies]	Unit Cost	Priority
Continue to adaptively manage during all phases of the Salmon Creek Restoration project (monitor species including juvenile salmonids and habitat use, changes in channel cross-sections, sediment transport, water quality, etc. and use results to guide future management). Report annually to CDFG the findings of the species monitoring. [1.1.1]	$50,000	1
Implement Phase II of the Salmon Creek Restoration project as described in (PCFWWRA 2003). [1.1.3]	$750,000	1
Work with appropriate Bay management partners and permitting agencies to develop and implement a plan to place large woody debris in Hookton Slough to improve habitat diversity for salmonids and goby and reduce predation. [1.1.5]	$75,000	2
Use excavated material from Phase II for salt marsh restoration and/or dike maintenance. [1.1.6]	$250,000	2
Install fish screens or other appurtenances as needed at appropriate locations on the Salmon Creek Unit to allow diversion to seasonal wetlands without impact to salmonids or other listed species. [1.1.7]	$200,000	1
Gather existing information and pursue funding to assess existing elevations on refuge units and sedimentation rates and locations in South Bay with respect to salt marsh restoration. [1.2.3]	$150,000	2
Repair and modify the White Slough tidegate to improve estuarine and brackish marsh conditions on the inside of Salmon Creek dikes. [1.2.4]	$250,000	2
Develop detailed designs to facilitate permitting on all South Bay Units restoration work. [1.3.3]	$50,000	1
On the White Slough Unit work with Caltrans to de-channelize Chism Creek so that it enters west White Slough Unit area, rather than terminating directly into Humboldt Bay, to maximize freshwater/salt marsh continuum. [1.3.16]	$15,000	3
On the Hookton Slough Unit develop and implement a hydrologic model and restoration plan that allows for at least partial tidal restoration in central area (see Salt Marsh alternatives), with muted tidal influence to eastern and western areas such that native freshwater to brackish vegetation is preserved, while allowing for fish passage, salmonid rearing and tidewater goby habitat. [1.3.19]	$100,000	3
Enhance riparian/swamp habitat by planting native understory plants and provide deer protection until established. [1.4.3]	$50,000	3
Work with the appropriate entities to develop a long-term water quality monitoring program to assess the impact of sediment flushing from Salmon Creek on eelgrass beds in southern Humboldt Bay and potential non-point source pollutants adjacent to Mad River Slough. [1.6.5]	$100,000	3
Develop a Hazard Analysis and Critical Control Point (HACCP) Plan for the Refuge to prevent establishment of new invasive species on the refuge [3.1.1]	$20,000	2
Continue to develop the Volunteer Invasives Mapping and Control Program at south refuge units and seek Service funding for volunteer and Friends invasive plant control programs [3.1.2]	$25,000	2

Expenditure [Related Strategies]	Unit Cost	Priority
Develop and implement a 5-year plan to remove eucalyptus (20 acres) and other non-native trees and replace with native communities. Use a combination of mechanical and chemical IPM techniques for removal and control of the eucalyptus [1.4.5, 3.2.6]	$75,000	1
Within 10 years, control *Spartina* on all refuge locations. [3.3.1-3.3.9, 3.3.11]	$400,000	1
Conduct Humboldt Bay wallflower population viability assessment (PVA) using existing demographic data set for Lanphere Dunes. [2.1.5]	$25,000	2
Continue to conduct metapopulation sampling of Humboldt Bay wallflower North Spit populations. Expand to include South Spit and Elk River spit populations. Track on a 9 or 10-year interval. [2.1.10]	$15,000	3
Develop partnerships to conduct habitat restoration activities and collect Humboldt Bay wallflower seed from South Spit. Reintroduce seeds from this subpopulation to restored habitat on Table Bluff Unit. [2.1.11]	$10,000	2
Repeat Pickart 1987 vegetation sampling to quantify succession rate and impacts to Humboldt Bay wallflower. [2.1.3]	$20,000	2
Create a monitoring program that will detect the presence of non-native bullfrog and control or abate its adverse effects on native species. [3.1.16]	$10,000	2
Pursue and support relevant bay ecosystem studies and modeling (currents and sediment transport, hydrology, sea level rise, etc.) that would provide information needs to determine a long-term, sustainable management direction for refuge lands. [4.1.2]	$200,000	1
Develop wheelchair access out to the kiosk on the Salmon Creek Unit and on the Ma-le'l Dunes Unit Tsoutsgish Trail. [5.1.3]	$50,000	1
Install a wildlife camera on the Salmon Creek Unit which will provide opportunities for "live action" wildlife observation from the closed portion of the refuge back to a large screen TV at the Visitor Center. [5.1.6]	$20,000	3
Monitor and assess disturbance caused by different public uses on Humboldt Bay NWR to both develop a baseline of use and provide the best possible management direction regarding existing and proposed future uses. [5.1.7]	$40,000	2
Work with partners to fully implement Ma-le'l Dunes Cooperative Management Area Access Plan. [5.1.8]	$65,000	1
Complete the "Historic Hunt Cabin", which will interpret the history of the Salmon Creek Unit and how it came to be, refuge development, and the early role of waterfowl management in Humboldt Bay NWR and the Refuge System. [5.2.16]	$100,000	2
Develop and implement a comprehensive plan to survey the HBNWR for newly identified cultural resources, including archaeological sites and traditional cultural properties. [6.1.6]	$50,000	2
Convert the Salmon Creek Unit barn into an EE/I facility, if feasible. [6.1.11]	$350,000	3
If above conversion not feasible, maintain at present condition or remove [6.1.11]	$100,000	3
Restore or replace the Quarters and Storage sheds at the Lanphere Dunes Unit [6.1.12]	$200,000	2

Expenditure [Related Strategies]	Unit Cost	Priority
In consultation with the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, and the Blue Lake Rancheria, research the ethnobotany and traditional plants and use locations on the refuge, and the Traditional Ecological Knowledge and its contribution to habitat management on the refuge. [6.2.6]	$30,000	2
Total Humboldt Bay NWR	**$3,845,000**	
Castle Rock NWR		
Develop a Monitoring Plan that takes into account the monitoring frequency required and best (scientifically valid and lowest impact on species) techniques for each species as recommended in the California Current System Seabird Management Plan [1.1.4]	$35,000	2
Camera maintenance, data compilation and analysis of existing data on rhinoceros auklets and common murres [1.1.6]	$50,000	1
Implement a study to quantify sources, frequency and severity of disturbance (including research) to seabirds and marine mammals [1.1.10]	$25,000	3
Install acoustic monitoring of seabirds to obtain an index of abundance of nocturnal burrow nesting species [1.1.14]	$10,000	2
Develop an age group specific instruction curriculum for K through 12 schools using video on DVD, live feed video, and science based monitoring [2.1.6]	$35,000	1
Increase signage and make brochure available to fisherman, kayakers, aircraft pilots, and the general public with information about the sensitivity of the seabirds and marine mammals to disturbance and has the link to the seasonally live video-stream [2.1.8]	$50,000	2
Total Castle Rock NWR	**$205,000**	

Table 17. Estimated annual cost to fully implement the Comprehensive Conservation Plan[1].

Expenditure	Status	Unit	Quantity	Total Cost
Salaries and Benefits				
Refuge Manager – GS-12/13	Existing	FTE	1.0	
Deputy Refuge Manager – GS-11/12	Existing	FTE	1.0	
Administrative Officer – GS-7/9	Existing	FTE	1.0	
Refuge Ecologist – GS-11/12	Existing	FTE	1.0	
Biological Technician – GS-5/7/9	Existing	FTE	1.0	
Wildlife Biologist – GS-9/11 To fulfill Goals 1,2,3,4 at Humboldt Bay NWR and Goal 1 at Castle Rock NWR	Proposed & Unfunded	FTE	1.0	
Engineering Equipment Operator – WG-8/9/10	Existing	FTE	1.0	
Maintenance Worker – WG-7/8	Existing	FTE	1.0	
Information & Education Specialist – GS-7/9/11 Currently a shared position, proposed to be full time	Newly Funded	FTE	1.0	
Volunteer/YCC Coordinator – GS-7/9 To fulfill Goals 5,6 at Humboldt Bay NWR and Goal 2 at Castle Rock NWR	Proposed & Unfunded	FTE	1.0	
Database Manager & IT Specialist – GS-7/9 Proposed position	Proposed & Unfunded	FTE	1.0	
Subtotal Salaries and Benefits		***FTE***	***11.0***	***$845,655***

Expenditure	Unit Cost	Unit	Quantity	Total Cost
Programs				
Maintenance (repairs, replacement, rentals, etc.) & Utilities (fuel, propane, electricity, phones, postage, etc.)	$75,000	ea	1.0	$75,000
Invasive Weed Program	$20,000	ea	1.0	$20,000
Water/Pumping Costs and Water Quality Monitoring	$10,000	ea	1.0	$10,000
Castle Rock NWR Wildlife Monitoring	$35,000	ea	1.0	$35,000
Travel/Training	$10,000	ea	1.0	$10,000
Supplies	$25,000	ea	1.0	$25,000
Printing	$2,000	ea	1.0	$2,000
Computer Services and Maintenance	$1,000	ea	12.0	$12,000

Volunteer Invasives Program and Stipends	$1,500	ea	12.0	$18,000
Law Enforcement MOU with BLM	$5,000	ea	1.0	$5,000
Subtotal Programs				***$212,000***
Grand Total (Annual salaries and benefits budget and annual maintenance program budget)				**$1,057,655**

[1] *Staffing and funding would be sought over the 15-year life of this plan subject to approval and funding by Congress.*

cost-effective manner. The program will be reviewed annually by refuge staff during the Habitat Management Plan review conducted each spring. The activities within the Visitor Services Plan are evaluated within compatibility determinations (hunting, wildlife observation and photography, environmental education and interpretation, and bicycling) located in Appendix F.

Hunt Plan

The purpose of the Waterfowl Hunt Plan (Appendix C) is to establish guidelines for hunting on the Humboldt Bay NWR that will provide the public with a quality wildlife-dependent recreational experience, an opportunity to use a renewable resource, and the ability to maintain wildlife numbers at levels compatible with refuge habitat. It was developed to provide safe hunting opportunities, while minimizing conflicts with other priority wildlife-dependent recreational uses. The plan will allow the hunting program to be conducted in a cost-effective manner, coordinated with the State. The hunting program will be reviewed annually by refuge staff during the Habitat Management Plan review conducted each spring. The activities within the Waterfowl Hunt Plan are evaluated within a waterfowl hunting compatibility determination located in Appendix F.

Sport Fishing Plan

The purpose of the Sport Fishing Plan (Appendix D) is to establish guidelines for fishing on the Humboldt Bay NWR that will provide the public with a quality wildlife-dependent recreational experience, an opportunity to use a renewable resource, and the ability to maintain sport fish numbers at levels compatible with refuge habitat. The plan will allow the sport fishing program to be conducted in a cost-effective manner, coordinated with the State. The fishing program will be reviewed annually by refuge staff during the Habitat Management Plan review conducted each spring. The activities within the Sport Fishing Plan are evaluated within a fishing compatibility determination located in Appendix F.

Waterfowl Disease Contingency Plan

Refuge staff will develop a Waterfowl Disease Contingency Plan for Humboldt Bay NWR, which will guide the refuge manager in the decision making process. The purpose of the Waterfowl Disease Contingency Plan is to establish protocols for monitoring and responding to wildlife disease outbreaks on the refuge. It will be developed to ensure a safe working environment for personnel involved in associated disease monitoring and clean-up activities while minimizing wildlife losses.

Habitat Management Plan

Refuge staff will develop an annual Habitat Management Plan for Humboldt Bay NWR, which will guide the refuge manager in the decision making process. This process is based on annual visits to each unit by the refuge's core staff to identify resource issues, develop a prioritized list of projects to address those issues, and monitor outcomes/responses. The database for this planning document will be annually updated. The plan is based on an adaptive management philosophy that allows the team to assess habitat condition and wildlife use of the units annually and make adjustments accordingly in order to meet the refuges' goals and objectives.

Resource Inventory and Monitoring Plan

The purpose of the Wildlife Inventory and Monitoring Plan is to establish guidelines and a schedule for conducting routine surveys to inventory and monitor wildlife and plant populations on the refuges. It will be developed to maintain consistency in the timing and methods used to collect population and habitat data in all years.

Integrated Pest Management Plan

Refuge staff will develop an Integrated Pest Management (IPM) Plan to address and reduce public nuisance and human health risk from mosquito-transmitted diseases, as well as to address invasive and exotic plants on the refuges. The purposes of this plan are: to identify mosquito

Photography blind. Photo: HBNWRC

abatement methods and materials currently approved for use on the refuge; identify use in an IPM program that is consistent with the goals of the refuge and minimizes public health risk from refuge-harbored mosquitoes; and provide long-term planning to meet the USFWS's goal of reducing effects of pesticide use on DOI trust resources to the greatest extent possible. This plan will be reviewed and updated to include new information and policy changes as needed. It will cover chemical herbicide/pesticide use, mechanical eradication, and biological controls. Mosquito monitoring and control activities are evaluated within a compatibility determination located in Appendix F.

Appropriate Use Requirements

The Appropriate Use policy describes the initial decision process the refuge manager follows when first considering whether or not to allow a proposed use on a refuge. The refuge manager must find a use is appropriate before undertaking a compatibility review of the use. Uses that have been administratively determined to be appropriate are the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, environmental education, and interpretation) and the take of fish and wildlife under State regulations.

A review of appropriateness of existing and proposed refuge uses was completed for the refuges. Grazing and haying for wildlife habitat management, recreational boating (including kayaking) in navigable waters, research, walking/hiking, invertebrate sampling with nets, and mosquito integrated pest management were found to be appropriate uses on all units of the Humboldt Bay NWR. Biking, paddle-in access site for camping, dog field training, a 2 to 3 week day camp for kindergarten through 12th grade, and dog walking were found to be not appropriate uses on all units of the Humboldt Bay NWR.

Compatibility Determinations

Federal law and policy provide the direction and planning framework to protect the Refuge System from incompatible or harmful human activities and to insure that Americans can enjoy Refuge System lands and waters. The Improvement Act is the key legislation on managing public uses and compatibility.

Before activities or uses are allowed on a refuge, uses must be found to be "compatible" through a written compatibility determination. A compatible use is defined as a proposed or existing wildlife-dependent recreational use or any other use of a National Wildlife Refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the Refuge System mission or the purposes of the national wildlife refuge. Sound professional judgment is defined as a decision that is consistent with the principles of the fish and wildlife management and administration, available science and resources, and adherence to the requirements of the Improvement Act, and other applicable laws. Wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety.

Bird banding being observed by Youth Conservation Corps members.
Photo: HBNWRC

Compatibility determinations for environmental education, fishing, grazing and haying, mosquito integrated pest management, plant gathering, recreational boating, research, waterfowl hunting, wildlife observation and photography for Humboldt Bay NWR; and research for Castle Rock NWR are included in Appendix F. These uses were all found to be compatible.

Compliance Requirements

This CCP was developed to comply with all Federal laws, executive orders, and legislative acts. Some activities (particularly those that involve a major revision to an existing step-down management plan, or preparing a new plan) would need to comply with additional laws or regulations besides NEPA and the Improvement Act. A list of Federal laws, executive orders, and legislative acts is in Appendix H.

Monitoring and Evaluation

The CCP is designed to be effective for a 15-year period. The plan will be reviewed and revised as required to ensure that established goals and objectives are still applicable and that the CCP is implemented as scheduled. The monitoring program will focus on issues involving visitor service activities, habitat management programs, wildlife inventory, and other monitoring and management activities. Monitoring and evaluation will use the adaptive management process. This process includes goal and objective setting, and applying management tools and strategies followed by monitoring and analysis to measure achievement of objectives and then refining management techniques based on the results of that analysis.

Collection of baseline data on wildlife and plant populations will continue. This data will be used to update existing species lists, wildlife habitat requirements, and seasonal use patterns. Migratory and resident birds, raptors, endangered plants and plant communities, and species of management concern will be the focus of monitoring efforts.

Where information gaps exist, a concerted effort will be made to obtain information. With new information, goals and objectives may need modification. Public involvement will be encouraged during the evaluation process.

Monitoring of visitor service programs will involve the continued collection of visitor use statistics. Monitoring will be done to evaluate the effects of public use on refuge habitat, wildlife populations, and visitor experience.

Adaptive Management

Adaptive management is the process of implementing policy decisions as scientifically driven experiments that test predictions and assumptions about management plans, using ongoing monitoring to measure success and provide information to improve the plans. Adaptive management provides the framework within which biological measures and public use can be evaluated by comparing the results of management to results expected from objectives. Management direction is periodically evaluated within a system that applies several options, monitors the success of objectives, and adapts original strategies to reach desired objectives. Habitat, wildlife, plants and plant communities, and visitor service management techniques and specific objectives would be regularly evaluated as results of a monitoring program and other new technology and information become available. These periodic evaluations would be used over time to adapt both the management objectives and strategies to better achieve management goals. Such a system embraces uncertainty and provides new information for future decision-making while allowing resource use.

Erosion control and dike maintenance at Salmon Creek Unit. Photo: HBNWRC

CCP Plan Amendment and Revision

The CCP is intended to evolve as refuges change, and the Improvement Act specifically requires that CCPs be formally revised and updated at least every 15 years. The formal revision process would follow the same steps as the CCP creation process. In the meantime, the USFWS would be reviewing and updating this CCP periodically based on the results of the adaptive management program. While preparing annual work plans and updating the refuge database, refuge staff will also review the CCP. It may also be reviewed during routine inspections or programmatic evaluations. Results of any or all of these reviews may indicate a need to modify the plan. The goals described in this CCP would not change until they are reevaluated as part of the formal CCP revision process. However, the objectives and strategies may be revised to better address changing circumstances or to take advantage of increased knowledge of the resources on the refuge. It is the intent of the USFWS to have the CCP apply to any new lands that may be acquired. If changes are required, the Complex would complete the any associated NEPA documentation required.

The intent of the CCP is for the refuges' objectives and strategies to be attained over the next 15 years. Management activities would be phased in over time and implementation is contingent upon and subject to results of monitoring and evaluation, funding through Congressional appropriations and other sources, and staffing.

Art students at Salmon Creek Unit of Humboldt Bay NWR. Photo: Shannon Smith

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Appendix A: Humboldt Bay NWR Complex CCP Glossary

Humboldt Bay NWR Complex CCP Glossary

Adaptive Management—The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. A process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels.

Algae (plural of alga)—Any of numerous groups of chlorophyll-containing, mainly aquatic organisms ranging from microscopic single-celled forms to large multicellular forms, distinguished from plants by the absence of true roots, stems, and leaves and by a lack of nonreproductive cells in the reproductive structures.

Alliance (plant alliance)—A uniform group of plant associations sharing one or more dominant or diagnostic plant species which, are found in the uppermost strata of the vegetation.

Alkalinity—Refers to the extent to which water or soils contain soluble mineral salts. Waters with a pH greater than 7.4 are considered alkaline.

Allelopathy—The inhibition of growth in one species of plants by chemicals produced by another species.

Alluvial—Made of clay, sand, or dirt washed by flowing water.

Alternatives—Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues. (1) A reasonable way to fix the identified problem or satisfy the stated need. (40 CFR 150.2) (2) Alternatives are different means of accomplishing refuge purposes and goals and contributing to the System mission (Draft Service Manual 602 FW 1.5).

Ammocoetes—Juvenille lampreys.

Anadromous—A lifecycle of fish that involves migrating up rivers from the sea to breed in fresh water followed by young returning to the sea until reaching maturity.

Animal Unit Month (AUM)—The amount of forage necessary to maintain one 1,000-pound animal for one month.

Aquatic—Pertaining to water, in contrast to land. Living in or upon water.

Aquatic Habitat—The physical, chemical, and vegetative features that occur within the water of lakes, ponds, reservoirs, rivers, irrigation canals, and other bodies of water.

Artifact—An object made by humans; usually in reference to primitive tools, vessels, weapons, etc.

Biodiversity (biological diversity)—Refers to the full range of variability within and among biological communities, including genetic diversity, and the variety of living organisms, assemblages of living organisms, and biological processes. Diversity can be measured in terms of the number of different items (species, communities) and their relative abundance, and it can include horizontal and vertical variability. The variety of life, including the variety of living organisms, the genetic differences among them, and the communities in which they occur.

Biological Integrity—Biotic composition, structure, and functioning at the genetic, organism, and community levels consistent with natural conditions, including the natural biological processes that shape genomes, organisms, and communities.

Birds of Conservation Concern—A U.S. Fish and Wildlife Service designation given to bird species (beyond those listed as endangered or threatened) that represent our highest conservation priorities and draw attention to species in need of conservation action.

California Current—The ocean current flowing southward along the western coast of the United States to northern Baja California.

California Species of Special Concern—A California Department of Fish and Game designation given to certain vertebrate species because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.

Carnivore—An animal that kills and eats other animals.

Categorical Exclusion (CE, CX, CATEX, CATX)—A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a Federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).

Cetacean—Any of various aquatic, chiefly marine mammals of the order Cetacea, including the whales, dolphins, and porpoises, characterized by a nearly hairless body, anterior limbs modified into broad flippers, vestigial posterior limbs, and a flat notched tail.

Closed-cone pines—Pine species that rely upon fire to open their cones and release seeds.

Community—The combined populations of all organisms in a given area, and their interactions. For example, the frogs, fish, algae, cattails, and lily pads in a backyard pond make up a community.

Compatible Use—A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the Mission of the System or the purposes of the refuge (Draft Service Manual 603 FW 3.6).

Comprehensive Conservation Plan (CCP)—A document that describes the desired future conditions of the refuge or planning unit; and provides long-range guidance and management direction to accomplish the purposes of the refuge, helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates.

Creching—The formation of groups of chicks from two or more broods in or adjacent to the breeding colony.

Crustacean—any of various predominantly aquatic arthropods of the class Crustacea, including lobsters, crabs, shrimps, and barnacles, characteristically having a segmented body, a chitinous exoskeleton, and paired, jointed limbs.

Cryptogamic Mat—short dune communities made up of members of a formerly recognized taxonomic group that included all seedless plants and plantlike organisms, such as mosses, algae, ferns, and fungi.

Cultural Resource—The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, such as a sacred area of native peoples) of an area. It includes historical, archaeological and architectural significant resources.

Cultural Resource Inventory—A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical

manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).

Cultural Resource Overview—A comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from a field offices background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).

Dike—An embankment of earth and rock built to prevent floods.

Dune—A hill or ridge of wind-blown sand.

Ecosystem—The sum of all interacting parts of the environment and associated ecological communities within a particular area; an ecological system. Many levels of ecosystems have been recognized. Very few, if any ecosystems are self-contained; most influence, or are influenced by, components or forces outside the system. For administrative purposes, we have designated 53 ecosystems covering the United States and its possessions. These ecosystems generally correspond with watershed boundaries, and their sizes and ecological complexity vary.

Effect—A change in a resource, caused by a variety of events including project attributes acting on a resource attribute (direct), not directly acting on a resource attribute (indirect), another project attributes acting on a resource attribute (cumulative), and those caused by natural events (e.g., seasonal change).

Emergent Vegetation—Rooted, aquatic plants that have most of their vegetative (nonroot) parts above water.

Endemic Species—Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

Endangered Species—Any species that is in danger of extinction throughout all or a significant portion of its range and listed as such by the Secretary of the Interior in accordance with the Endangered Species Act of 1973. Endangered species are afforded protection under the Act as amended and under various State laws for State-listed species.

Environmental Assessment (EA)—A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

Environmental Health—Abiotic composition, structure, and functioning of the environment consistent with natural conditions, including the natural abiotic processes that shape the environment.

Epifauna—Benthic fauna that live on a surface, such as the sea floor, other organisms, or objects.

Epiphyte—A plant that grows on another plant upon which it depends for mechanical support but not for nutrients.

Eradicate—To effectively eliminate a non-native organism from a defined area. It is acknowledged that weeds can be reintroduced (including by natural dispersal) and that, as the Office of Technology Assessment states in "Harmful Non-Indigenous Species of the United States (1993), "some continued unintentional introductions are inevitable...perfect screening, detection, and control are technically impossible and will remain so in the foreseeable future." Our use of the term "eradication" suggests that the goal of the effort is to eliminate a species regionally, such that only continued screening is needed to detect and remove minor missed, re-established, or re-introduced occurrences. This contrasts with our use of the word "control" where the goal of the effort is to reduce the population to a level that requires minimal maintenance, knowing that continued dispersal from adjacent populations is likely.

Estuarine—Of, relating to, or found in an estuary.

Estuarine Wetland—Deepwater and wetland areas that are usually semi-enclosed with an opening to the ocean and in which there is some mixing of fresh and sea water.

Estuary—The part of the wide lower course of a river where its current is met by the tides.

EuroAmerican—A U.S. citizen or resident of European descent.

Eutrophic—Having waters rich in mineral and organic nutrients that promote a proliferation of plant life, especially algae, which reduces the dissolved oxygen content and often causes the extinction of other organisms. Used of a lake or pond.

Eutrophication—The process of becoming eutrophic.

Evapotranspiration—The collective processes by which water is transferred from the surface of the earth, including from the soil and the surface of water-bodies (through evaporation) and from plants (through transpiration).

Evolutionarily Significant Unit (ESU)—A population or group of populations inhabiting a defined geographical area that comprises a unique segment of the species; a distinct population, reproductively isolated from other conspecific populations and is an important evolutionary legacy of the species.

Exotic and Invading Species (Noxious Weeds)—Plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insects or disease; or nonnative, new, or not common to the United States, according to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or has adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the Unite States and to the public health.

Eyrie (aerie)—The nest of a bird, such as an eagle, built on a cliff or other high place.

Finding of No Significant Impact (FONSI)—A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a Federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).

Flyway—A route taken by migratory birds between their breeding grounds and their wintering grounds. Four primary migration routes have been identified for birds breeding in North America: the Pacific, Central, Mississippi, and Atlantic Flyways.

Foraging—The act of feeding; another word for feeding.

Forbs—Herbaceous dicotyledonous plants.

Fragmentation—The process of reducing the size and connectivity of habitat patches.

Fungi (plural of fungus)—Any of numerous organisms of the kingdom Fungi, which lack chlorophyll and vascular tissue and range in form from a single cell to a body mass of branched filamentous hyphae that often produce specialized fruiting bodies (ex. mushrooms, puff balls, etc.). The kingdom includes the yeasts, molds, smuts, and mushrooms.

Gastropod—Any of various mollusks of the class Gastropoda, such as the snail, slug, or limpet, characteristically having a single, usually coiled shell or no shell at all, a ventral muscular foot for locomotion, and eyes and feelers located on a distinct head.

Geophyte—bulb plants.

GIS—Geographic Information System. Refers to such computer mapping programs as ArcView, ArcInfo, ERDAS, etc.

Goal—A descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Draft Service Manual 620 FW 1.5).

Grain—A single, hard seed of a cereal grass.

Habitat—Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.

Hemiparasitic Plant—A plant, such as mistletoe, that obtains some nourishment from its host but also photosynthesizes.

Hydrobasin—A major hydrological drainage basin.

Integrated Pest Management (IPM)—Methods of managing undesirable species, such as weeds, including education; prevention, physical or mechanical methods or control; biological control; responsible chemical use; and cultural methods.

Invasive Species—An alien (non-native) species whose introduction does or is likely to cause economic or environmental harm or harm to human health

Invertebrate—Animals that do not have backbones. Included are insects, spiders, mollusks (clams, snails, etc.), and crustaceans (shrimp, crayfish, etc.).

Irrigation Drainwater—Ideally, subsurface water which flows from irrigated land and generally transports higher concentrations of dissolved salts than the water applied to the land.

Irrigation Return Flow—Water which reaches surface drainage by overland flow or through groundwater discharge as a result of applied or natural irrigation.

Issue—Any unsettled matter that requires a management decision, e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition.

Levee—An embankment raised to prevent a river from overflowing.

Lichens—A fungus that grows symbiotically with algae, resulting in a composite organism that characteristically forms a crustlike or branching growth on rocks or tree trunks.

List 1B Plants (California Native Plant Society)—Plants that are rare, Threatened or Endangered in California and elsewhere.

List 4 Plants (California Native Plant Society)—Plants of limited distribution, often referred to as a plant watch list.

Marsh—An area of soft, wet, low-lying land, characterized by grassy vegetation and often forming a transition zone between water and land.

Mean high water (tide)—The average height of all high waters recorded at a given place over a 19-year period.

Mean low water (tide)—The average height of all low waters recorded at a given place over a 19-year period.

Memorandum of Understanding—A legal document outlining the terms and details of an agreement between parties, including each parties requirements and responsibilities.

Midden site—A mound or deposit containing shells, animal bones, and other refuse that indicates the site of a human settlement.

Mitigation—To avoid or minimize impacts of an action by limiting the degree or magnitude of the action; to rectify the impact by repairing, rehabilitating, or restoring the affected environment; to reduce or eliminate the impact by preservation and maintenance operations during the life of the action.

Mycoheterotrophs—Orchids and other species that are mutualists with mycorrhizal fungi; these plants derive their energy from fungi that in turn get their energy from another vascular plant.

National Environmental Policy Act (NEPA)—An act which encourages productive and enjoyable harmony between humans and their environment, to promote efforts that will prevent or eliminate damage to the environment and atmosphere, to stimulate the health and welfare of humans. The act also established the Council on Environmental Quality (CEQ). Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making (from 40 CFR 1500).

National Wildlife Refuge (Refuge or NWR)—A designated area of land or water or an interest in land or water within the system, including national wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas (except coordination areas) under the Service jurisdiction for the protection and conservation of fish and wildlife. A complete listing of all units of the Refuge System may be found in the current "Report of Lands Under Control of the U.S. Fish and Wildlife Service."

National Wildlife Refuge System, Refuge System, or **System**—Various categories of areas that are administered by the Secretary for the conservation of fish and wildlife, including species that are threatened with extinction; all lands, waters, and interest therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; game ranges; wildlife management or waterfowl production areas.

Native Species—Species that normally live and thrive in a particular ecosystem.

Nekton—The collection of marine and freshwater organisms that can swim freely and are generally independent of currents, ranging in size from microscopic organisms to whales.

No Action Alternative—An alternative under which existing management would be continued.

Objective—A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Make objectives attainable, time-specific, and measurable.

Oology—The branch of zoology that deals with the study of eggs, especially birds' eggs.

Ornithology—The branch of zoology that deals with the study of birds.

Ozone—Ozone is an invisible pollutant formed by chemical reactions involving nitrogen oxides, reactive hydrocarbons and sunlight. It is a powerful respiratory irritant that can cause coughing, shortness of breath, headaches, fatigue and lung damage, especially among children, the elderly, the ill and people who exercise outdoors.

pH—An index of acidity/alkalinity of a solution, being an expression of concentration of hydrogen ions.

Pacific Decadal Oscillation—The Pacific Decadal Oscillation (PDO) is a pattern of Pacific climate variability that shifts phases on a multi-decadal time scale, usually about 20 to 30 years. The PDO is detected as warm or cool surface waters in the Pacific Ocean, north of 20° N. During a "warm", or "positive", phase, the west Pacific becomes cool and part of the eastern ocean warms; during a "cool" or "negative" phase, the opposite pattern occurs.

Palustrine—being, living, or thriving in a marsh.

Palustrine Wetland—All non-tidal wetlands dominated by trees, shrubs, and persistent emergent vegetation.

Particulate matter—Particulate matter is the fine mineral, metal, soot, smoke and dust particles suspended in the air. For health reasons, regulators are most concerned with inhalant particulate matter less than 10 microns in diameter (PM10), which can permanently lodge in the deepest, most sensitive areas of the lungs, and cause respiratory and other health problems.

Pelagic—Living in open oceans or seas rather than waters adjacent to land or inland waters.

Piscivorous—Habitually feeding on fish; fish-eating.

Pinniped—Of or belonging to the Pinnipedia, a suborder of carnivorous aquatic mammals that includes the seals, walruses, and similar animals having finlike flippers as organs of locomotion.

Plant Community—An assemblage of species populations of plants in a particular area at a particular point in time; the biological part of an ecosystem as distinct from its physical environment. The plant community of an area can change over time due to disturbance (e.g., fire) and succession.

Polychaete—Any of various annelid worms of the class Polychaeta, including mostly marine worms such as the lugworm, and characterized by fleshy paired appendages tipped with bristles on each body segment.

Population—All the members of a single species coexisting in one ecosystem at a given time.

Preferred Alternative—This is the alternative determined (by the decision maker) to best achieve the Refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management. The Service's selected alternative at the Draft CCP stage.

Prescribed Fire—The skillful application of fire to natural fuels under conditions of weather, fuel moisture, soil moisture, , etc., that allows confinement of the fire to a predetermined area and produces the intensity of heat and rate of spread to accomplish planned benefits to one or more objectives of habitat management, wildlife management, or hazard reduction.

Priority Public Uses—Compatible wildlife-dependent recreation uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).

Propagules—Any of various usually vegetative portions of a plant, such as a bud or other offshoot, that aid in dispersal of the species and from which a new individual may develop.

Proposed Action—The Service's proposed action for Comprehensive Conservation Plans is to prepare and implement the CCP.

Public Involvement—A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

Public Scoping—See public involvement.

Purposes of the Refuge—"The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit." For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge.

Raptor—A bird of prey, such as a hawk, eagle, or owl.

Redoximorphic Features—Colors in the soil that indicate water is seasonally present at the level the features are found.

Refuge—Short form of National Wildlife Refuge.

Refuge Operating Needs System (RONS)—The Refuge Operating Needs System is a national database that contains the unfunded operational needs of each refuge. We include projects required to implement approved plans and meet goals, objectives, and legal mandates.

Salmonid—Of, belonging to, or characteristic of the family Salmonidae, which includes the salmon, trout, and whitefish.

Sand—A sedimentary material, finer than a granule and coarser than silt, with grains between 0.06 and 2.0 millimeters in diameter.

Salinity—An expression of the amount of dissolved solids in water.

Salt Marsh—Low coastal grassland frequently overflowed by the tide.

Seabird—A bird, such as a petrel or albatross, that frequents the ocean, especially far from shore.

Shorebirds—Long-legged birds, also known as waders, belonging to the Order Charadriiformes that use shallow wetlands and mudflats for foraging and nesting.

Silt—A sedimentary material consisting of very fine particles intermediate in size between sand and clay.

Siltation—The process of becoming covered with silt.

Shorebird—Any of various birds, such as the sandpiper, plover, or snipe, that frequent the shores of coastal or inland waters.

SLAMM—Sea Level Affecting Marsh Management

Sound Professional Judgment—A finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to the requirements of the Refuge Administration Act and other applicable laws.

Species—A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

Step-Down Management Plan—A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives.

Strategy—A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (Draft Service Manual 602 FW 1.5).

Stratigraphy—The study of rock strata, especially the distribution, deposition, and age of sedimentary rocks.

Suffrutescent—Having a stem that is woody only at the base; somewhat shrubby.

Tidal Prism—The difference between the mean high-water volume and the mean low-water volume of an estuary.

Threatened Species—Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, and one that has been designated as a threatened species in the Federal Register by the Secretary of the Interior. Threatened species are afforded protection under the Endangered Species Act of 1973, as amended.

Trust Resources—Those resources for which the Service has been given specific responsibilities under Federal law. These include migratory birds, interjurisdictional fishes (fish species that may cross state lines), federally listed threatened or endangered species, some marine mammals, and lands owned by the Service.

Upland—An area where water normally does not collect and where water does not flow on an extended basis. Uplands are non-wetland areas.

Vision Statement—A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes, and other mandates. We will tie the vision statement for the refuge to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates.

Wading Bird—A long-legged bird, such as a crane, heron, or stork, that frequents shallow water, especially in search of food.

Waterfowl—A group of birds that include ducks, geese, and swans (belonging to the order Anseriformes).

Watershed—The entire land area that collects and drains water into a river or river system.

Wetland—Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of the year (from USFWS Classification of Wetlands and Deepwater Habitats of the United States).

Wilderness Review—The process we use to determine if we should recommend Refuge System lands and waters to Congress for wilderness designation. The wilderness review process consists of three phases: inventory, study, and recommendation. The inventory is a broad look at the refuge to identify lands and waters that meet the minimum criteria for wilderness. The study evaluates all values (ecological, recreational, cultural), resources (e.g., wildlife, water, vegetation, minerals, soils), and uses (management and public) within the Wilderness Study Area. The findings of the study determine whether or not we will recommend the area for designation as wilderness.

Wildfire—A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

Wildlife—All nondomesticated animal life; included are vertebrates and invertebrates.

Wildlife-Dependent Recreational Use—"A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation." These are the six priority public uses of the Refuge System as established in the National Wildlife Refuge System Administration Act, as amended. Wildlife-dependent recreational uses, other than the six priority public uses, are those that depend on the presence of wildlife. We also will consider these other uses in the preparation of refuge CCPs; however, the six priority public uses always will take precedence.

Appendix B: Visitor Services Plan

VISITOR SERVICES PLAN

Humboldt Bay National Wildlife Refuge Complex

November 2008

Region 8
U.S. Fish and Wildlife Service

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Summary

The purpose of the Humboldt Bay National Wildlife Refuge Complex's (refuge) visitor services program is to foster understanding and instill in refuge visitors appreciation of fish, wildlife, and plants and their conservation. This will be accomplished by providing the public with safe, high-quality, appropriate, and compatible wildlife-dependent recreation and education programs and activities. In 1997 Congress passed the National Wildlife Refuge Improvement Act (Improvement Act) which clearly states that on national wildlife refuges, wildlife comes first. The 1997 Improvement Act also identified six wildlife-dependent priority public use activities and programs that are compatible with the mission of the National Wildlife Refuge System. These uses include: environmental education and interpretation, wildlife photography, wildlife observation, hunting and fishing.

This Visitor Services Plan (VSP) was prepared based on these guidelines. With the adoption and implementation of the Comprehensive Conservation Plan (CCP) and this step-down plan, all visitor service activities and programs on the refuge would be in conformance with national guidelines and would ensure that all visitor activities are compatible with the refuges' overarching wildlife mission and purposes. During the winter of 2006 a Visitor Services Review was conducted for the refuge. The Visitor Services Review evaluated the status of all refuge visitor services programs at that time and suggested changes and guidance that were incorporated into this document.

The purpose of the VSP is to establish priorities and identify improvements which will guide the refuge visitor services program over the next fifteen years. A visitor services goal, objectives and strategies have been identified within the CCP (Chapter 3 of the CCP). A Waterfowl Hunt Plan and a Sport Fishing Plan have also been prepared (Appendices to the CCP). This VSP addresses all compatible wildlife-dependent recreational uses on the refuge including environmental education and interpretation, wildlife photography, wildlife observation (which includes non-motorized boating), hunting and fishing.

Visitors enjoying the Shorebird Loop Trail at Humboldt Bay NWR's Salmon Creek Unit.
Photo: USFWS

Introduction
See Chapter 1 of the CCP

Brief History
See Chapter 1 of the CCP

Significant Features
See Chapter 1 of the CCP

Primary Refuge Resource Management Goals and Objectives
See Chapter 5 of the CCP

Local Setting

Community Description
See Chapter 3 of the CCP

Local Economy
See Chapter 3 of the CCP

Demographics
See Chapter 3 of the CCP

Visitor Data
See Chapter 3 of the CCP

Travel Links
The major transportation route in the vicinity of the refuge is Highway 101. Many small paved county roads provide for local transportation. These, and Highway 101, provide access to refuge visitor contact stations and parking lots. There are currently no alternative transportation systems that provide access to refuges, however the refuge is a participant in planning for a system of regional biking and walking trails.

Visitor Services Opportunities (off-refuge)
Eel River Wildlife Area (California Department of Fish and Game)
The Eel is California's third largest river and carries ten percent of California's yearly runoff. The Eel is important to coastal dunes because it carries tremendous amounts of sediments that form the building materials of dunes. The Eel is federally classified as a wild and scenic river. The Eel River delta can be explored from Crab County Park and the Eel River Wildlife Area, accessed four miles west of Loleta, at the end of Cannibal Island Road.

Eel River Wildlife Area is home to the threatened western snowy plover. In the Wildlife Area vehicles are restricted to the wave slope (wet sand) and the back dune road. Dogs must be on a leash between March 1st and September 30th.

South Spit Cooperative Management Area (Bureau of Land Management, California Department of Fish and Game, Humboldt County, US Fish and Wildlife Service)
Located at the end of Table Bluff Road 5 miles west of Loleta, the area is open from one hour before sunrise until one hour after sunset, with earlier opening during waterfowl season. Equestrian use is limited to the west side of jetty road and vehicle access is restricted to the waveslope, not to exceed 15 miles per hour. The south spit is also home to the threatened western snowy plover, and has restrictions for vehicles and dogs.

Headwaters Forest Reserve
On March 1, 1999, the Headwaters Forest and surrounding lands, totaling 7,500 acres in central Humboldt County, were acquired from private owners by the U.S. Department of the Interior, Bureau of Land Management (BLM) and the California Department of Fish and Game (CDFG). The Headwaters Forest

Reserve is set aside to protect and preserve the ecological and wildlife values in the area, particularly the stands of old-growth redwoods that provide habitat for the threatened marble murrelet, and the stream systems that provide habitat for threatened Coho salmon. Public access is available to the north end of the reserve along the Elk River County Road, approximately six miles southeast of Eureka. To get there; take Highway 101 to the Elk River Road exit. Turn right on Elk River Road. The county road ends at the reserve boundary where signs provide information for visitors. A parking area is available inside the reserve.

Elk River Wildlife Sanctuary (California Department of Fish and Game)
The Elk River is Humboldt Bay's largest tributary and is a spawning ground for salmon, steelhead and coastal cutthroat trout. A sand spit began to form at the river's mouth in 1930 and now extends over a mile into Humboldt Bay. A parking area off Hilfiker Lane, west of Highway 101, provides access to trails through 100 acres of restored riparian woodland, freshwater marsh, saltmarsh, and dunes. Please stay on trails to avoid impacts to endangered plants and sensitive resources.

Fay Slough Wildlife Area (California Department of Fish and Game)
This 484 acre wildlife management area is located 1.5 miles north east of Eureka, off Hwy 101. This previously grazed land has been restored to coastal and seasonal wetlands. Egrets and herons are now common in this riparian habitat. The site is open to hunting during waterfowl season and wildlife observation year round.

Mad River Wildlife Area (California Department of Fish and Game)
Located a half mile west of Arcata off of Samoa Blvd., this area consists of 547 acres of agricultural land and restored coastal wetland, with many sloughs. Egrets, herons, mink and weasel are found here. Mad River Wildlife area is open to hunting during waterfowl season and wildlife observation year round.

Arcata Marsh and Wildlife Sanctuary (City of Arcata)
The City of Arcata's unique wastewater treatment facility, marsh, and wildlife sanctuary attracts approximately 150,000 visitors per year. Arcata's wastewater treatment plant is an example of a community's involvement in environmental politics, innovative uses of land, and applications of appropriate technology in a small urban community. The Arcata Wastewater Treatment Plant combined with the Arcata Marsh and Wildlife Sanctuary has multiple uses, including wastewater treatment, recreation, wildlife habitat, education, and research.

Samoa Dunes (Bureau of Land Management)
This 300 acre park allows visitors to take advantage of a wide variety of recreational activities, including hiking, surfing, fishing, sightseeing, beachcombing, off-highway vehicle (OHV) use, picnicking, and birdwatching. When walking in the recreation area visitors should be aware of off road vehicle riding areas.

Humboldt Coastal Nature Center (Friends of the Dunes)
Plans are currently underway to transform the ocean and bay view property formerly known as the Stamps House into a "gateway to the dunes." Featuring an interpretive nature center, restrooms, ample parking, and a marked trail system, the Humboldt Coastal Nature Center will provide the community with an easy point of entry to the coastlands and dune trails that will connect to Ma-le'l and Lanphere Dunes to the north, and Manila Community Services Dunes to the south. The linked trail system will provide visitors with access to approximately 1,000 acres of coastal dune habitats, and the nature center, and an adjacent loop trail, will be wheelchair accessible.

Boating and non-motorized boating opportunities in Humboldt Bay
Recreational boating opportunities are available for watercraft ranging from the smallest canoes and kayaks to the largest sailboats and yachts. Improved non-motorized boat launching facilities are located throughout Humboldt Bay. Canoes and kayaks are popular for exploring the salt marshes that ring Humboldt Bay. In addition to the improved non-motorized boat launching facilities, there are several launch areas that are appropriate for canoes and kayaks around Humboldt Bay. A public canoe/kayak launch area is located at Woodley Island Marina. In addition, canoe and kayak rentals, sales and lessons are also available at Woodley Island.

Visitor Services Standards

The Service Manual (605 FW 1, Section 1-7) provides Service policies, strategies and requirements for management of wildlife-dependent recreation programs within the National Wildlife Refuge System (Refuge System).

The Service Manual (605 FW 1, Section 1.6) states: the Refuge System provides a unique opportunity to ensure that we approach our compatible wildlife-dependent recreation programs from the perspective of the Refuge System mission and goals. We believe wildlife-dependent recreation that comports well with the following criteria will continue to meet the needs and desires of refuge visitors. To ensure continued visitor satisfaction with our wildlife-dependent recreation programs, we incorporate public input using visitor satisfaction surveys, feedback given in person or other instruments, including input during the development of the CCP and VSP, that help us define and evaluate wildlife-dependent recreation programs at Humboldt Bay NWRC. We develop our wildlife-dependent recreation programs in consultation with State fish and wildlife agencies and stakeholder input based on the following criteria:

- Promotes safety of participants, other visitors, and facilities;
- Promotes compliance with applicable laws and regulations and responsible behavior;
- Minimizes or eliminates conflict with fish and wildlife populations or habitat goals or objectives in an approved plan;
- Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation;
- Minimizes conflicts with neighboring landowners;
- Promotes accessibility and availability to a broad spectrum of the public;
- Promotes resource stewardship and conservation;
- Promotes public understanding and increases public appreciation of America's natural resources and our role in managing and conserving these resources;
- Provides reliable/reasonable opportunities to experience wildlife;
- Uses facilities that are accessible to people and blend into the natural setting; and
- Uses visitor satisfaction to help define and evaluate programs.

Section A: Humboldt Bay NWR

Welcome and Orient Visitors

We will assure that our refuge is welcoming, safe and accessible. We will provide visitors with clear information so they can easily determine where they can go, what they can do, and how to safely and ethically engage in recreational and educational activities. Facilities will meet the quality criteria defined in 605 FW 1, Section 1.6 of the Service Manual. We will treat visitors with courtesy and in a professional manner.

Welcome and Orient Visitors Goals/Objectives

Our Visitor Services goal is to:
Provide public with safe, high-quality wildlife-dependent recreation and volunteer opportunities to enhance public appreciation and understanding of fish, wildlife, plants, and habitats of Humboldt Bay and associated watersheds.

Welcome and Orient Visitors Strategies

1. Improve directional signage on refuge entrance road and parking lot.
2. Create new interpretive areas along entrance road to welcome and orient visitors.
3. Improve signage on buildings and trails to better welcome and orient visitors.

Current Program

In compliance with the policies governing National Wildlife Refuges, Humboldt Bay National Wildlife Refuge (HBNWR) is a welcoming, safe, and accessible facility. We provide visitors with clear information so they can easily determine where they can go, what they can do, and how to safely and ethically engage in recreational and educational activities. The facilities found on Humboldt Bay NWR are high-quality, clean, well-maintained, and accessible. We treat visitors with courtesy and in a professional manner.

The Richard J. Guadagno Headquarters and Visitor Center (Visitor Center), headquarters for the Humboldt Bay NWR Complex, is located just off the Interstate Highway 101, exit 696. Refuge signs are visible on the interstate from both the southern and northern approach.

Entrance to Richard J. Guadagno Headquarters and Visitor Center. Photo: USFWS

Once inside the refuge gates visitors drive approximately ½ mile before they initially see several buildings (the former refuge headquarters, refuge staff housing) and then come to a paved parking area and the Visitor Center. It is not compatible with overall resource management and visitor safety to have a separate auto tour route at Humboldt bay NWR. However, wildlife viewing opportunities are often available to visitors as they drive on the refuge entrance road. An interpretive pullout is provided on the entrance road just past the cattle guard to view geese and other wildlife. Once at the Visitor Center parking lot, visitors are drawn into the building by a breezeway and wildlife viewing deck. Refuge volunteers continue to develop native landscaping in the area around the facilities. Just to the west of the entrance is a small garden memorial dedicated to Richard J. Guadagno, the former refuge manager that was killed on September 11, 2001 aboard Flight 93 in Pennsylvania.

Memorial dedicated to former refuge manager, Richard J. Guadagno. Photo: USFWS

Inside the Visitor Center (open 7 days per week, 8am to 5pm, except Federal holidays), visitors are greeted by refuge volunteers and/or staff who work the reception area. The volunteers are knowledgeable about the refuge and welcome visitors. This personal touch helps the visitor feel welcome and also provides them with information about what to see and do at the refuge, or in the surrounding area. The Visitor Center also has an attractive series of dioramas which display a sample of the habitats, wildlife and plants found in the South Bay and Dune Units and at Castle Rock NWR. In addition, there is a large viewing room that looks out over a seasonal wetland supplied with spotting scopes for observing wildlife as well as a large screen TV for viewing FWS (and other) feature films. This room can be reserved for meetings and also has one corner called the "Fledgling Fort". This area has been outfitted by the Friends of Humboldt Bay NWR (FHBNWR), and dedicated as a space for smaller children to read, do art, or take part in other pertinent environmental education and interpretation activities.

Two brochures directly relating to the refuge are available at the front desk. The general refuge brochure is informative, attractive, and meets Service standards (Appendix A). It provides visitors with information on local ecology, a list of things to do and see on the refuge along with refuge maps. The second brochure is a list of fish, wildlife and plants found in the Humboldt Bay area. The refuge also maintains a current and informative web site. Many other brochures are available inside the Visitor Center relating to local activities, invasive weeds and maps of water trails and hiking trails found in the Humboldt Bay area.

Also visible from the parking lot is an old hunting clubhouse and beyond that a large old barn. The old hunting clubhouse is in need of restoration but was one of the oldest clubs in the state of California. The barn is architecturally interesting and is regularly the subject of artists and photographers.

Table B–1. NWR System 6 Priority Uses at Humboldt Bay NWR—15 Year Projection

Category of Use	Current Use	Anticipated Use[5]	% Increase
Waterfowl Hunting	1,500	1,800	20%
Salmon Creek Unit [1]	1,100	1,200	9%
All Other Units	400	600	50%
Fishing [2]	200	250	25%
Wildlife Observation/ Photography [3]	20,000	35,000	75%
Environmental Education/ Interpretation [4]	2,200	4,400	100%

Footnotes:
[1] *Maximum capacity is approximately 3600 hunters per season*
[2] *Fishing opportunities are relatively few and use is light; mainly for sharks at very high tides*
[3] *Population growth and increased lands/facilities should justify*
[4] *500 students per year in field trip visits, 1100 visitors per year for special events, 600 visitors per year for guided walks*
[5] *15-year projection of estimated anticipated use in 2024*

* *All numbers are approximate estimates*

Proposed Changes
There are plans for improved directional signage, an improved refuge entrance area that will include a gate, turn around area for large vehicles with trailers, and additional orientation signage and information. Additions to the Richard J. Guadagno Visitor Center will include an entrance sign at the apex of the breezeway entrance and orientation, informational and interpretive panels in the breezeway, viewing deck and boardwalk areas. Future plans would add a small bookstore to the Visitor Center and call for the installation of a video camera that would feed live wildlife footage back to the large screen TV in the viewing room.

Plans currently call for conversion of the old hunting clubhouse into an interpretive "Historic Hunt Cabin" with exhibits focused on early land management, the waterfowling history of Humboldt Bay, and the role that waterfowl management has played in conservation both locally and nationally. The refuge staff is evaluating the potential and costs of using part of the old barn for Environmental education/interpretation or maintaining it in a functional state into the future. Currently the barn is in need of maintenance and is used for the storage of refuge equipment.

The Ma-le'l Dunes Unit (acquired in 2005) is proposed to open to the public in 2008-2009 with the implementation of the Ma-le'l Dunes Unit Cooperative Management Area Access Plan (Appendix B). This unit will provide opportunities for wildlife observation, photography, environmental education and interpretation, hunting and fishing.

Monitoring and Evaluation
Visitation is monitored by several systems. A network of traffic and trail counters records both types of use at the units of highest visitation. A record of visitors per day is kept at the Visitor Center. This information is entered into a computer database kept current each month. School visitation numbers, off-site outreach, multipurpose room use by the community and special events attendance records are all recorded into separate computer databases.

Hunting History and Opportunities at the Refuge

Hunting is a wildlife-dependent recreational use and, when compatible, an appropriate use of resources in the Refuge System. Humboldt Bay NWR's hunting program will meet the quality criteria defined in the Visitor Services Standards above and will be carried out in a manner consistent with State laws, regulations, and management plans. Waterfowl hunting has taken place on the refuge since establishment in 1971 and on the Salmon Creek Unit since 1988, when it was acquired. The capacity for hunters at Salmon Creek Unit under current operations in approximately 1100 hunters per year. We really have no cost effective way to reliably estimate the amount of hunting that takes place on other refuge units.

Hunt Program Goals

- Provide a quality wildlife-dependent recreational experience, using a renewable natural resource.
- Promote hunter education and ethics through information and enforcement of hunting regulations and compliance with compatibility determinations.
- Provide mobility-impaired hunters accessible blinds and a quality experience.
- Promote designated hunts and educational opportunities for youth hunters.

Hunt Program Objectives

- Within 15 years maintain and improve existing waterfowl, coot, common moorhen and snipe hunting program to accommodate a minimum of 1,200 hunter opportunities per year on the Salmon Creek Unit and continue waterfowl, coot, common moorhen and snipe hunting on Table Bluff, Eureka Slough, and Jacoby Creek Units as well as Egret Island, Teal Island, and Hookton Slough, concurrent with state regulations.
- Improve information and outreach of existing regulations.
- Open limited areas of the Ma-le'l Dunes Unit to waterfowl, coot, common moorhen and snipe hunting and retrieval and provide two additional junior-only hunting days on the Salmon Creek Unit.

Rationale

The existing (1990) Humboldt Bay NWR Sport Hunting Plan has been revised concurrently with the preparation of the Humboldt Bay NWR Complex's CCP (Appendix C).

Hunting is one of the six priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997. Currently waterfowl hunting regulations on the Salmon Creek Unit are temporally less permissive than State hunting regulations, but otherwise identical. Hunting on the Salmon Creek Unit is permitted from legal shoot time to 3 p.m. on Tuesdays and Saturdays of the regular waterfowl hunting season (usually the third weekend in October through the last weekend in January). Waterfowl, coot, common moorhen and snipe hunting is permitted on the Table Bluff, Eureka Slough, and Jacoby Creek units, including Egret Island, Teal Island and Hookton Slough, concurrent with state regulations. In the best professional judgment of the Humboldt Bay NWR Manager, restricting the number of days per week that hunting occurs on the Humboldt Bay NWR maintains a high quality hunting experience. Upland game (except snipe) and big game hunting is not permitted on the Humboldt Bay NWR due to the small size of potential hunt areas, safety issues, and likelihood for conflicts with other priority wildlife-dependent recreational uses recognized by the Improvement Act.

New waterfowl hunter check station and parking area constructed in 2005. Photo: USFWS

After multiple discussions with hunters and their representatives, the following adjustments will help balance public use goals at the Ma-le'l Dunes Unit. Hunting will be allowed on the portion of Fernstrom-

Root Islands owned by the Service, but no permanent blind construction is permitted. Areas of Ma-le'l Island within the Service's jurisdiction, adjacent to Fernstrom-Root Island and the Viqhul Trail, will only be open to retrieval of downed waterfowl, not active waterfowl hunting. Lastly, educational materials on hunting and the rights of all refuge wildlife-dependent recreation user groups will be posted at the Ma-le'l Dunes Unit to avoid conflicts between different user groups. Portions of the recently acquired Ma-le'l Dunes Unit adjacent to the Mad River Slough, while privately owned, were hunted for waterfowl, coot, and snipe prior to acquisition by the Service, so the refuge will be opening portions of these areas to hunting and/or retrieval from adjacent areas that are open to hunting.

Limited youth only hunting opportunities in the Humboldt Bay area and the high quality of waterfowl hunting on the Salmon Creek Unit justifies the addition of two days for junior (age 16 and under) only hunts. In addition, allowing less experienced junior hunters to learn hunting skills outside of the regular hunting times will avoid impacts on the quality of the hunting experience for regular, more experienced hunters.

Potential Hunting Strategies

1. Maintain current sport hunting program as described in the updated Humboldt Bay NWR Waterfowl Hunt Plan.
2. Continue to fund and use MOUs with Federal, State and local agencies for law enforcement support.
3. Follow necessary procedures to permit waterfowl hunting on portions of the island salt marsh areas of the recently acquired Ma-le'l Dunes Unit.
4. Add two junior only waterfowl hunt days per season at the Salmon Creek Unit.
5. Improve interpretation and outreach, especially on Salmon Creek, Hookton Slough, Jacoby Creek, and Ma-le'l Dunes Units to make sure that where hunting and other wildlife dependent visitor uses come together, all users are aware and all uses are managed for maximum mutual compatibility.
6. Conduct daily bag checks (i.e., verify number and species of waterfowl) – which will promote compliance with regulations and to keep biological data on species harvest.
7. Improve hunt program record keeping by improving harvest record card.
8. Improve directional signs in the hunt area on the Salmon Creek Unit.
9. Create new maps of hunting areas to improve accuracy and improve the quality of the hunting experience and the efficiency of the hunting system.
10. Increase staffing of hunter check station, to a minimum of two individuals per hunt day (Humboldt Bay NWR staff, temporary hires/contractors, or volunteers) to best manage refuge hunt.
11. Modify hunting pit blinds to prevent stranding of wildlife.
12. Post additional boundary signs on the Eureka Slough Unit, the Jacoby Creek Unit, the Table Bluff Unit, Egret Island, Teal Island, and Hookton Slough.
13. Enforce boat in only regulations on Humboldt Bay NWR land on the Eureka Slough Unit (ESU) and the Jacoby Creek Unit in order to meet USFWS safety standards.
14. Work with CDFG, HBHRCD and USFWS Solicitor's Office to clarify legal jurisdiction of over-water hunting in bay sloughs and salt marsh islands.
15. Seek funding for a new FTE Visitor Services Assistant/Volunteer Coordinator position to assist in planning and implementing projects.
16. Increase law enforcement on the Humboldt Bay NWR, especially during waterfowl season, by contract or through support from other Service law enforcement staff.

Current Program
See Chapter 3 of the CCP

Proposed Changes
See Waterfowl Hunt Plan (Appendix C of the CCP)

Monitoring and Evaluations
See Waterfowl Hunt Plan (Appendix C of the CCP)

Provide Quality Fishing Opportunities

Sport fishing (fishing) is a wildlife-dependent recreational use and, when compatible, an appropriate use of resources in the Refuge System. Fishing programs will meet the quality criteria defined in the Visitor Services Standards above and be carried out in a manner consistent with State laws, regulations and management plans as well as refuge specific regulations.

Fisherman at the Hookton Slough non-motorized boat dock. Photo: Shannon Smith

Fishing Objectives

- Maintain existing sport fisheries program. Provide fishing opportunities at the Ma-le'l Dunes Unit.
- Collaborate with CDFG and other local agencies and private entities to increase awareness of fishing and shellfishing opportunities on the Humboldt Bay NWR and/or in Humboldt Bay.

Rationale
The existing (1990) Humboldt Bay NWR Sport Fishing Plan has been revised concurrently with the preparation of the Humboldt Bay NWR Complex's CCP (Appendix D).

Fishing is one of the six priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997. Most local fishing occurs in freshwater areas that are not within the refuge boundaries. Limited fishing does occur for sharks, rays, and shellfish on Humboldt Bay NWR. Shell fishing is most popular on South Bay mudflats. Many other freshwater and saltwater fishing areas are located nearby to the Humboldt Bay NWR.

While fishing opportunities on the Humboldt Bay NWR are limited, fishing is a priority wildlife dependent recreational use recognized by the Improvement Act and additional outreach may promote its use by the public.

Potential Fishing Strategies

1. Maintain current fishing program as described in the updated Humboldt Bay NWR Sport Fishing Plan.
2. Continue to fund and use MOUs with Federal, State and local agencies for law enforcement support.
3. Incorporate elements of the Service's initiatives (e.g., Connecting People with Nature).
4. Enhance outreach and education on fishing regulations and opportunities on Humboldt Bay NWR.
5. Increase signage at allowable sport fishing sites.
6. Advertise and participate in events which promote fishing (the Service's initiatives (e.g., CDFG free fishing day, FWS fishing days).
7. Conduct outreach at pertinent events, such as Harbor District Maritime Expo.
8. Increase law enforcement on the Humboldt Bay NWR by contract or hiring a seasonal law enforcement officer.

Current Program
See Chapter 3 of the CCP

Proposed Changes
See Sport Fishing Plan (Appendix D of the CCP)

Monitoring and Evaluations
See Sport Fishing Plan (Appendix D of the CCP)

Provide Quality Wildlife Observation and Photography

Visitors of all ages and abilities will have an opportunity to observe and photograph key wildlife and habitat on the refuge when it is compatible with the refuges purposes. Viewing wildlife in natural or managed environments should foster a connection between visitors and the natural environment.

The trails in the Lanphere Dunes Unit pass near fragile forest habitats and out onto the foredune complex. Guided tours help visitors understand the ever changing ecosystem. Photo: © Yvonne Everett

Wildlife Observation and Photography Goal

To provide the public (especially children) with accessible, safe, high-quality wildlife-dependent recreation opportunities to enhance the public's appreciation and understanding of Humboldt Bay's fish, wildlife, plants, habitats and associated watersheds.

Wildlife Observation and Photography Objectives

- Within 15 years provide 35,000 annual wildlife observation and photography visitor opportunities by land and water trails (see Table B-1).
- Within 15 years provide 1.5 miles (entire Shorebird Loop Trail) of wheelchair accessible trail.
- Provide a total of 3.5 miles of Americans with Disabilities Act (ADA) compliant trail at Salmon Creek (1.5 miles), Hookton Slough (1.5 miles), and Ma-le'l Dunes (.5 mile) units.
- Within 2 years, implement all phases of the Ma-le'l Dunes Cooperative Management Area Access Plan which includes: an expanded trail system, interpretive panels, a viewing deck, a volunteer caretaker, and restrooms at the Ma-le'l Dunes Unit. The majority of these improvements will be acquired through a grant from the California Coastal Conservancy.

Rationale

Wildlife observation and photography are two of the six priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997. Despite a small staff and a refuge of relatively small size, all six priority public uses are made available at Humboldt Bay NWR. With few exceptions, the vast majority of wildlife species found on the refuge can be viewed and/or photographed from existing trails and/or blinds. A common comment from the public at this and many other refuges is, "The trails you have are great but we would like to hike/bike/drive around the rest of the refuge". While this desire to "see the rest of the refuge" is understandable, it is often not compatible when considered cumulatively with all other actions occurring on the refuge. Managers need to clarify for the public the distinction between managed wildlife-dependent recreation and the (public's) perception of all areas of the refuge being open.

Similar to national trends, there is a large and growing desire for wildlife observation and photography opportunities on the Humboldt Bay NWR. If additional staff and project resources are available, the refuge could provide increased opportunities for wildlife observation and photography from refuge facilities, if compatible.

When coordinating with oyster growers on water quality concerns related to non-motorized boating on Mad River Slough, the Service will also coordinate with non-motorized boating groups and/or individuals, such as kayakers, that have expressed an interest in these discussions.

Potential Wildlife Observation and Photography Strategies

1. Maintain existing Visitor Services Programs and infrastructure, making all as fully accessible as possible. Include completion and upgrading of interpretive exhibits, panels, and signage plans.
2. Work with Friends Groups and other partners to develop and implement FWS Initiatives (Connecting People with Nature, Schoolyard Habitats and Birding Initiatives).

3. Develop wheelchair access out to the kiosk on the Salmon Creek Unit and on the Ma-le'l Dunes Unit Tsoutsgish Trail.
4. Continue to collaborate with Friends Groups and other partners to provide wildlife observation day use opportunities.
5. Continue to work with local and national wildlife photography groups (and individuals) to improve wildlife photography day use opportunities on the refuge, including a fully accessible photo blind.
6. Install a wildlife camera on the Salmon Creek Unit which will provide opportunities for "live action" wildlife observation from the closed portion of the refuge back to a large screen TV at the Visitor Center.

View from Visitor Center deck towards the Shorebird Loop Trail and Table Bluff. Photo: USFWS

7. Monitor and assess disturbance caused by different public uses on Humboldt Bay NWR to both develop a baseline of use and provide the best possible management direction regarding existing and proposed future uses.
8. Work with partners to fully implement Ma-le'l Dunes Cooperative Management Area Access Plan.
9. Work with HBHRCD, Redwood Community Action Agency (RCAA) and Humboldt Bay boating groups to produce an assessment of needs for safe, compatible boating experiences (including the proposed bay trail(s)) on or adjacent to the refuge and then implement recommendations.
10. Work with same groups on producing guidelines and doing outreach to boating community on avoiding impacts (especially disturbance) to natural resources on and around the bay.
11. Provide both signage and brochures explaining the need to maintain high water quality, how/where to properly dispose of waste, and the need to be good stewards of the bay.
12. Assess opportunities to increase seasonal day use hiking on the Salmon Creek Unit around the hunt area or other areas which are normally closed to the public.
13. Work with CA Coastal Conservancy, HBHRCD, Redwood Community Action Agency (RCAA), City of Arcata, Humboldt County, and groups interested in the "Trail Around the Bay" to assess the potential and compatibility of a bay trail(s)) on or adjacent to the refuge.
14. Seek funding for a new FTE Visitor Services Assistant position to assist in planning and implementing projects.
15. Increase law enforcement on the Humboldt Bay NWR by contract or hiring a seasonal law enforcement officer.
16. Assess need to implement a fee collection program.

Current Program

One of the main goals of Humboldt Bay NWR is to provide all sectors of the public with quality wildlife observation and wildlife photography opportunities. Wildlife can usually be seen while traveling down the entrance drive to refuge headquarters. Once at headquarters, a universally accessible deck and short boardwalk attached to the Richard J. Guadagno Visitor Center provides a wildlife observation area for all visitors, including those with severe mobility challenges. The Shorebird Loop Trail (1.7 miles round trip) adjacent to the Visitor Center is level and consists of gravel and packed dirt. The trail provides visitors with wildlife viewing and photography opportunities and features an observation kiosk and interpretive panels. The trail is open during Visitor Center hours seven days per week. The trail passes along seasonal freshwater wetlands, eventually leading to a permanent brackish pond and the eastern edge of Hookton Slough. A spur trail from the Shorebird Loop Trail leads to the refuge's permanent photography blind. The photography blind is open seasonally, depending on water conditions. Reservations are required for the photography blind. Visitors use the refuge website to obtain availability and reservation information for the photography blind. Additionally, numbered posts along the trail correspond to a trail guide developed by the Friends of Humboldt Bay NWR. The trail guide provides additional historical, biological and

regional information to visitors. Trail guides, wildlife lists, and plant lists are available at the Visitor Center. Binoculars and a "Discovery Pack" are also available for checkout. Discovery packs include identification guides for plants, animals, tracks and scat, binoculars, magnifying glasses and a field notebook.

The Hookton Slough Unit is open daily from sunrise to sunset. The 1.5 mile trail (one way) starts in the parking area and follows the south bank of Hookton Slough. Visitors pass along grasslands, marsh, freshwater, saltwater, and mudflat habitats. The trail is level, graveled, and has interpretive panels. Maps of a boating trail that leads through Hookton Slough to South Bay can be found inside the Humboldt Bay NWR brochure. A boat dock for use by non-motorized boats is available to the public at Hookton Slough. There are also vault style restrooms at the parking lot. Trail maps for the Salmon Creek and Hookton units are available on the refuge website and in the Visitor Center (Appendix C).

The Lanphere Dunes Unit is accessible only by permit or guided tours. This unit of the refuge has guided walks led once a month by the Friends of the Dunes. Refuge staff also leads walks when time permits.

There are four hiking trails at the Ma-le'l Dunes Unit of the refuge. This first is the Tsoutsgish Trail. The Tsoutsgish Trail extends 2,800 feet north from the Ma-le'l North parking area along a berm that once held an old railroad line on the edge of the Mad River Slough. It serves as the entry route to a forest loop and beach access trails found throughout the Ma-le'l Dunes Unit. Trail maps for Lanphere and Ma-le'l Dunes units are available on the refuge website and in the Visitor Center (Appendix D). Improvements along this trail (taken from the Ma-le'l Dunes Unit Cooperative Management Agreement (MDUCMA) will include:

- Preliminary upgrade which will include trail clearing and grubbing to a 3' minimum width, and an 8' overstory clearance.
- ADA accessibility upgrade to the trail.
- Installation of "bio-engineered" erosion control measures to protect the berm and the installation of benches and a wetland view deck.

To accommodate ADA accessibility, along the Tsoutsgish Trail, typical design requirements will be based on CalDAG 2000 and should include:

- 48-inches minimum trail width, which may be reduced to 36-inches in areas where significant site disruption would otherwise occur.
- Minimum 60 inches x 60 inches passing/rest area at minimum 200 feet apart, or two rest areas for every 400 feet.
- Hard surfaces such as asphalt, natural emulsion pavement or concrete.
- Trail gradients maximum running slope 5 percent and cross gradient 2 percent.
- One ADA accessible parking space should be provided at trail parking lot.
- Maintain 36-inch clearance between gates or bollards.

The Kimuk (meaning whale in Wiyot) Trail, is a proposed new trail that will extend from the Tsoutsgish Trail up a large dune, past a dune overlook, over open sand and nearshore dunes, to the beach. It passes through the corner of Ma-le'l South/BLM property, a portion of Humboldt Bay wallflower populations, and nearshore dunes densely vegetated with European beachgrass.

The Kimuk Trail will include the following improvements:

- The trail will be marked with trail markers at appropriate sight distances for clear trail delineation, as discussed in the signing section.

The Dap (meaning "spruce roots" in Wiyot) Loop, consists of portions of an existing trail through the forest that will loop northward from the Tsoutsgish Trail. The Dap Loop will include the following improvements:

- At the Dap Loop trailhead steps and rail will be installed to ease access to Ma-le'l Dunes Cooperative Management Area and eliminate erosion potential.
- Along the Dap Loop approximately 150 feet of steps and rail will be installed to replace a dilapidated wooden staircase.
- The trail that leads to the bank of Iron Creek will be decommissioned in order to eliminate impact to salt marsh vegetation.

Visitors learn to paint shorebird and duck silhouettes at the Humboldt Visitor Center during Family Fun Days.
Photo: Shannon Smith

The Viqhul (meaning salal berry in Wiyot) trail is an existing spur trail extending from the Dap Loop to the northwest to an open clearing next to the salt marsh. The trail is relatively flat and no significant improvements are planned.

The Hout (meaning surfish in Wiyot) Trail, will be an open dune trail to the beach that extends from the forested Dap Trail. The trail will ascend a large dune, descend to nearshore dunes, and cross a seasonal wetland where it will continue over the primary dune system to the beach. Hikers can return to the forest by following this trail in reverse or by walking south on the beach strand for approximately 1,000 feet to a marked trail that re-enters the foredunes and returns to the Ma-le'l North parking area via the Kimuk Trail. The set of trails could also be hiked in reverse by starting at the Kimuk Trail. The Hout Trail may include the following improvements:

- A new, less steep forest exit, or forest egress, will be delineated at the Hout trailhead and cable steps will be installed to enhance access up the dune and out of the forest.
- The trail will be marked with trail markers at appropriate sight distances for clear trail delineation, as discussed in the signing section. In particular, a marker will be placed north of the large dune that is visible from the top of the forest dune egress steps.

A small puncheon-style footbridge will be installed in the foredunes across the seasonal wetland.

Proposed Changes
See Proposed Wildlife Observation and Photography strategies for proposed changes.

Monitoring and Evaluation
Vehicle and trail counters on the refuge assist in monitoring the number of visitors monthly. Docents at the Visitor Center also keep track of visitors to the Salmon Creek Unit daily. The Visitor Center is staffed seven days a week by staff and volunteers. Staff and volunteers engage visitors in conversations that help evaluate the wildlife viewing facilities and program. Also, question and comments from our website visitors help assess our wildlife viewing program.

Provide Quality Environmental Education and Interpretation Opportunities

Volunteer leads an environmental education program on the Dunes.
Photo: Andrea Pickart

Environmental Education and Interpretation Objectives

- Within 15 years provide wildlife-dependent educational opportunities for at least 8 school or community groups per month and 35,000 annual visitor opportunities for interpretive experiences on and off refuge to foster public awareness and appreciation of the natural heritage of the north coast (see Table B-1). The current program includes 3 walks monthly at Salmon Creek Unit and 1 walk monthly at both Lanphere Dunes Unit and Ma-le'l Dunes Unit. With the addition of a 1/2 time FTE, 8 groups per month is reasonable goal.
- Develop a "Children's Outdoor Exploration Area" at the Salmon Creek Unit to provide unstructured environmental education opportunities for children.
- Within 3 years complete the Salmon Creek "Historic Hunt Cabin."
- Assess feasibility for an on-site environmental education outdoor classroom facility on the Salmon Creek Unit.

Rationale

Environmental education and interpretation are two of the six priority visitor uses identified in the National Wildlife Refuge System Improvement Act of 1997. The Humboldt Bay NWR provides a unique opportunity for the local community to experience pristine dune habitats, native bay habitats, and wildlife in proximity to an urban area with multiple educational institutions. Refuge-based environmental educational and interpretive activities can also be integrated into both indoor and outdoor classroom curricula. Interpretive activities can introduce the public to habitat management activities and familiarize them with the conservation efforts that protect local natural resources. The activities currently offered at the refuge are primarily the result of collaboration with refuge Friends groups and volunteer efforts, which we will seek to enhance.

If additional staff and project resources are available, the refuge will work with Friends groups, volunteers and others to provide additional environmental education and interpretation opportunities to foster public awareness and appreciation of Humboldt Bay and north coast's unique natural heritage; which will ultimately help to fulfill the purposes for which the refuge was established. The refuge will look at opportunities to implement existing (Junior Duck Stamp, The Nature of Learning, Project WILD, Shorebird Sister Schools, etc.) and new (Children in Nature, Schoolyard Habitats) environmental education and interpretation initiatives from the Service and others.

Potential Environmental Education and Interpretation Strategies

1. Maintain existing Visitor Services Programs and infrastructure, including completion and upgrading of interpretive exhibits, panels, and signage plans
2. Maintain, improve, and keep updated refuge website to provide information on refuge complex history, management, visitor service opportunities and current events.
3. Continue to offer guided bird walks by Friends of the Humboldt Bay NWR (FHBNWR) every other week and Audubon Society once per month.

4. Continue to offer Humboldt State University and College of the Redwoods professors, high school classes, and other local citizens' access to the Salmon Creek, Lanphere and Ma-le'l Dunes Units for guided and self-guided educational tours and study.
5. Continue to offer Friends of the Dunes guided natural history walks on the Dunes Units (once per month).
6. Continue to coordinate with the Friends of the Dunes (FOD), which leads a restoration work day one time per month on MDU or LDU and for their annual Spring Breakaway event.
7. Continue to coordinate with Friends of the Dunes for the annual lupine bash, work to involve additional partners (particularly North Coast Chapter of California Native Plant Society).
8. Continue to participate in interpretive events both on the refuge and off (ex. Aleutian Goose Fly-Off, CA Waterfowl Outdoor Adventure Day, CA State Fair, Humboldt County Fair, Godwit Days, ACG Festival, NWR Week, etc.).
9. Continue to offer a seasonal lecture series (3-6 per year) that interprets pertinent natural and cultural resources.
10. Continue to offer occasional presentations to community groups and college/university classes (four to six per year).
11. Continue to offer a self-guided trail guide, produced by FHBNWR, on the SCU.
12. Build on existing Outdoor Youth Days event and offer multi-day programs during the summer (i.e., Day Camp, Jr. Ranger/Naturalist, over-night experiences, etc.).
13. Work with refuge Friends Groups to locate and develop a "Children's Outdoor Exploration Area" at the Salmon Creek Unit to provide "unstructured" EE/I opportunities for children.
14. Work with the Regional Office, AFWO, and Friends Groups to develop/implement environmental education programs that could include: Junior Duck Stamp, Schoolyard Habitats, Nature of Learning, Bay to Dunes, Shorebird Sister Schools, Salmon Creek Watershed Education, and others.
15. Work with AFWO and two schools in the bay area to develop pilot Schoolyard Habitat Projects.
16. Complete the "Historic Hunt Cabin", which will interpret the history of the Salmon Creek Unit and how it came to be, refuge development, and the historic role of waterfowl management in Humboldt Bay NWR and the Refuge System.
17. Develop interpretive outreach for the public about the historical support hunters and fishermen have provided for the refuge system and conservation.
18. Assess feasibility of conversion of the barn or construction of a new covered outdoor structure for environmental education wet lab type activities.
19. Investigate finding grants and/or community assistance to acquire rain gear for use by K-12 visitors and facilitate visitation by economically challenged members of the community (i.e., shuttle buses/vans, etc.).
20. Develop an off refuge wildlife presentation for K-12.
21. Develop traveling trunks of educational materials for use by staff and/or Friends on and off-site.
22. Facilitate teacher training workshops so that teachers can lead environmental education field trips.
23. Create a curriculum that corresponds to California state education standards to cultivate an appreciation for refuge resources.
24. Design training guide for volunteer docents who would like to lead environmental education activities.
25. Provide for additional program assistance through trained volunteers, friends, interns, grant funding, and other partnerships.
26. Develop and implement greening policies and then interpret greening activities completed on the refuge.
27. Seek funding for permanent full-time Information and Education Specialist and Volunteer Coordinator positions to assist in planning and implementing projects.

Current Environmental Education Program

Currently the refuge offers pre-scheduled classroom visits, drop-in classroom visits and field trips to local school districts. School groups to the refuge can choose to have a self- guided or tour guided by refuge staff and volunteers. Schools can also choose from a variety of environmental education options, including hands on projects or experiments designed by refuge staff and local educators and media materials developed by the Fish and Wildlife Service.

Tours and educational walks are also led on the Lanphere Dunes Unit. Additionally, an environmental education curriculum called Bay to Dunes has been developed by the Friends of the Dunes, a Friends group of Humboldt Bay NWR. This curriculum is taught in area elementary schools when funds allow. The environmental education and outreach services of the refuge will continue to expand with the addition of full-time environmental education staff in the future.

Current Interpretation Program
Humboldt Bay NWR offers many special events throughout the year to interpret key resources and issues to the general public. These include the Aleutian Goose Fly-Off and Family Fun Weekend, Outdoor Adventure Day in partnership with the California Waterfowl Association and National Wild Turkey Federation, the Annual Youth Hunt Day in partnership with California Waterfowl Association, National Wildlife Refuge Week events and Earth Day. In addition, the refuge offers a series of quarterly talks called "Friday Nights at the Refuge." A variety of speakers present on a diversity of topics related to natural resource management. The refuge has also developed outreach materials both in the visitor center and on the refuge website to familiarize visitors with key wildlife and issues relating to the refuge such as a featured species of the month, "Nature's Calendar", track plate and touch box exhibits and interpretational exhibits.

Bureau of Land Management Chief Ranger Jeff Knisley checks a youth hunter's bag at Humboldt Bay NWR.
Photo: Sean Brophy

Staff and volunteers of the refuge also lead tour groups regularly and provide on site assistance and information for all facets of interpretation of the refuge's resources and management. Refuge brochures and handouts containing information on the refuge, watchable wildlife, hunting, environmental education, photography and fishing programs are utilized by visitors. A variety of videos about the Fish and Wildlife Service and the National Wildlife Refuges System are available upon request. Development of a video highlighting the story of the Aleutian Cackling Goose, a key species of the refuge, is also underway. Refuge related information is also provided at annual local festivals and events such as the Aleutian Goose Festival and Godwit Days.

Proposed Changes
If additional staff and project resources are available, the refuge should provide additional environmental education and interpretation opportunities to foster public awareness and appreciation of the unique natural heritage of the Humboldt Bay and north coast area, which will ultimately help to fulfill the purposes for which the refuge was established.

The refuge will work with schools and colleges to integrate environmental concepts and concerns into structured educational activities. These refuge-lead or education-conducted activities are intended to actively involve students or others in first-hand activities that promote discovery and fact-finding, develop problem solving skills, and lead to personal involvement and action. Refuge staff will promote environmental education that is aligned to the current Federal, State and local standards, is curriculum based, meets the goals of school districts adopted instructional standards, and provides interdisciplinary opportunities that link the natural world with all subject areas. The environmental education program will be managed in accordance with Service Manual 605 FW 6 Environmental education.

Monitoring and Evaluation
The reservation and application process to schedule an Environmental Education and Interpretation visit assists refuge staff in monitoring the environmental education programs. The application (available in paper copy and on the refuge web site) records the name of the school, teacher, and date, educational goals for the visit, arrival and departure time, number of students and adults, grade level, items requested for loan, and requested environmental education activities. Teacher feedback assists with managing the environmental education and interpretation programs. Sign-in sheets for tours led by staff and volunteers monitor the level of interpretation provided. Annual on and off refuge events are monitored by refuge staff recording the event and number of participants and are recorded in both an outreach log and an annual report.

Manage for Other Recreational Use Opportunities

We may allow other recreational uses that support or enhance wildlife-dependent recreational uses or minimally conflict with any of the wildlife-dependent recreational uses when we determine they are both appropriate and compatible. We will allow uses that are legally mandated to occur due to special circumstances (606 FW 1).

Communicate Key Issues with Off-Site Audiences

Effective outreach depends on open and continuing communication and collaboration between the refuge and its many publics. Effective outreach involves determining and understanding the issues, identifying audiences, listening to stakeholders, crafting messages, selecting the most effective delivery techniques, and evaluating effectiveness. If conducted successfully, the results achieved will further refuge purposes and the Refuge System mission.

Proposed Changes
Non wildlife-dependent uses are not currently allowed on the refuge. Bicycling is allowed only on the main refuge entrance road at the Salmon Creek Unit and the entrance road at Ma-le'l Dunes Unit.

Monitoring and Evaluation
The refuge will monitor and evaluate the outreach program by following the guidance of the National Outreach Strategy: A Master Plan. A media list for outreach activities is updated annually. Refuge outreach activities, including number of participants, are recorded in an outreach log. Refuge staff networks with local chambers of commerce, civic organizations, educational systems and many partners including the Friends of Humboldt Bay NWR, Friends of the Dunes, California Waterfowl Association, the Audubon Society and others to discuss outreach options and ideas. Suggestions are also taken from the refuge website.

Refuge Outreach, Volunteers, and Partnerships

Volunteer and Friends organizations fortify refuge staffs with their gifts of time, skills, and energy. They are integral to the future of the Refuge System. Where appropriate, refuge staff will initiate and nurture relationships with volunteers and Friends organizations and will continually support, monitor and evaluate these groups with the goal of strengthening important refuge activities and programs. The National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act of 1998 strengthens the Refuge System's role in developing effective partnerships with various community groups. Whether through volunteers, Friends organizations, or other important partnerships in the community, refuge personnel will seek to make the refuge an active community member, giving rise to a stronger Refuge System.

Outreach, Volunteer and Partnership Objective

- Over 15 years refuge staff will collaborate with Friends groups and other regional partners to annually host at least two regionally based environmental education field trips, workshops, seminars, or study courses and refuge staff will take a local leadership role in developing and strengthening partnerships.

Rationale
Part of the mission of the Service is, working with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats. Staff at the Humboldt Bay NWR realizes that all wildlife, plants, and habitats on the refuge are part of an interdependent ecosystem that extends beyond the refuge boundaries. Providing outreach to the public and developing partnerships is the best way to manage the Humboldt Bay ecosystem for the benefit of all. Additionally, when the public and partners are not aware of the refuge and its role in local, regional, and national conservation they are less likely to value, appreciate, or advocate for the resources on the refuge.

If additional staff and project resources are available, the Humboldt Bay NWR should provide additional environmental education and outreach to contribute to protecting the Humboldt Bay ecoregion.

Potential Volunteer and Partnership Strategies (From Visitor Services Alternatives

1. With Friends, volunteers, and staff continue to participate in interpretive events on the refuge (for example, ACG Fly-Off and Family Fun Weekend, CA Waterfowl Outdoor Adventure Day, etc.).
2. With Friends, volunteers, and staff continue to participate in off-site interpretive events (California State Fair, Godwit Days, ACG Festival).
3. Continue to involve volunteers in a variety of refuge programs to strengthen ties with the community.
4. Incorporate elements of FWS Initiatives (Connecting People with Nature and Birding Initiatives).
5. Work with Friends to develop and implement Friends Groups priority projects for the refuge (Children's Outdoor Exploration Area, bookstore, etc.).
6. Pursue funding for permanent full-time Information and Education Specialist and Volunteer Coordinator positions to assist in planning and implementing projects to strengthen and enlarge the volunteer services program, and to provide effective training and program management of the program for a corps of 50-100 volunteers.

Current Program

The Friends and volunteers of Humboldt Bay NWR enrich refuge staff with their gift of time, skills and energy. Humboldt NWR is affiliated with two official friends' organizations: Friends of Humboldt Bay NWR and Friends of the Dunes. The Friends of Humboldt Bay NWR, a relatively new organization, was formed in 2006. They work primarily at the Salmon Creek Unit of Humboldt Bay NWR and provide a multitude of services including greeting visitors at the visitor center, providing information about the refuge, and assisting the office staff and field personnel. The organization also leads several environmental education programs at the refuge and provides outreach into the community at local fairs and events.

Friends of the Dunes (FOD) was established in the mid-1970s to help conserve Lanphere Dunes, an area which did not become part of the refuge until 1997. FOD coordinates a number of conservation and restoration programs for all dune areas around the bay, including the provision of educational walks once a month on the dune units of Humboldt Bay NWR.

Humboldt Bay NWR also hosts an active roster of approximately 100 volunteers that assist with biological, environmental education, interpretive, wildlife observation, hunting, maintenance, outreach events and refuge activities. Additional individuals are signed up for one-time events such as Brush-Up Day of the hunting areas and the Outdoor Adventure Day.

The refuge has also formed strategic partnerships with the Sheriff Work Alternative Program (SWAP), the California Conservation Corps (CCC) and the Youth Conservation Corps (YCC) to provide maintenance work including facilities maintenance, habitat management and invasive weed removal.

Proposed Changes

If additional staff and project resources are available, the refuge should provide additional environmental education and outreach to contribute to protection of the Humboldt Bay ecoregion.

Monitoring and Evaluation

Volunteers are monitored through both an application process that enables refuge staff to match requested volunteer projects by refuge staff with volunteer interests and expertise. Volunteers may participate in specific work projects, special events or on specific days/hours. Each volunteer records their hours daily on time sheets, which are entered into the computer program "VolunteerWorks3.0 ™". This program allows staff to generate monthly and annual volunteer evaluation reports.

Other Applicable Programs

Youth Conservation Corps

The Youth Conservation Corps (YCC) is a well-balanced work-learn-earn program that develops an understanding and appreciation in participating youth of the Nation's environment and heritage. The YCC program will be administered in accordance with Public Law 93-408 and an interagency Letter of Cooperation. It is administered by the Forest Service, the Fish and Wildlife Service, and the National Park Service. YCC offers gainful summer employment to youth 15-19 years of age for approximately eight weeks. The organization and management of individual YCC projects will be governed by program

objectives, budget limitations, and guidelines established by the Service, see Fish and Wildlife Service Manual Part 141. Within these objectives, limitations and guidelines, individual program operations, public information and community relations concerning YCC will be the responsibility of the Host Site Supervisor, who will be the Assistant Refuge Manager.

YCC Objectives

The stated purpose of the YCC is to further the development and maintenance of the natural resources of the United States by America's youth and, in doing, to prepare them for the ultimate responsibility of maintaining and managing these resources for the American people.

There are three equally important objectives as reflected in the law:

1. Accomplish needed conservation work on public lands.
2. Provide gainful employment for young males and females from all social, economic, ethnic, and racial classifications.
3. Develop an understanding and appreciation in the participating youth of the Nation's natural environment and heritage.

The objectives are accomplished in a manner that provides the YCC crew member with an opportunity to acquire increased self-discipline. YCC crew members learn work ethics, how to relate to peers and supervisors, and how to build lasting cultural bridges with youth from other backgrounds.

Current Program

A YCC crew has been maintained each summer at the refuge since the program was first implemented on the refuge during the summer of 2002. The crew of 4 to 6 is supervised by one crew leader. During the eight week program, enrollees complete maintenance, construction, and invasive plant management projects and receive training and exposure to various conservation principles and issues.

Proposed Changes

None

Monitoring and Evaluation

At the end of each YCC program the crew leader prepares a YCC Crew Report detailing work projects completed, hours spent on projects and evaluates the program.

Refuge Law Enforcement

Visitor safety is a key issue in providing high quality wildlife-dependent recreation programs. Visitor safety at refuges is a high priority when developing compatible wildlife-dependent recreation programs. We use environmental education and interpretive programs to alert visitors to safety issues.

Refuge Law Enforcement Objectives

Continue to provide a safe environment for visitors, protect refuge resources, and ensure compliance with regulations through effective law enforcement.

Rationale:

An increasing number of refuge facilities and visitors necessitate an adequate level of safety and security through a law enforcement presence. Illegal activities, such as vandalism and illegal dumping, are present on refuge lands where there are public activities. A strict law enforcement program and the support of refuge partners is necessary to provide a safe, welcoming environment for visitors and staff. A well planned and coordinated program will be necessary to successfully address these concerns.

Refuge Law Enforcement Strategies

1. Continue to develop MOUs with various agencies to improve coordination, improve safety and coordinate efforts in areas of special concerns.
2. Increase law enforcement on the Humboldt Bay NWR by contract or hiring a seasonal law enforcement officer.
3. Provide public education and signage as part of law enforcement programs and provide a sufficient level of law enforcement from various agencies to address these issues.

4. Refuge staff will work closely with CDFG game wardens and Bureau of Land Management (BLM) rangers from surrounding public lands.
5. Annually maintain boundary, closed area, and other public use signs.

Current Program
Currently, there is no full-time nor duel-function refuge officer assigned to Humboldt Bay NWR. An MOU established in FY2007 with BLM provides for ~100 hours annually for law enforcement assistance to the refuge. A FWS zone law enforcement officer is located at Sacramento NWR and the Klamath Basin NWRC occasionally provides law enforcement coverage upon special request. The Humboldt County Sheriff's Department and officers from Humboldt State University also provide some coverage in case of emergency. Additionally, both CDFG and NOAA Fisheries Service provide wildlife law enforcement coverage on an opportunistic basis.

Proposed Changes
Increase law enforcement on the Humboldt Bay NWR, especially during waterfowl season, by contract or by hiring a seasonal law enforcement officer.

Monitoring and Evaluation
All law enforcement activities during the hunting season are recorded in a law enforcement log. An annual meeting between all law enforcement partners is held at the refuge to evaluate the law enforcement program.

Concession Operations
There are currently no concession operations at Humboldt Bay NWR. The Friends of Humboldt Bay NWR plan to eventually install a bookstore in the Richard J. Guadagno Headquarters and Visitor Center.

Fee Programs
The Service is one of four Federal land management agencies (Fish and Wildlife Service, Bureau of Land Management, National Park Service, and National Forest Service), directed by Congress in 1996, to implement or expand fee collection sites as part of a program to explore the feasibility to better offset costs to administer recreation on public lands. In 2004, Congress passed the Federal Lands Recreation Enhancement Act which allows the government to charge a fee for recreation use of public lands managed by the Service, Bureau of Reclamation, National Park Service, Bureau of Land Management, and Forest Service.

A Recreational Use permit, operated under the Recreation Fee Program, is required at Salmon Creek Unit. The fee is used to fund the staff required to maintain a high quality managed hunt, in compliance with the Federal Lands Recreation enhancement Act of 2004. The fee is reduced by 50 percent for permanently disabled hunters and hunters over the age of 62. No fee is charged for hunters 16 and under.

Other
In "Fulfilling the Promise" the Service (USFWS 1999) identified the need to forge new and non-traditional alliances and strengthen existing partnerships with States, Tribes, non-profit organizations and academia to broaden citizen and community understanding of and support for the National Wildlife Refuge System. The Service recognizes that strong citizen support benefits the Refuge System. Involving citizen groups in refuge resource and management issues and decisions helps managers gain an understanding of public concerns. Partners yield support for refuge activities and programs, raise funds for projects, are activists on behalf of wildlife and the Refuge System, and provide support on important wildlife and natural resource issues.

SECTION B: Castle Rock NWR

Introduction and Brief History
Approximately eighty miles north of Humboldt Bay, Castle Rock National Wildlife Refuge (CRNWR) lies about a half mile offshore from Crescent City, California. Castle Rock NWR is part of the Humboldt Bay National Wildlife Refuge Complex (Complex). Purchased in 1979 from the Nature Conservancy, Castle Rock NWR is only 14 acres in size, but is critical to the survival of several hundred thousand seabirds each year. Castle Rock rises 335 feet above sea level with a grassy slope, two large inlets, and cliffs that are important to nesting seabirds in the summer.

Castle Rock. Photo © Stan Harris

The cliffs provide nesting habitat for one of the largest breeding populations (~100,000) of common murres on the Pacific coast. Ten other species of seabirds also nest here, including three species of cormorants, pigeon guillemots, Cassin's and rhinoceros auklets, Leach's and fork-tailed storm-petrels, and tufted puffins. Because many of these bird species nest in burrows and crevices and are primarily nocturnal, they avoid predation by western gulls that also nest on the island. Castle Rock NWR is also a key roost site for up to 20,000 Aleutian cackling geese each winter and spring. Finally, Castle Rock NWR serves as an important haul out (resting site) for marine mammals, including harbor seals, northern elephant seals (both bear pups there), and California and Steller sea-lions.

Castle Rock NWR is closed to the public to prevent disturbance to the seabirds, their habitat, and marine mammals. The birds and mammals of Castle Rock can best be seen in the early morning hours with a spotting scope from Pebble Beach Drive.

Castle Rock NWR Environmental Education and Outreach Goals

Provide high quality environmental education and information to the public regarding the ecology and sensitivity of the wildlife of Castle Rock NWR. Methods should include an existing web cam which is available online, as well as more traditional methods on the mainland including interpretive panels, brochures, and outreach to local communities and schools.

Rationale

Standard visitor service programs are inappropriate for Castle Rock NWR due to the potential for sensitive wildlife disturbance and the general inaccessibility of the island itself. However, by working collaboratively with Humboldt State University (HSU), the National Park Service (NPS), the US Coast Guard (USCG), the Bureau of Land Management (BLM) which manages adjacent islands as part of the California Coastal National Monument, the National Oceanic and Atmospheric Administration (NOAA), local tribes, agencies, schools, and individuals we can still effectively and efficiently reach interested audiences and provide educational and interpretive messages about the natural resources of Castle Rock NWR.

Castle Rock NWR Environmental Education and Outreach Objective

Over the 15 year life of the CCP, Complex staff will coordinate environmental education and interpretation programs on the seabird, marine mammal, and Aleutian cackling geese populations that use Castle Rock NWR with that of larger State, Regional, and other California Current System seabird programs. Within three years Complex staff will collaborate with National and State organizations to develop and provide additional environmental education, interpretation, and outreach to K-12 school groups, community groups, and individuals about Castle Rock NWR. Complex staff will also participate in at least 2 community events annually.

Proposed Castle Rock NWR Environmental Education and Outreach Strategies

1. Continue collaboration with Humboldt State University, National Park Service, and the United States Coast Guard to provide the seabird web-cam online.
2. Conduct outreach to educate the public, develop stewardship, and ultimately help protect the natural resources of Castle Rock NWR and integrate outreach with other programs.
3. Develop age group specific educational outreach DVDs based on webcam recordings.
4. Develop a brochure on Castle Rock's natural resources and how to protect seabird and marine mammal populations that use Castle Rock NWR.
5. Increase signage and distribute flyers to educate kayakers, the fishing community, and other users to the risk of disturbance, the potential impact on seabirds and marine mammals and the illegality of trespass or disturbance to wildlife.
6. Develop informational flyers specific to the Castle Rock NWR and distribute to Redwood State and National Park visitors center, local chambers of commerce and other tourism information locations.
7. Work with community partners (e.g., College of the Redwoods, Marine Mammal Center, and Siskiyou Field Institute) to provide educational interpretive field trips and courses using Castle Rock NWR to showcase wildlife, seabird and marine mammal ecology.
8. Work with partners to provide educational and interpretive information for their excursions around Castle Rock.
9. Coordinate with local tribal entities to provide interpretation of traditional uses of Castle Rock NWR as appropriate.
10. Collaborate with Redwood National and State Parks to increase environmental education and community outreach (e.g., newsletters, web sites, campfire talks).

Current Program

With current staffing levels, Complex staff is only able to participate in one community event associated with Castle Rock NWR each year. A combination of Complex volunteers and permanent, seasonal, and temporary staff participate in the Aleutian Cackling Goose Festival annually and will continue to do so.

Proposed Changes

Within two years staff will develop new environmental education and interpretation partnerships that will allow participation in two events annually. Staff will coordinate environmental education and interpretation programs on species that use Castle Rock NWR with that of larger State, Regional, and other CCS seabird programs. Staff will also work with community partners to provide educational interpretive field trips and courses using Castle Rock NWR to showcase wildlife, seabird and marine mammal ecology.

Within three years Staff will collaborate with partners to develop and provide additional environmental education, interpretation, and outreach to K-12 school groups, community groups, and individuals. They will also coordinate with local tribal entities to provide interpretation of traditional uses of Castle Rock NWR as appropriate.

Monitoring and Evaluation

An outreach log is maintained for all activities relating to outreach and environmental education on the Complex; including Castle Rock NWR. No systems are currently in place to monitor visitor use of the observation area overlooking the refuge.

Implementing the Plan

Essential Staffing Needs
See Chapter 4 of the CCP.

Table of Projects, Costs
See Chapter 6 of the CCP.

Partnership Funding and Resources
See Chapter 4 of the CCP.

Compatibility Determinations
See Appendix F of the CCP.

NEPA Document/Decision Document
See Appendix E of the CCP.

ESA Section 7 Consultations
See Appendix I of the CCP.

Appendices

Appendix B-1: Humboldt Bay NWR Brochure
Find the brochure at http://www.fws.gov/humboldtbay/brochure.pdf

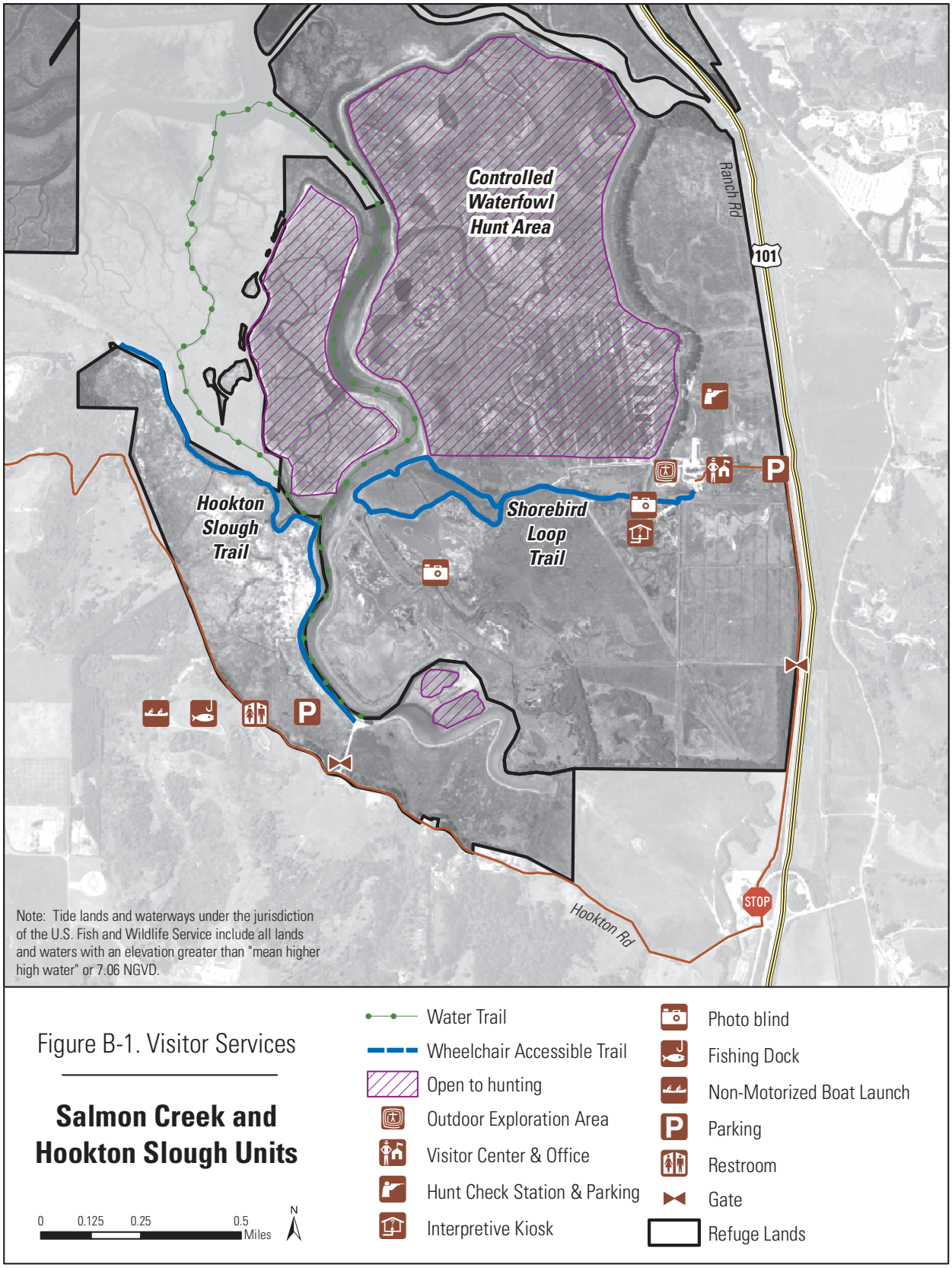

Figure B–1. Visitor Services Alternative—Salmon Creek and Hookton Slough Units

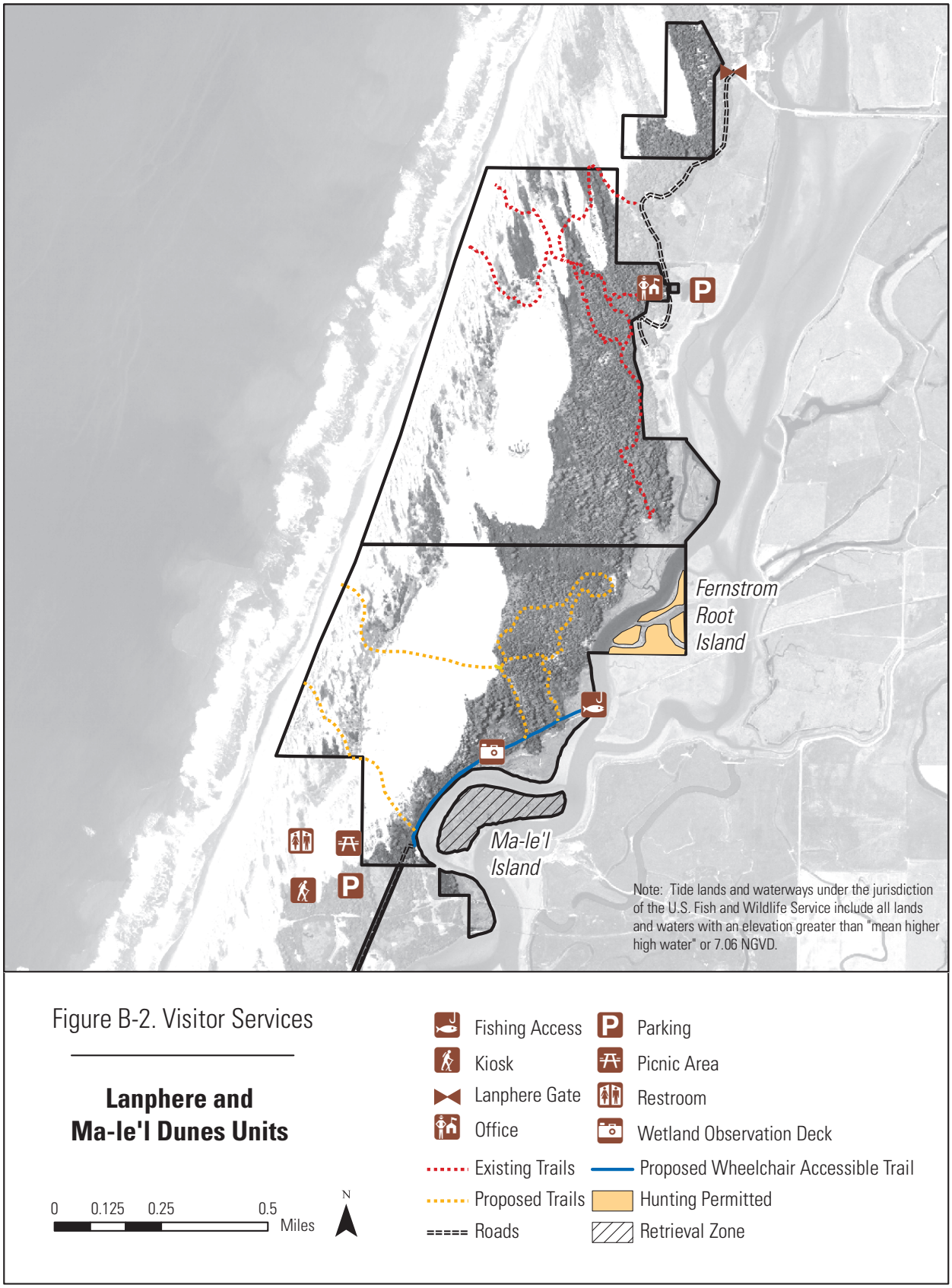

Figure B–2. Visitor Services Alternative—Lanphere and Ma-le'l Dunes Units.

Visitor Services Plan - Humboldt Bay NWR

Prepared by:

Visitor Services Asst.
Humboldt Bay NWR

Sean Brophy Date 08/11/09

Project Leader
Humboldt Bay NWR

Eric Date 8/13/09

Appendix C: Waterfowl Hunt Plan

WATERFOWL HUNT PLAN

Humboldt Bay National Wildlife Refuge
Humboldt County, California

November 2008

Youth Hunters at the Salmon Creek Unit of Humboldt Bay NWR. Photo: USFWS

I. Introduction

Humboldt Bay National Wildlife Refuge (HBNWR) is located in Humboldt County, California, with refuge units within and adjacent to Humboldt Bay and associated watersheds (Figure C-1). The approved refuge boundary is roughly defined by Hookton Road on the south, Mad River County Park on the north, Highway 101 and Mad River Slough on the east, and the Pacific Ocean on the west (Figure C-1). Topography in the general region of Humboldt Bay is characterized by steep mountains and narrow valleys, which are typical of the coast ranges of northern California. Most of these uplands are covered by dense forests of redwood and Douglas-fir. Humboldt Bay consists of three primary sections: Arcata Bay in the north, Entrance Bay the middle and South Bay. Below are brief descriptions of each section as described in the Humboldt Bay Management Plan (HBHRCD 2007):

Arcata Bay
Arcata Bay is bounded by the Samoa Peninsula and the North Spit to the west; the Arcata Marsh and Wildlife Sanctuary, Arcata Bottoms, and City of Arcata to the north; Bayside Bottoms and Bracut areas to the east; and the City of Eureka and Woodley Island to the south. Arcata Bay covers ~ 13 square miles and is ~ 5.8 miles at its longest and 4.3 miles at its widest points. This portion of the bay is generally shallow, with over half of the area exposed at low tides. These tidal flats are incised by several deeper channels, as well as numerous shallow channels. Most of the mud-silt bottom of Arcata Bay is exposed on average low tides, creating habitat for foraging shorebirds.

Entrance Bay
Entrance Bay is ~ 5 miles long and generally less than a mile wide. It is bounded by the North Spit on the west, Arcata Bay to the north, the City of Eureka and Elk River Spit and wetlands to the east. It includes Woodley Island and Indian Island and the City of Eureka waterfront. Entrance Bay, with a mostly sand bottom, lacks the expansive mudflats found in Arcata Bay and South Bay.

South Bay
South Bay covers ~ 7 square miles and is ~ 4 miles at its longest and 2.5 miles at its widest points. It is bounded by the South Spit on the west side, Entrance Bay on the north, lands and waters of the Humboldt Bay National Wildlife Refuge (HBNWR) on the southeast, and Table Bluff to the southwest. Like Arcata Bay, much of the South Bay is occupied by broad expanses of tidal flats incised by numerous small, shallow channels and one deep-water channel which serves the Fields Landing and King Salmon areas and is maintained for navigation. South Bay supports eelgrass over much of its silt bottom, with the higher elevations of the east and south sides exposing bare (or algae covered) mudflats on most low tides.

In 1971, the Humboldt Bay National Wildlife Refuge was established to conserve important habitat for the great diversity of animals and plants that occur in the Humboldt Bay area. Humboldt Bay NWR has several different units totaling almost 3,500 acres. These units consist of a mixture of mudflats, estuarine eelgrass meadows, salt marsh, brackish marsh, seasonally flooded freshwater wetlands, riparian wetlands, streams, coastal dunes, and forest. These habitats support over 316 species of birds and 40 species of mammals. The refuge also provides habitat for ~ 100 species of fish and marine invertebrates, many of which contribute to sport and commercial fisheries, including steelhead, Coho and Chinook salmon, and Dungeness crab.

Concentrations of migratory waterbirds, especially shorebirds, occur in the fall, winter, and spring. In winter, it is not unusual for over 100,000 birds to use Humboldt Bay as a feeding or resting site. Key habitats for these waterbird concentrations are eelgrass beds and extensive mudflats. These also make the bay an important spawning, nursery, and feeding area for fish and other marine life. Complimentary to the bay habitats are thousands of acres of seasonal wetlands (mostly former tidal wetlands that have been diked off for over a century).

Endangered or threatened species include: brown pelican, snowy plover, Chinook and Coho salmon, steelhead, tidewater goby, Humboldt Bay wallflower, and beach layia. The Lanphere Dunes and Ma-le'l Dunes Units protect endangered and rare plants within rare dune plant communities. The refuge contains one of very few dune systems in which the underlying processes are intact.

The Humboldt Bay watershed is considered the most important wintering waterfowl habitat between San Francisco Bay and the Columbia River (PCJV 2004). Many species of waterfowl use habitats on Humboldt

Bay NWR, particularly for resting and foraging during their annual migrations. Seasonally common waterfowl that use Humboldt Bay NWR and nearby wetlands and agricultural short-grass pastures during migration include: northern pintail, northern shoveler, American wigeon, green-winged teal, mallard, bufflehead, scaup, tundra swan, Pacific brant, Aleutian and cackling geese, and non-native Western Canada geese, which were introduced to the area in the 1980s. Larger, seasonally common waterfowl such as Pacific brant, Canada geese, and cackling geese are highly valued by sport hunters and by wildlife watchers alike. This refuge has also been described as one of the most important areas in the United States south of Alaska for Pacific brant. This is especially true during the spring when the bay is a key staging area for more than 60 percent of the flyway Pacific brant population prior to their return to arctic nesting grounds. Similarly, the northcoast of California and southern coast of Oregon are key spring staging areas for the growing population of Aleutian cackling geese.

A young hunter enjoys a hunt with his father and dog at the Salmon Creek Unit. Photo: USFWS

The refuge is a focal point for humans and wildlife. Currently, visitors may tour the Salmon Creek Unit of the refuge, including the Shorebird Loop Trail and Richard J. Guadagno Headquarters and Visitor Center from 8:00 a.m. to 5:00 p.m., Federal holidays excepted. The Hookton Slough Unit, including the Hookton Slough Trail and Non-Motorized Boat Ramp, is open 7 days a week from sunrise to sunset. Special tours and other environmental education programs are available on request. More than 25,000 people visit the refuge annually. The refuge hosts a variety of special events such as the Goose Flyoff and Family Fun Weekend, the California Waterfowl Association (CWA) Outdoor Adventure Day and is a partner in Godwit Days. There are many opportunities for wildlife-dependent uses at the refuge, including wildlife observation, environmental education and interpretation, waterfowl hunting, wildlife photography, and fishing.

The purpose of this hunt plan is to outline how the hunting program is operated at Humboldt Bay NWR. In addition, this plan documents how the refuge will provide safe hunting opportunities, while minimizing conflicts with other priority wildlife-dependent recreational uses.

Humboldt Bay NWR will have parts of eight units open to hunting under this plan: Ma-le'l Dunes (Fernstrom-Root Island), Jacoby Creek, Eureka Slough, Table Bluff, White Slough (Egret Island), Hookton Slough (Teal Island), and Salmon Creek (Figure C-1). All units associated with Humboldt Bay are potentially hazardous due to deep mud, volatile wind conditions, underwater hazards, and changing tides. Caution should be used when hunting any unfamiliar areas of the bay or the refuge. Only safe, reliable boats should be used. Possession of all boater safety gear required by the United States Coast Guard is mandatory to use a boat in any refuge units. The Service is continually seeking ways to improve safety. In response to a public comment received on the Draft CCP/EA, the refuge staff has considered and plans to install a "throw rope" or other device near hunt blinds 3, far 5, 7. The purpose of the rope would be for visitors to have a means of self-rescue available in the event that they become stuck in the mud.

Hunting of waterfowl, coots, common moorhens and snipe is currently permitted only in designated areas of the refuge and is governed by Federal and State regulations. The Sport Hunting Decision Document Package that currently dictates all hunting occurring within HBNWR was approved February 27, 1990.

II. Conformance with Statutory Authorities

Humboldt Bay National Wildlife Refuge was established by authority of the Migratory Bird Conservation Act of February 16, 1929, as amended, and the Migratory Bird Hunting and Conservation Stamp Act of March 16, 1934, as amended. The purpose of Humboldt Bay NWR is to protect and enhance wetland habitats in and adjacent to Humboldt Bay for a wide variety of migratory waterbirds, especially Pacific brant. National Wildlife Refuges are guided by the mission and goals of the National Wildlife Refuge System (NWRS), the purposes of an individual refuge, Service policy, laws and international treaties. Relevant guidance includes the National Wildlife Refuge System Improvement Act of 1997, Refuge Recreation Act of 1962, and selected portions of the Code of Federal Regulations and Fish and Wildlife Service Manual.

The National Wildlife Refuge System Improvement Act of 1997 provides guidelines and directives for the administration and management of all areas in the NWRS. The Act also defines six wildlife-dependent priority public uses, including hunting, that refuges should strive to provide when compatible with the purposes of the refuge and the mission of the NWRS. A strong historical precedent for hunting on refuge lands exists as much of the lands and waters acquired by the refuge were hunted for migratory birds prior to FWS acquisition. One of the major contributors to the National Wildlife Refuge System has been the Federal Duck Stamp Program, among the most successful conservation programs ever initiated. Waterfowl hunters are required to purchase a duck stamp to hunt waterfowl. More than 1.5 million stamps are sold each year. Over the years, sales of duck stamps have led to the purchasing of over five million acres of wildlife habitat for the NWRS. Hunting is permitted in accordance with State and Federal regulations and seasons to ensure that it will not interfere with the conservation of other wildlife and fish and their habitats.

The Office of Migratory Bird Management sets the general frameworks through their annual regulations permitting the hunting of migratory birds. The individual States set seasons within those frameworks. If necessary, the Service develops regulations that may be more restrictive that State hunting regulations in order to protect resources on a refuge-by-refuge basis, termed "refuge-specific regulations" (i.e., species or days hunted). Otherwise, the Service observes State regulations on all refuges open to hunting.

The estimated annual cost to administer the hunt program is $8,500. Within the annual HBNWR budget the necessary funds are available for this work. The refuge also participates in the Recreational Fee Program, which offsets some costs of the hunting program. Therefore, the hunting of migratory ducks, geese, coots, common moorhens and snipe is in compliance with the Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd-ee), the Refuge Recreation Act of 1962 (16 U.S.C. 460k), and all other governing statutory authorities.

The State of California has legislatively granted to the Humboldt Bay Harbor, Recreation, and Conservation District (HBHRC District) jurisdiction over areas below mean higher high water or elevation 7.06 NGVD (3.15 feet above mean sea level). Therefore, at this writing, hunting on the sloughs and in the tidally-influenced lands below 3.15 mean sea level is within the HBHRC District's jurisdiction. Areas above 3.15 mean sea level are within the refuge's jurisdiction.

III. Statement of Objectives

The goal of the National Wildlife Refuge System is: To provide the general public with a quality wildlife-oriented recreational experience and an opportunity to utilize a renewable natural resource. The objectives of the Humboldt Bay NWR Waterfowl Hunt Plan are to:

1. Provide a quality wildlife-dependent recreational experience, using a renewable natural resource.
2. Promote hunter education and ethics through information and enforcement of hunting regulations and compliance with compatibility determinations.
3. Promote mobility-impaired access by providing designated mobility-impaired accessible blinds.
4. Promote opportunities for youth and junior hunters by providing designated hunts for youth and junior hunters.

For the goals of HBNWR as established by the refuge Comprehensive Conservation Plan (CCP) see Chapter 5 of the CCP.

Therefore, with existing staff and resources, the hunt program would contribute to CCP Goal 5 by providing safe, high quality hunting opportunities without impeding the ability of the refuge to achieve remaining refuge goals. This plan would allow waterfowl hunting on designated refuge units under State waterfowl regulations as well as regulations set by the U.S. Fish and Wildlife Service specifically for HBNWR. In addition, hunter education, ethics, and opportunities for youth and mobility-impaired hunters are emphasized as part of the refuge hunt program.

IV. Assessment

Pacific flyway waterbirds migrating along the coast use Humboldt Bay as a feeding and resting area during fall, winter and spring. Humboldt Bay is a key spring staging area for arctic–bound Pacific brant, which feed almost entirely on eelgrass south of their breeding grounds and are therefore limited to areas on the flyway which provide this habitat. Humboldt Bay is also a key spring staging area for tens of thousands of Aleutian cackling geese, which utilize the pasturelands found on Humboldt Bay NWR and surrounding lands.

Based on decades of winter waterfowl survey data; the combined dabbling and diving duck numbers in the Humboldt Bay area range from 10,000 to 40,000 from fall through spring. Species which occur in the greatest numbers are American wigeon, bufflehead, green-winged teal, scaup, scoters, and northern pintail. Coots and snipe are also seasonally abundant in the area, while common moorhens are listed in local field guides as "accidental occurrences".

Are wildlife populations present in numbers sufficient to sustain optimum population levels for priority refuge objectives other than hunting?
Yes, wildlife populations are present in sufficient numbers to sustain optimum population levels for priority refuge goals other than hunting (See Section III for a list of refuge goals). The refuge harvest regulations follow those set by the State, which are in turn set within Federal guidelines.

Under Federal law established by international treaties with Canada, Mexico and other countries with whom the United States of America share migratory birds, the Service has ultimate responsibility for regulating migratory bird hunting nationwide. The Service establishes frameworks that govern all migratory bird hunting in the United States through a regulatory process that begins each year in January and includes public consultation. Within the boundaries established by those frameworks, State wildlife commissions have the flexibility to determine season length, bag limits, and areas for migratory game bird hunting.

Resident and migratory birds, wildlife and fish would be minimally impacted by the hunt program because of the limited days hunting occurs on the refuge and the percentage of refuge lands closed to hunting and other uses. Other effects considered within the context of the refuge hunt program include such things as: disturbance to non-hunted species, take of non-target species, presence of lead from historic hunting, and crowding of birds into closed zones causing disease. While all of these issues may have had substantive effects on waterfowl at different locations around the country at one time or another, none of these issues taken separately or cumulatively has ever had a significant impact on local wintering waterfowl populations. This is likely due to the large diversity and spread of wetlands in the area from Eel River to Mad River which allows birds ample habitat to distribute themselves in.

Therefore, a waterfowl hunt can be sustained that does not impact populations of resident and other migratory birds, wildlife and fish and allows the refuge to contribute to the goals listed in Section III.

Is there competition for habitat between target species and other wildlife?
Possibly; while each species occupies a certain niche, there is a finite amount of space available to satisfy various habitat requirements for water, food, cover, and roosting areas. Management of seasonal and permanent wetlands is currently guided by the goals and management objectives of the CCP. These goals and objectives would ensure that habitats would be managed to provide for a diverse number of species including waterfowl, shorebirds, and other wading birds.

Are there unacceptable levels of predation by target species on other wildlife forms?
No, some waterfowl species feed on fish and invertebrates as well as plant seeds and tubers, but it is not likely that they feed at levels that impact other wildlife on the refuge.

V. Description of Hunting Program

The hunt program at Humboldt Bay NWR is small compared to many other National Wildlife Refuges in California such as Sacramento NWRC or Tule Lake NWR. However, Humboldt Bay NWR provides a unique public land hunting opportunity for the citizens of California and Humboldt County in general and specifically for the cities of Eureka, Arcata and Fortuna. The lottery draw type of hunt offered at the Salmon Creek Unit of HBNWR is different than the other public lands open to hunting in the area, which are currently managed as free-roam hunt areas. During the 2006/2007 hunting season a total of 1187 hunters took 2967 ducks at the Salmon Creek Unit of the refuge for a 2.5 bird average. The refuge maintained a greater than two birds per hunter average for the 2001 to 2006 hunting seasons, indicating a high quality hunt. The three most commonly harvested species at the Salmon Creek Unit are green-winged teal, American wigeon and northern shoveler. Western Canada geese, Aleutian cackling geese and cackling geese are all also regularly harvested at the Salmon Creek Unit but in much smaller numbers. Use and harvest data is not available for other areas on the refuge open to hunting.

The refuge also allows hunting at the Jacoby Creek, Eureka Slough, Table Bluff, South Bay, and Salmon Creek Units; as well as the White Slough/Egret Island, Hookton Slough/Teal Island areas in South Bay; totaling 840 acres. Under this plan, the portions of Fernstrom-Root Island owned by FWS would be opened to hunting; totaling 10 acres. Therefore, ~25 percent of the properties owned by the Service is or will be open to hunting. The remaining lands owned by the refuge are not suitable for a hunting program because they are: located too close to residential areas or highway/freeway areas, used as sanctuary areas or are currently open or planned for other priority wildlife-dependent visitor uses including wildlife observation, environmental education, interpretation, and photography. Listed below are brief descriptions of each refuge unit open to hunting:

North (Arcata) Bay Units

Ma-le'l Dunes Unit (Fernstrom-Root Island)
Fernstrom-Root Island is a 10 acre island in Mad River Slough consisting of high salt marsh. Mad River Slough is north of Highway 255 and lies between the dunes and the Arcata Bottoms. Mad River Slough is navigable water and therefore overwater hunting is permitted. Areas of Ma-le'l Island within the Service's jurisdiction, south of Fernstrom-Root Island, are designated as retrieval only areas. The islands are accessible by boat only and FWS only owns part of the island. The area receives light to moderate use during the early part of the waterfowl season.

Jacoby Creek Unit
Jacoby Creek Unit is ~ 73 acres located in northeastern Arcata Bay south of the Arcata Marsh. It is characterized by mudflat and tidally influenced salt marsh habitat. The dominant plants found in the salt marsh habitats of Humboldt Bay are Spartina (*Spartina densiflora*) and pickleweed (*Salicornia* spp.). The Jacoby Creek Unit includes the mouth of Jacoby Creek. Jacoby Creek Unit is hunted most frequently during the early waterfowl season, when birds are attracted to the freshwater coming out of the creek. During the latter half of the waterfowl season hunting pressure is generally low.

Eureka Slough Unit
Eureka Slough is ~ 86 acres of undiked salt marsh and mudflat in southeastern Arcata Bay. The area is difficult to access and receives very little hunting pressure throughout the season.

South Bay Areas and Units

White Slough Unit/Egret Island
White Slough is diked on both sides, with very little cover on either shore in South Bay. Egret Island is a two acre low salt marsh island. This island is boat access only and is inundated by high tides on a regular basis. The area also includes several other small salt marsh islands. The majority of the White Slough Unit is diked and the dikes and all areas landward of the dikes are closed to hunting due to the proximity of Highway 101. The open water area is difficult to safely access and to navigate at low tides. The area receives moderate hunting pressure during the early part of the hunting season.

Salmon Creek Unit
The hunt area at Salmon Creek is ~ 320 acres and consists of a mixture of short-grass pastures, seasonal and permanent freshwater wetlands, brackish wetlands and numerous brackish sloughs. Salmon Creek features a regulated, spaced blind hunting program and is part of the Recreation Fee Permit program. Salmon Creek receives the most hunting pressure of all the refuge units.

The Salmon Creek hunt program can currently accommodate a maximum of 60 hunters in the field at one time, with potential for 120 hunters or more during a hunt day with 100 percent blind re-fills. Blinds areas may have one or more standup blinds, pit blinds, or both. Hunting occurs from 15 blind areas, separated to ensure a safe hunting experience.

Hookton Slough Unit/Teal Island
The area of Hookton Slough bayward of the dikes is navigable water and is open to hunting on overwater hunting days (see California Department of Fish and Game Regulations for definition of overwater hunting days). The area consists of a deep tidal channel with steep dikes on both sides, several salt marsh islands, and remnant dikes of Teal Island in South Bay. Teal Island is not a true island; rather it consists only of the remnants of an exterior dike built around the historical salt marsh island. The dike consists of rapidly eroding bay mud and in some places dense coyote brush (*Baccharis pilularis*). There are also several low marsh islands created by dense mats of Spartina associated with Teal Island. Most hunting occurs from the dike. Teal Island receives moderate hunting pressure during the entire waterfowl season. The mainland dikes and all areas landward are closed to access from the slough. Hookton Slough receives light hunting pressure during the entire waterfowl season.

Youth hunters enjoying the morning hunt. Photo: USFWS

Table Bluff Unit
Table Bluff is an ~160 acre unit consisting of mudflat and a muted tidal marsh. Located in the southwest corner of South Bay, a breached dike and an adjacent shoreline grading from dune to brackish marsh make the area difficult to access by boat or on foot. The channels that lead to the area are impassable by foot during high tide. The area receives light hunting pressure throughout the season.

South Bay Unit
This unit consists of tidal flats and eelgrass primarily in areas west and north of Teal Island and immediately west of the north end of the White Slough Unit. Most of South Bay is prime habitat for Pacific brant as it is covered with eelgrass, their primary food. Most brant hunting takes place either from the bay shoreline of South Spit (which is owned by CDFG but managed by BLM), or out on the bay itself on overwater hunt days by hunters using scull or layout boats. The brant season is generally occurs during the month of November.

A. Areas of the refuge that support populations of target species:
All hunted species are found in appropriate habitats throughout the refuge. Waterfowl feed, loaf, and rest on the refuge primarily from fall through spring with some species nesting during spring and summer. The most common breeding waterfowl on the refuge are Western Canada geese, mallards, and gadwall. Waterfowl utilize the managed permanent and seasonal wetlands, flooded pastures, ponds, sloughs, intertidal mudflats, salt marsh and other bay habitats found throughout all the units of the refuge.

B. Areas to be newly opened to the public:

1. Fernstrom-Root Island

Hunting on the portions of Fernstrom-Root Island owned by FWS will be opened to hunting according to this plan. Fernstrom-Root Island is located in Mad River Slough north of Ma-le'l Island and the water pipe crossing (Figure C-4). Areas of Ma-le'l Island within the Service's jurisdiction, adjacent to Fernstrom-Root Island and the Viqhul Trail will be open for retrieval only. The HBHRCD has jurisdiction over areas below mean higher high water or elevation 7.06 NGVD (3.15 feet above mean sea level). Therefore, hunting on the sloughs and in the tidally-influenced lands below 3.15 mean sea level is within the HBHRCD's jurisdiction. Areas above 3.15 mean sea level are within the refuge's jurisdiction.

2. Salmon Creek Unit

There is currently a regularly scheduled youth hunt every year after the end of the regular waterfowl season in concurrence with California state regulations. The event is very well attended and adult hunters help out in many different ways, from guiding youth hunters whose parents have no hunting experience to cooking breakfast for youth hunters returning from the field. In order to increase opportunity for youth hunters, the refuge will open a youth hunt in concurrence with State regulations following the close of waterfowl season and extending for one day. Youth hunters must be 15 years of age or younger and accompanied by a non-hunting adult 18 years of age or older.

The refuge will also open two junior hunts. The junior hunts will occur during the regular waterfowl season on the last Thursday in December and the first Thursday in January, aligning with the regular holiday school break to maximize junior hunter opportunities at the refuge. Junior hunt days will be managed similar to the existing youth hunt held at the end of the regular season. This measure will help maintain a high quality hunt and prevent conflicts with other wildlife dependent recreation uses. Junior hunts will be open to hunters 16 years of age or under possessing a valid junior hunting license. All hunters age 16 or younger must be accompanied by a non-hunting adult 18 years of age or older. All 16 year old hunters with a junior hunting license are required to have in possession a signed Federal duck stamp.

C. Species to be taken, hunting periods:

The waterfowl hunt program at HBNWR takes place during the normal State waterfowl hunting season, typically from the third weekend in October to the last weekend in January as set by the State Commission in accordance with Federal guidelines. Shooting is permitted from ½ hour before Eureka legal shoot time until 3:00 p.m. at the Salmon Creek Unit, and ½ hour before Eureka legal shoot time until sunset at all other units open to hunting. Only ducks, geese, coots, common moorhens and snipe are permitted to be taken. Common duck species include American wigeon, green-winged teal, northern shoveler, northern pintail, mallard, bufflehead, greater and lesser scaup, scoters, ruddy duck and gadwall. Common goose species include Western Canada, cackling and Aleutian cackling geese.

D. Justification for permit, if one is required:

A permit is required at Salmon Creek Unit to monitor hunter use, levels of waterfowl harvest and to collect a fee. The fee is used to fund the staff required to maintain a high quality managed hunt.

E. Procedures for consultation and coordination with the State:

The following procedures are done:
Refuge staff meets with CDFG, BLM and FWS managers and wardens before and after hunt season to discuss the hunting season and possible improvements for the coming year.

The State Lands Commission has determined that all tide and submerged lands, as well as navigable rivers and sloughs, are impressed with the Common Law Public Trust. The Public Trust is a sovereign public property right held by the State or its delegated trustee for the benefit of all the people in the State. Jurisdiction over most of Hookton Slough has been legislatively delegated by the State to the Humboldt Bay Harbor, Recreation, and Conservation District (HBHRCD). The HBHRCD's management boundary extends to "mean higher high water". That is, the refuge has jurisdiction over areas within the refuge boundary that are above the elevation of "mean higher high water" (3.15 feet above mean sea level or 7.06 feet NGVD). The HBHRCD has jurisdiction over water and lands below "mean higher high water".

F. Methods of control and enforcement:

The following methods are used to control and enforce hunting regulations:

- Hunt area boundary signs will be posted at all units.
- At the Salmon Creek Unit hunters are assigned a spaced blind and must hunt within a designated "blind zone." Blind zones are both described in written terms and shown on a map in a document provided to all hunters at the check station, the refuge web site and in the Visitor Center.
- Humboldt Bay NWR has produced a brochure and a map that clearly illustrates hunt areas. The map and brochure is available at the Richard J. Guadagno Headquarters and Visitor Center, the hunter check station and the refuge website.
- Hunters are randomly checked by a cooperative of law enforcement agencies (FWS, BLM, CDFG) for compliance with State and Federal laws as well as refuge-specific regulations.
- A hunter check station is located on the Salmon Creek unit and staffed by refuge staff, volunteers and/or California Waterfowl Association (CWA) staff/volunteers to conduct the lottery draw, assist hunters, and monitor the hunt.

G. Funding and staffing requirements:

Administering the hunt program at Salmon Creek Unit requires staff to randomly select hunters through a lottery draw system, check in hunters, record harvest data, prepare and construct blinds prior to the season, enforce regulations, monitor impacts to other wildlife and ensure safety. The orientation/hunter check-in and administering of the hunt requires the Wildlife Biology Aide to work about 8 hours for every hunt day. An estimated annual expense of $6,000 is required to pay the Wildlife Biology Aide.

Estimated annual costs include ~ $6,000 to fund the Visitor Services/Wildlife Biology Aide position, $4,000 for other staff and law enforcement, $2,000 to maintain roads and trails and improve the hunt area (signs) and $500 for Hunt Area habitat improvement for a total estimated annual expenditure of $12,500. Due to the high costs of this program, the refuge participates in the Recreational Fee Program, which results in an average yearly fee collection of $3,700 from ~ 1000 refuge hunters.

H. Consideration of mobility-impaired hunters:

Providing opportunities for mobility-impaired hunters is one of the goals of the waterfowl hunting program at the refuge. Specifically, the program:

- Provides a blind area accessible to mobility-impaired hunters on the Salmon Creek Unit for the exclusive use of mobility-impaired persons and their hunting partners.
- Ensures parking areas leading to blinds are accessible for persons in wheelchairs, or using walkers.
- Provides a discounted permit fee for mobility-impaired hunters.
- A "mobility impaired hunter" is defined as any person who has been issued a "DMV Disabled license plate, or a permanent parking placard identification card," or a valid "Mobility Impaired Disabled Persons Motor Vehicle Hunting License" (FG Form 1460). The blue plastic "Disabled Parking Placard" may not be substituted for the required "Identification card" which bears the name of the mobility impaired person. Disabled hunters must provide the registration certificate for DMV issued disabled license plates.

VI. Measures Taken to Avoid Conflicts With Other Management Objectives

The hunt program as outlined was designed to minimize or eliminate any conflicts with other management objectives. These objectives include providing the public with other wildlife-dependent opportunities such as wildlife observation and photography, and providing habitat for other wetland-dependent species such as shorebirds, grebes, non-hunted migratory waterfowl, raptors and Federal and State special status species such as the brown pelican.

A. Biological Conflicts

The current and proposed hunt plan is designed to minimize or avoid potential biological conflicts with other wetland-dependent species through education, monitoring, and limiting hunt days and times. Potential biological conflicts include flushing other migratory and resident birds from areas being hunted or the take of non-target species either by mistake or willfully. Portions of the Salmon Creek, Hookton Slough and White Slough Units are closed to provide waterfowl secure resting areas where they are not hunted. Portions of the Hookton Slough and White Slough Units are not open to hunting due to proximity of homes, public roads, trails or sanctuary areas. Hunting on the Jacoby Creek and Eureka Slough Units is limited to boat access to that area bayward of posted signs due to an absence of other safe access routes, proximity of public roadways and to prevent damage to sensitive salt marsh plants.

The portions of the refuge being opened to the hunting of migratory birds through this plan are not typically used by Pacific brant. The only federally listed species that may be affected by hunting is the endangered brown pelican. However, brown pelicans rarely use the units where hunting occurs and take due to hunter identification mistakes is very unlikely. Therefore, impacts on threatened and endangered species would be minimal.

International treaties for conservation of migratory birds mandate that protecting and maintaining overall populations be given a higher priority than harvesting of waterfowl. The Fish and Wildlife Service, State wildlife agencies, academic institutions, and federal and provincial governments in Canada have long-term cooperative programs that monitor breeding population status, harvest levels, production, migration, and other parameters utilized for regulating harvests. The process of regulating waterfowl harvests involves a lengthy sequence of public involvement and decision-making by the Service, State wildlife agencies, and the Canadian and Mexican governments during the regulatory cycle. The process involves assessment of waterfowl populations, publication of Federal Register notices, and numerous meetings by Waterfowl Flyway Councils and the Service Regulations Committee. It culminates in regulations being set at the flyway level (season lengths, daily bag limits, and outside dates for the earliest opening and latest closing dates for a hunting season) and special regulations at the State level (e.g., split seasons, harvest zones, special seasons, area closures) which are in turn followed by the NWRS when administering hunt programs.

B. Public Use Conflicts

The waterfowl hunting program is organized to have minimal to no impact on other public uses at the refuge by implementing the following measures:

- Public uses on the entire refuge, especially the Salmon Creek Unit, are zoned both temporally and spatially during the entire hunting season to avoid conflict and provide for public safety.
- Signage and brochures indicate hunt area boundaries.
- Only pedestrian traffic is allowed for all but mobility-impaired hunters going to and from hunting blinds at Salmon Creek Unit.
- Dogs used for retrieving waterfowl must remain in control of the owner at all times.
- Many portions of the refuge are open year round to other wildlife-dependent uses such as wildlife observation, photography, fishing, environmental education and interpretation.
- Cease fire is set at 3:00 p.m. at the Salmon Creek Unit, providing the non-hunting public times when no hunting or shooting is occurring at the refuge during hunt days.
- The refuge will post educational materials on hunting and avoiding conflict between user groups at the Ma-le'l Dunes north boat ramp.

VII. Conduct of the Hunt

A. Refuge-Specific Hunting Regulations (All Units)

The hunting of geese, ducks, coots, common moorhens and snipe during the waterfowl season as determined by the State on designated areas of the refuge is subject to the following conditions:

- Hunters must possess a valid hunting license, an affixed State duck stamp, a signed Federal duck stamp and an affixed Harvest Information Program (HIP) stamp.
- All hunters age 17 and under must be accompanied by an legally responsible adult aged 18 or over.
- Hunting hours will coincide with California State Regulations, except at the Salmon Creek Unit where hunting hours end at 3:00 p.m.
- Non-Toxic shot is required on all refuge units. Shot size is restricted to no larger than "T" for steel shot and "BB" for all other non-toxic shot.
- No person may build or maintain fires.
- When not hunting, dogs must be in vehicles or on a leash and kept under control at all times. Dogs are not allowed to enter closed areas for any reason.
- Hunters may use only portable blinds or temporary blinds constructed of natural materials. Hunters must dismantle or remove all temporary blinds from the refuge after each days hunt.
- Vehicle parking is permitted only in designated areas.
- Hunters must remove all decoys, shotshell casings, personal equipment and refuse from the refuge following each day's hunt. Littering is unlawful and will be prosecuted.
- Possession or use of alcohol is prohibited on National Wildlife Refuges
- All weapons must be unloaded to and from the hunting area.

B. Unit- Specific Regulations

1. Salmon Creek Unit

Hunting at the Salmon Creek Unit generally occurs two days per week, Tuesday and Saturday from ½ hour before sunrise until 3:00 p.m. during the entire regular hunting season. During check in hunters will receive a daily hunting permit. The hunting permit must be in possession of the hunter while in the field, and hunters must return their permits and report hunting results at the check station by 4:30 p.m.

Use of hunting dogs for retrieval of birds is allowed and strongly encouraged, however dogs must be under control of their owners at all times. Failure to follow any State, Federal or refuge-specific regulations may result in eviction from the refuge or a citation.

A mobility-impaired ("disabled") blind is available for mobility-impaired hunters. A "mobility-impaired (disabled) hunter" is defined as: Any person who has been issued a "DMV Disabled license plate, or a permanent parking placard identification card," or a valid "Mobility Impaired Disabled Persons Motor Vehicle Hunting License" (FG form 1460). The blue plastic "Disabled Parking Placard" may not be substituted for the required "Identification card" which bears the name of the mobility-impaired person. Disabled hunters must provide the registration certificate for DMV issued disabled license plates.

Hunting is permitted from designated blind zones (Figure C-3, Table C-1). Free roam hunting is not allowed. Hunters are required to remain within designated blind zones, except for retrieving downed birds. Hunters may possess and use, while in the field, no more than 25 shells per hunter, per day. Firearms must be unloaded while being transported between parking areas and hunting sites. A firearm is deemed loaded when there is a live cartridge or shell in, or attached in any manner to, the firearm, including, but not limited to, the firing chamber, magazine, or clip thereof attached to the firearm. (Penal Code & 12031(g).).

2. Teal Island Area

Teal Island is open to hunting Wednesdays, Saturdays, Sundays, holidays and the opening and closing days during the prescribed open season as per Section 3681 of the California Fish and Game code (Figure C-2). Teal Island is designated as boat in access only. Hunting is permitted from the dikes or from a boat blind. Teal Island may not be accessed for hunting from the Hookton Slough boat dock to conserve the integrity of refuge closed zones adjacent to Hookton Slough. Fields Landing is the nearest public boat launch.

3. Hookton Slough Area

Hookton Slough is open to hunting Wednesdays, Saturdays, Sundays, holidays and the opening and closing days during the prescribed open season as per Section 3681 of the California Fish and Game code. Hookton Slough is designated as boat in access only (Figure C-2). Retrieval is not allowed in the Salmon Creek Unit. Boat access for hunting is not allowed from the Hookton boat dock; Fields Landing is the nearest public entry point. No shooting is allowed within 150 yards of Hookton non-motorized boat dock. All other areas of Hookton Slough Unit are closed to hunting.

4. White Slough/Egret Island Area

This area is open to hunting Wednesdays, Saturdays, Sundays, holidays and the opening and closing days during the prescribed open season as per Section 3681 of the California Fish and Game Code. White Slough and Egret Island are designated as boat in access only; Fields Landing is the nearest public boat launch. Hunting and retrieval are allowed on all of the salt marsh islands but access and hunting is not allowed on any of the dikes and lands inside the dikes (Figure C-2). Retrieval is not allowed in the Salmon Creek Unit. Shooting is not allowed within 150 yards of Highway 101 or Tompkins Hill Road.

5. Table Bluff Unit

Table Bluff Unit is open to free roam hunting 7 days a week (Figure C-2). Hunters may access the area either by boat or by walking in.

6. South Bay Unit

The South Bay Unit is open to hunting concurrent with overwater hunt days as described in CDFG Regulations.

7. Eureka Slough Unit
The Eureka Slough Unit is open to free roam hunting 7 days a week, but the property is boat in access only (Figure C-4). Woodley Island Marina or the boat launch behind the Target store, located in east Eureka, are the nearest public boat launches.

8. Jacoby Creek Unit
Jacoby Creek is open to free roam hunting 7 days a week, but the property is designated as boat in access only. No parking is allowed on FWS property. No trespass onto the banks of Jacoby Creek is permitted (Figure C-4). Parking along Highway 101 is not recommended and the FWS assumes no responsibility or liability for hunters that choose to park along Highway 101. The Arcata Marsh has the closest public boat launching point.

9. Fernstrom-Root Island (Ma-le'l Dunes Unit)
Fernstrom-Root Island is open to hunting 7 days a week. Hunting but no blind construction is allowed on the portion of the Fernstrom-Root Island owned by FWS. Areas of Ma-le'l Island under the Service's jurisdiction are is designated as retrieval only areas (Figure C-4). Hunters can access Mad River Slough from the boat ramp on Lanphere Road and from Samoa Boulevard to reach Fernstrom-Root Island.

10. General Regulations
California Department of Fish and Game Code 3681: Interpretation—This Fish and Game Code allows for hunting in any manner below the incoming or outgoing tidewaters edge or from any blind, boat, floating device, island, islet or exposed tidal flat on the waters of Humboldt Bay, including all rivers, streams and sloughs emptying into the bay on Wednesday, Saturdays, Sundays, Federal holidays, and the opening and closing days of the season.

C. Anticipated Public Reaction to the Hunt
Most hunters support the expansion and continued existence of a hunting program within the Humboldt Bay NWR. Hunting and fishing have strong traditional use in the Humboldt Bay area. During the comment period for the CCP in February 2007 a number of opinions from the public were heard. The majority of the comments received supported increasing access to the refuge and opening as much of the refuge to hunting as possible. There was also some opposition to allowing existing or additional hunting on the refuge.

D. Hunter Application and Registration Procedures at Salmon Creek Unit
A permit is required to hunt at the Salmon Creek Unit. The refuge check station opens two hours before Eureka legal shoot time. A random drawing for available permits takes place at the check station 1½ hours prior to shoot time before each daily hunt. Hunters must be present to be eligible for the draw. The refuge's controlled waterfowl hunt is operated under the Recreation Fee Program. The permit fee for hunters between the ages of 16 and 61 is currently $5.00 per person or $10.00 per blind, whichever is greater. There is no fee for junior hunters (age 16 and under), but they must be accompanied by an adult who will assume legal responsibility of the junior hunter. Holders of Golden Age (62 and older) or Golden Access (disabled) Passports pay half price.

E. Description of Hunter Selection Process at Salmon Creek Unit

1. Sign in procedure:
Waterfowl hunters or groups of hunters are required to sign in at the check station in order to participate in that day's hunt. To sign in, hunters must clearly write the first and last names of all persons in their hunting party (up to four people) on a 4x6 draw application card and turn the card in to the check station attendant. When the card is turned in the hunters will be given a corresponding number which will be used in the random lottery draw for available hunting blinds. Hunters must be present in order to participate in the lottery draw.

When the lottery draw is complete and the numbers are posted in the order they were drawn, the check station attendant will begin filling blinds and checking in hunters in the order of the lottery draw. These numbers are also used to prioritize re-filling blinds. Hunters must present a filled out permit card and their hunting license to the check station attendant. The permit must have the assigned blind number written on the permit to be valid. Hunters must have an affixed State duck stamp, an affixed HIP program stamp and be in possession of a Federal duck stamp signed by the hunter in order to hunt.

2. Joining up:
The first fifteen (15) lottery numbers drawn may join with any other of the first fifteen (15) draws as long as there are no more than four (4) hunters per blind.

Waterfowl hunters or groups of hunters chosen after the first fifteen (15) must wait until their number is called in order to pair with other hunters. The check station attendant will continue to call numbers until all blinds are occupied. Once all blinds are occupied, no more numbers will be called.

3. Re-filling:
At 10:00 AM the check station attendant will assign priority numbers for re-filling available blinds based on the morning random draw and those present. Hunters must be present in order to maintain their position from the morning draw. If a hunter was not present at the morning draw they would sign in according to the "sign in procedures" listed above in Section A. Hunters would then be given a re-fill number after all other priority hunters have either taken a blind or declined to accept a blind.

When a blind has been vacated by all hunters and those hunters have checked out with the check station attendant, the blind is available to be re-filled. Re-fill #1 has the option of taking the blind or not taking the blind without losing position in line. If re-fill #1 does not take an available blind, the choice goes to priority two with the same options, so on and so forth.

F. Media Selection for Announcing and Publicizing the Hunt Plan
The hunt plan will be announced in the media as part of the refuge CCP process, and will be released as an amendment to the HBNWR CCP.

G. Description of Hunter Orientation
Orientation at the Salmon Creek Unit consists of a verbal announcement to hunters 10 minutes before the lottery draw on the morning of the hunt, providing a list of refuge-specific regulations, safety procedures, sign in procedures, and a detailed map of the hunt area. The check station attendant remains on hand to answer any questions regarding the locations of assigned blinds. Hunters may also call a message detailing exact draw and shoot times for the next hunt day, bird averages for the previous hunt day and current hunt area habitat conditions.

Hunters may also attend the "Blind Brush-Up Day" at the Salmon Creek Unit, held prior to the hunt season. This allows hunters to tour the hunt area while preparing blinds for the upcoming waterfowl season. There is no orientation for hunting at the other refuge units, but hunters can contact staff at the Richard J. Guadagno Headquarters and Visitor Center with any questions they may have. A suggestion box is provided at the hunt check station in addition to periodic meetings to gather input from the public on the hunting program at Humboldt Bay NWR.

H. Hunter Requirements
Hunters are required to comply with all State, Federal and refuge-specific regulations. Refuge-specific regulations are available on the refuge website and copies are available at the Richard J. Guadagno Headquarters and Visitor Center and hunter check station on hunt days.

VIII. References

Pacific Coast Joint Venture (PCJV). 2004. Pacific Coast Joint Venture (PCJV), Northern California Component, Strategic Plan Update.

Humboldt Bay Management Plan, HBHRCD Draft Environmental Impact Report April, 2006.

Waterfowl Hunt Plan - Humboldt Bay NWR

Prepared by:

Visitor Services Asst.
Humboldt Bay NWR

Sean Brophy Date 08/11/09

Project Leader
Humboldt Bay NWR

Eric Rykl Date 8/13/09

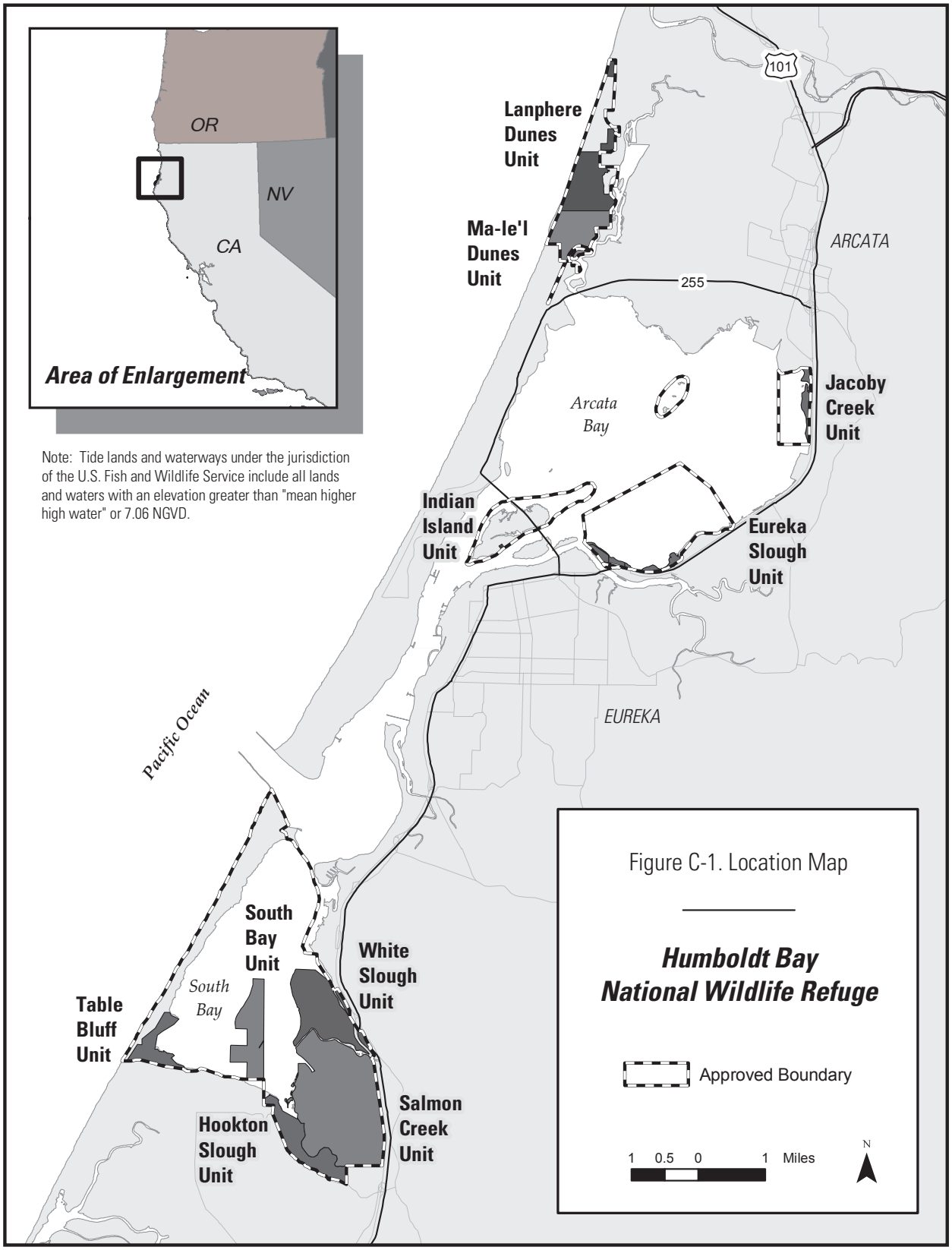

Figure C–1: General location and overview map of the Humboldt Bay NWR.

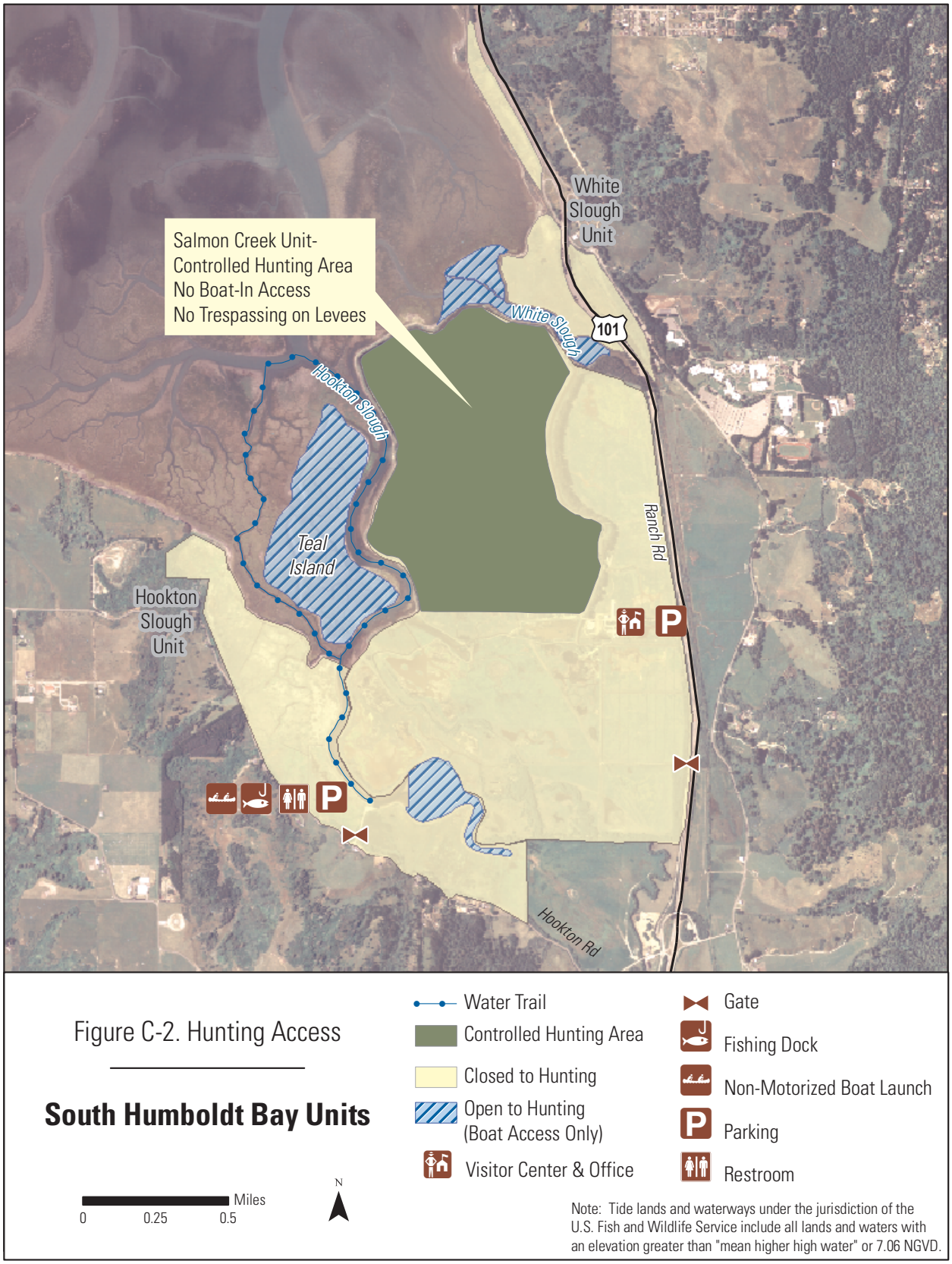

Figure C–2: Location and boundary map of hunting areas on the southern units of Humboldt Bay NWR.

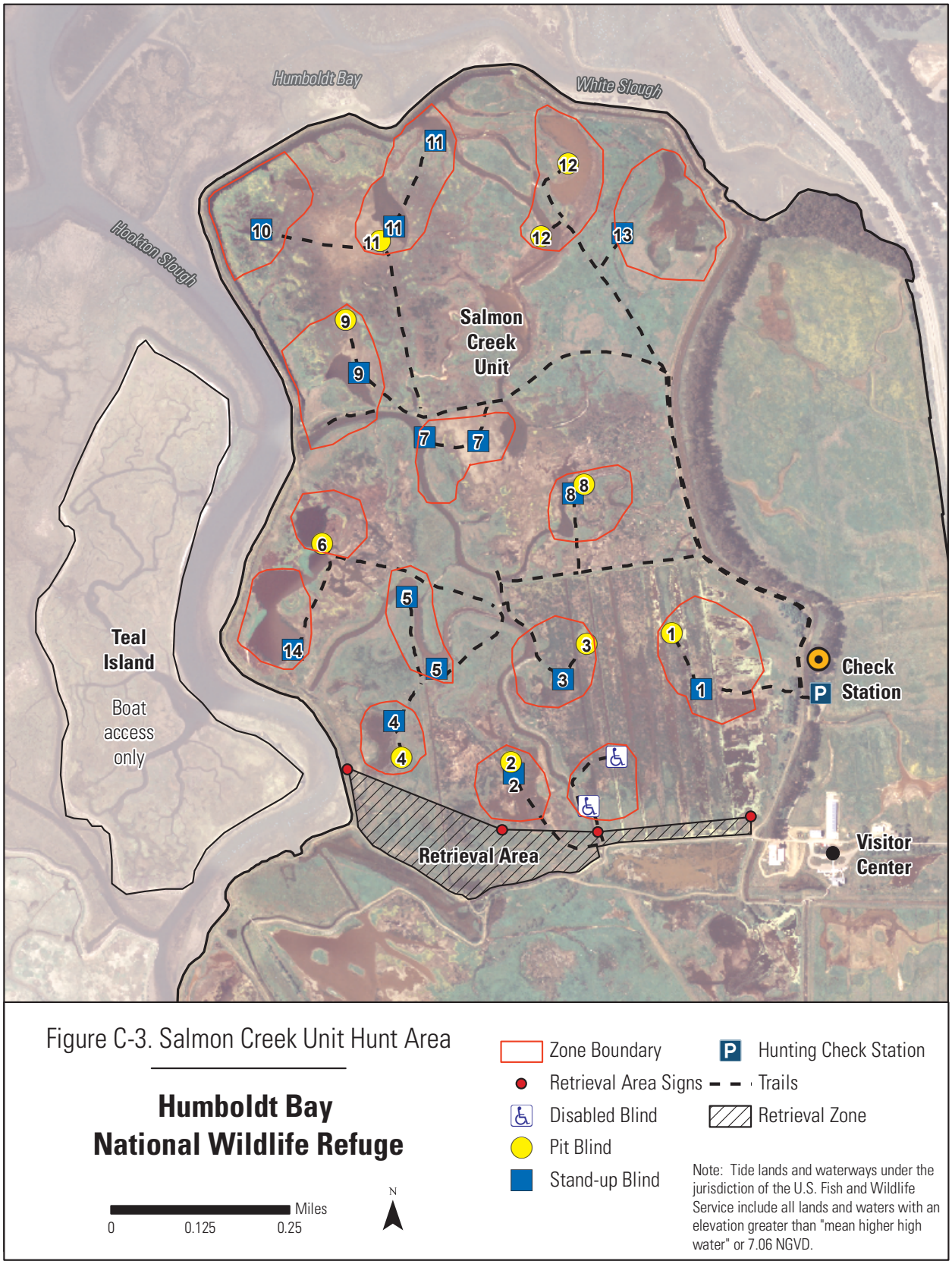

Figure C–3: Map of the hunting area at Salmon Creek Unit.

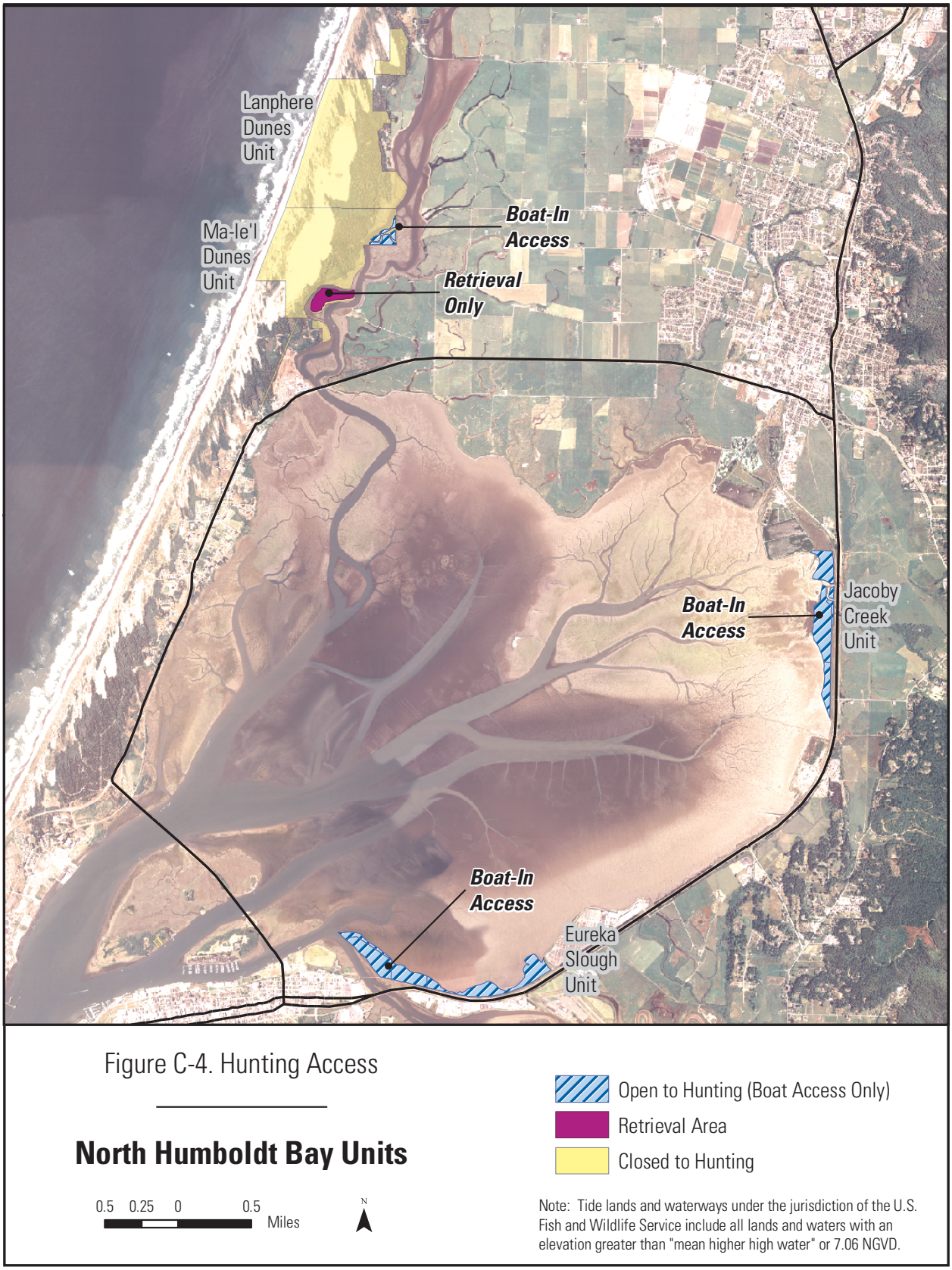

Figure C–4: Location and boundary map of hunting areas on the northern units of Humboldt Bay NWR.

Table C–1: Blind types at the Salmon Creek Unit hunt area

Salmon Creek Unit controlled hunting blind types 2007-08.

Blind Number	Stand-up Blinds	Pit Blinds
Disability	2	0
1	1	1
2	1	1
3	1	1
4	1	1
5	2	0
6	0	1
7	2	0
8	1	1
9	1	1
10	1	0
11	2	1
12	0	2
13	1	0
14	1	0

Note: One pit blind means two hunters can be in pits.
Note: No more than four hunters per blind at any time.

Appendix D: Sport Fishing Plan

SPORT FISHING PLAN

Humboldt Bay National Wildlife Refuge

November 2008

Fisherman at Hookton Slough Boat Dock Photo: USFWS

I. Introduction

A. Physical Environment

Humboldt Bay is situated 280 miles north of San Francisco and 85 miles south of the Oregon border (Figure D-1). Topography in the general region of Humboldt Bay is characterized by steep mountains and narrow valleys, which are typical of the coast ranges of northern California. Most of these uplands are covered by dense forests of redwood and Douglas-fir.

Humboldt Bay National Wildlife Refuge (HBNWR) is located in Humboldt County, California, with refuge units within and adjacent to Humboldt Bay and associated watersheds. The approved refuge boundary is roughly defined by Hookton Road on the south, Mad River County Park on the north, Highway 101 and Mad River Slough on the east, and the Pacific Ocean on the west (Figure D-1). Humboldt Bay lies on a narrow coastal plain. It is one of the few naturally protected harbors found in California. Humboldt Bay measures from ½ to 4 miles wide and 14 miles long. Humboldt Bay is an open lagoon system protected from the ocean by two long sand spits except for a narrow entrance channel permanently kept open by dredging and rock jetties. Four creeks and several sloughs, draining approximately 288 square miles, flow directly into the bay. The total surface water areas of the bay are 26.5 square miles at high tide and 7.8 square miles at low tide. The tidal range at the bay entrance is about 6.4 feet. Two major rivers, the Mad and the Eel, bound the area on the north and south, respectively, and flow directly into the ocean. The countryside adjacent to the bay is relatively flat with rolling terraces.

Humboldt Bay consists of three primary sections: Arcata Bay in the north, Entrance Bay in the middle and South Bay. Below are brief descriptions of each section as described in the Humboldt Bay Management Plan (HBHRCD 2007):

Arcata (North) Bay
Arcata Bay is bounded by the Samoa Peninsula and the North Spit to the west; the Arcata Marsh and Wildlife Sanctuary, Arcata Bottoms, and City of Arcata to the north; Bayside Bottoms and Bracut areas to the east; and the City of Eureka and Woodley Island to the south. Arcata Bay covers approximately 13 square miles and is approximately 5.8 miles at its longest and 4.3 miles at its widest points. This portion of the bay is generally shallow, with over half of the area exposed at low tides. These tidal flats are incised by several deeper channels, as well numerous shallow channels. Most of the mud-silt bottom of Arcata Bay is exposed on average low tides, creating habitat for foraging shorebirds.

Entrance Bay
Entrance Bay is approximately five miles long and generally less than a mile wide. It is bounded by the North Spit on the west, Arcata Bay to the north, the City of Eureka and Elk River Spit and wetlands to the east. It includes Woodley Island, Indian Island and the City of Eureka waterfront. Entrance Bay, with a mostly sand bottom, lacks the expansive mudflats found in Arcata Bay and South Bay.

South Bay
South Bay covers approximately 7 square miles and is approximately four miles at its longest and 2.5 miles at its widest points. It is bounded by the South Spit on the west side, Entrance Bay on the north, lands and waters of the Humboldt Bay National Wildlife Refuge (HBNWR) Complex on the southeast, and Table Bluff to the southwest. Like Arcata Bay, much of the South Bay is occupied by broad expanses of tidal flats incised by numerous small, shallow channels and one deep-water channel which serves the Fields Landing and King Salmon areas and is maintained for navigation. South Bay supports eelgrass over much of its silt bottom, with the higher elevations of the east and south sides exposing bare mudflats on most low tides.

In 1971, the Humboldt Bay National Wildlife Refuge was established to conserve important habitat for the great diversity of animals and plants that occur in the Humboldt Bay area. Humboldt Bay NWR has several different units totaling almost 3,500 acres. These units consist of a mixture of mudflats, estuarine eelgrass meadows, salt marsh, brackish marsh, seasonally flooded freshwater wetlands, riparian wetlands, streams, coastal dunes, and forest. These habitats support over 316 species of birds and 40 species of mammals. The refuge also provides habitat for ~ 100 species of fish and marine invertebrates, many of which contribute to sport and commercial fisheries, including steelhead, Coho and Chinook salmon, and Dungeness crab.

Concentrations of migratory waterbirds, especially shorebirds, occur in the fall, winter, and spring. In winter, it is not unusual for over 100,000 birds to use Humboldt Bay as a feeding or resting site. Key habitats for these waterbird concentrations are eelgrass beds and extensive mudflats. These also make the bay an important spawning, nursery, and feeding area for fish and other marine life. Complimentary to the bay habitats are thousands of acres of seasonal wetlands (mostly former tidal wetlands that have been diked off for over a century).

Endangered or threatened species include: brown pelican, snowy plover, Chinook and Coho salmon, steelhead, tidewater goby, Humboldt Bay wallflower, and beach layia. The Lanphere Dunes and Ma-le'l Dunes Units protect endangered and rare plants within rare dune plant communities. The refuge contains one of very few dune systems in which the underlying processes are intact.

The Humboldt Bay watershed is considered the most important wintering waterfowl habitat between San Francisco Bay and the Columbia River (PCJV 2004). Many species of waterfowl use habitats on Humboldt Bay NWR, particularly for resting and foraging during their annual migrations. Seasonally common waterfowl that use Humboldt Bay NWR and nearby wetlands and agricultural short-grass pastures during migration include: northern pintail, northern shoveler, American wigeon, green-winged teal, mallard, bufflehead, scaup, tundra swan, Pacific brant, Aleutian and cackling geese, and non-native Western Canada geese, which were introduced to the area in the 1980's. Larger, seasonally common waterfowl such as Pacific brant, Canada geese, and cackling geese are highly valued by sport hunters and by wildlife watchers alike. This refuge has also been described as one of the most important areas in the United States south of Alaska for Pacific brant. This is especially true during the spring when the bay is a key staging area for more than 60% of the flyway Pacific brant population prior to their return to arctic nesting grounds. Similarly, the northcoast of California and southern coast of Oregon are key spring staging areas for the growing population of Aleutian cackling geese.

II. Conformance with Statutory Authorities

Humboldt Bay National Wildlife Refuge was established by authority of the Migratory Bird Conservation Act of February 16, 1929, as amended, and the Migratory Bird Hunting and Conservation Stamp Act of March 16, 1934, as amended. The purpose of the refuge is to protect and enhance wetland habitats in and adjacent to Humboldt Bay for a wide variety of migratory waterbirds, especially Pacific brant. National Wildlife Refuges are guided by the mission and goals of the National Wildlife Refuge System (NWRS), the purposes of an individual refuge, Fish and Wildlife Service (FWS) policy, laws, and international treaties. Relevant guidance includes the National Wildlife Refuge System Improvement Act of 1997, Refuge Recreation Act of 1962, and selected portions of the Code of Federal Regulations and Fish and Wildlife Service Manual.

The National Wildlife Refuge System Improvement Act of 1997 provides guidelines and directives for the administration and management of all areas in the NWRS. The Act also defines six wildlife-dependent priority public uses, including sport fishing, which refuges should strive to provide when compatible with the purposes of the refuge and the mission of the NWRS. Prior to refuge acquisition, sport fishing access was by private boat only. Land access was not available to the general public. Therefore, a historical precedent for sport fishing on refuge lands exists as some of the lands and waters acquired by the refuge were utilized for sport fishing prior to refuge acquisition and public access to sport fishing opportunities will be increased through this plan. Sport fishing is permitted in accordance with State, Federal and refuge-specific regulations to ensure that it will not interfere with the conservation of fish and other wildlife and their habitats.

The State of California has legislatively granted to the Humboldt Bay Harbor, Recreation, and Conservation District (HBHRC District) jurisdiction over areas below mean higher high water or elevation 7.06 NGVD (3.15 feet above mean sea level). Therefore, fishing in the sloughs and land areas below 3.15 mean sea level are under the HBHRC District's jurisdiction. Areas above 3.15 mean sea level are within the refuge's jurisdiction.

III. Statement of Objectives

The goal of the National Wildlife Refuge System is: To provide the general public with a quality wildlife-oriented recreational experience and an opportunity to utilize a renewable natural resource. The objectives of the Humboldt Bay NWR Sport fishing Plan are to:

1. Provide a quality wildlife-dependent recreational experience, using a renewable natural resource.

The goals of HBNWR as established by the Refuge Comprehensive Conservation Plan (CCP) are to:

1. Conserve, manage, restore, and enhance estuarine and palustrine wetland habitats representative of the Humboldt Bay area to benefit their associated native fish, wildlife, plants, and special status species.
2. Conserve and restore globally rare dune and dune forest habitats, associated native plant and animal species and support recovery of threatened, endangered, and endemic species dependent upon these rare habitats.
3. Promote long term viability of the Humboldt Bay estuarine and dune ecosystems through ecosystem based management coordinated with both public and private partners around the bay.
4. Provide public with safe, high-quality wildlife-dependent recreation and volunteer opportunities to enhance public appreciation and understanding of fish, wildlife, plants, and habitats of Humboldt Bay and associated watersheds.
5. In cooperation with tribal representatives identify and protect cultural resources on the Humboldt Bay NWR.

Therefore, the Sport Fishing Plan will contribute to refuge goal number four (see above) without impeding the ability of the refuge to achieve remaining refuge goals. This plan will allow sport fishing on designated refuge units under State regulations as well as regulations set by the Fish and Wildlife Service specifically for HBNWR.

IV. Assessment of Resource

Sport fishing in Humboldt Bay is a popular form of recreation. Well established fisheries for perch, smelt, salmon, rockfish, crabs and clams provide for local enthusiasts as well as tourists. A complete listing of all fish found in Humboldt Bay is located in Appendix K.

All of Humboldt Bay including that portion of Salmon Creek on the refuge provides habitat for Endangered Species Act (ESA) listed threatened steelhead, Coho, and Chinook salmon. Endangered tidewater gobies are also found in estuaries and up to 1km (0.6 mi) upstream. Coastal cutthroat trout are a State Species of Special Concern.

Declines in salmon stocks on the north coast have resulted in sharply reduced or closed seasons and shifts in fishing effort to other species. Fisheries gaining rapidly in popularity are Dungeness crab (*Cancer magister*), leopard shark (*Triakis semifasciata*), California halibut (*Paralichthys californicus*), and various species of clams. Sport fishing within Humboldt Bay accounts for more than 30,000 angler-days each year. Most of the sport fishing in South Humboldt Bay occurs on the South Jetty and at Buhne's Point.

Historically, the four major tributaries of Humboldt Bay were popular trout fishing streams. Elk River, Freshwater Creek, Salmon Creek, and Jacoby Creek held resident populations of cutthroat trout. Steelhead and salmon augmented the fishermen's catch. Current observations indicate occasional localized sport fishing on these streams. Cutthroat trout were planted in lower Freshwater Creek in 1992 to enhance the fishery. No sport fishing is allowed on Jacoby Creek or Salmon Creek within the refuge boundaries. Sport fishing on both creeks is limited to private properties upstream from the refuge. A fishery management plan was completed for Humboldt Bay NWR in September 1992.

V. Description of Sport Fishing Program

A. Areas Opened

Public sport fishing will continue to be permitted on navigable waters of Humboldt Bay that fall within the existing refuge boundary. Most sport fishing in Humboldt Bay will occur from boats on navigable waters. Sport fishing will also continue to be permitted from the Hookton Slough boat dock and off

the Hookton Slough trail, west of the designated parking lot. This area is known as the "Hookton Slough Shoreline Fishing Trail" (Figure D-2).

Sport fishing will be opened to the public at the end of the Tsoutsgish Trail trail (end of railroad berm) at the Ma-le'l Dunes Unit. Boaters can also access Mad River Slough from the boat ramp on Lanphere Road or from Samoa Blvd. All others areas within the refuge remain closed to sport fishing (Figure D-3).

Kayakers using the Hookton Slough non-motorized boat launch to access Hookton Slough and South Bay. Photo: USFWS

B. Procedures for Coordination with State

The California Department of Fish and Game (CDFG) will be consulted if any changes are planned in the refuge sport fishing program. For seasons, limits, and fishery-related species to be taken, sportfishers should refer to State of California Sportfishing Regulations.

Additionally, refuge staff meets with CDFG, Bureau of Land Management (BLM) and FWS managers and wardens before and after each hunting season to discuss the hunting season and possible improvements for the coming year. During this meeting, any issues arising from the sport fishing program will be discussed.

C. Methods of Enforcement

Refuge staff patrols public sport fishing areas on the refuge as part of their normal duties. Law enforcement officers with CDFG, BLM, and FWS will continue to enforce all applicable laws within their authority.

D. Funding and Staffing Requirements

The costs of managing the sport fishing program are minimal, and consist primarily of posting and maintaining "Public Fishing Area" signs and including sport fishing information in the refuge brochure and website. Necessary funds are available for this work within the annual budget of Humboldt Bay NWR. Because of the relatively light opportunity and pressure from sport fishing there will be no facilities developed or managed specifically for the use of anglers.

VI. Measures Taken to Avoid Conflict with Other Objectives

A. Biological Conflicts

The non-tidally influenced areas (dikes and seasonal wetlands) will be closed to sport fishing to provide disturbance-free resting and foraging areas for migratory birds. Anglers will be monitored on an opportunistic basis to determine if any wildlife disturbance is occurring. The sport fishing program will not affect any threatened or endangered species.

B. Public Use Conflicts

Sport fishing at Humboldt Bay NWR is not expected to have any adverse effects on refuge resources or to conflict with any other visitor activities.

C. Administrative Conflicts

At this time no administrative conflicts are anticipated.

VII. Conduct of the Sport Fishing Program

A. Refuge-Specific Regulations

Sport fishing is permitted on designated areas of Humboldt Bay NWR subject to the following refuge-specific regulations:

1. A State Fishing License is required to fish on all refuge property.
2. Sport fishing from the Hookton Slough boat dock, the Hookton Slough Shoreline Fishing Trail along Hookton Slough and from the end of the Cukish trail at the Ma-le'l Dunes Unit is permitted during daylight hours only. No wading from shore is permitted at any units.
3. Only the use of pole and line or rod and reel is permitted from the Hookton Slough boat dock, the Hookton Slough Shoreline Fishing Trail and from the end of the Cukish trail at the Ma-le'l Dunes Unit.
4. Use or possession of alcohol is prohibited on refuge property.
5. Fish may not be cleaned on refuge property.
6. Littering is prohibited and will be prosecuted.

B. Anticipated Public Reaction to the Sport Fishing Program

Most sportfishers support the expansion and continued existence of sport fishing on the Humboldt Bay NWR. Sport fishing has strong traditional use in the Humboldt Bay area. During the comment period for the CCP in February 2007, a number of opinions were heard from the public regarding the increased opening of refuge lands to wildlife- dependent recreation opportunities. The majority of comments received supported increasing access to the refuge for wildlife-dependent recreation.

C. Media Used to Publicize Fishing Opportunities

The Sport Fishing Plan will be announced in the media as part of the refuge CCP process, and will be released as an amendment to the HBNWR CCP.

D. Fishing Requirements

Sportfishers must comply with all State, Federal, and refuge-specific regulations.

VII. Literature Cited

Ma-le'l Dunes Cooperative Management Area Access Plan. 2008.

Pacific Coast Joint Venture (PCJV). 2004. Pacific Coast Joint Venture (PCJV), Northern California Component, Strategic Plan Update.

Humboldt Bay Harbor Conservation and Recreation District Management Plan, 2007.

Humboldt Bay Management Plan, HBHRCD Draft Environmental Impact Report April, 2006.

Fishing Plan- Humboldt Bay NWR

Prepared by:

Visitor Services Asst.
Humboldt Bay NWR
Sean Brophy Date 08/11/09

Project Leader
Humboldt Bay NWR
Eric Rel Date 8/13/09

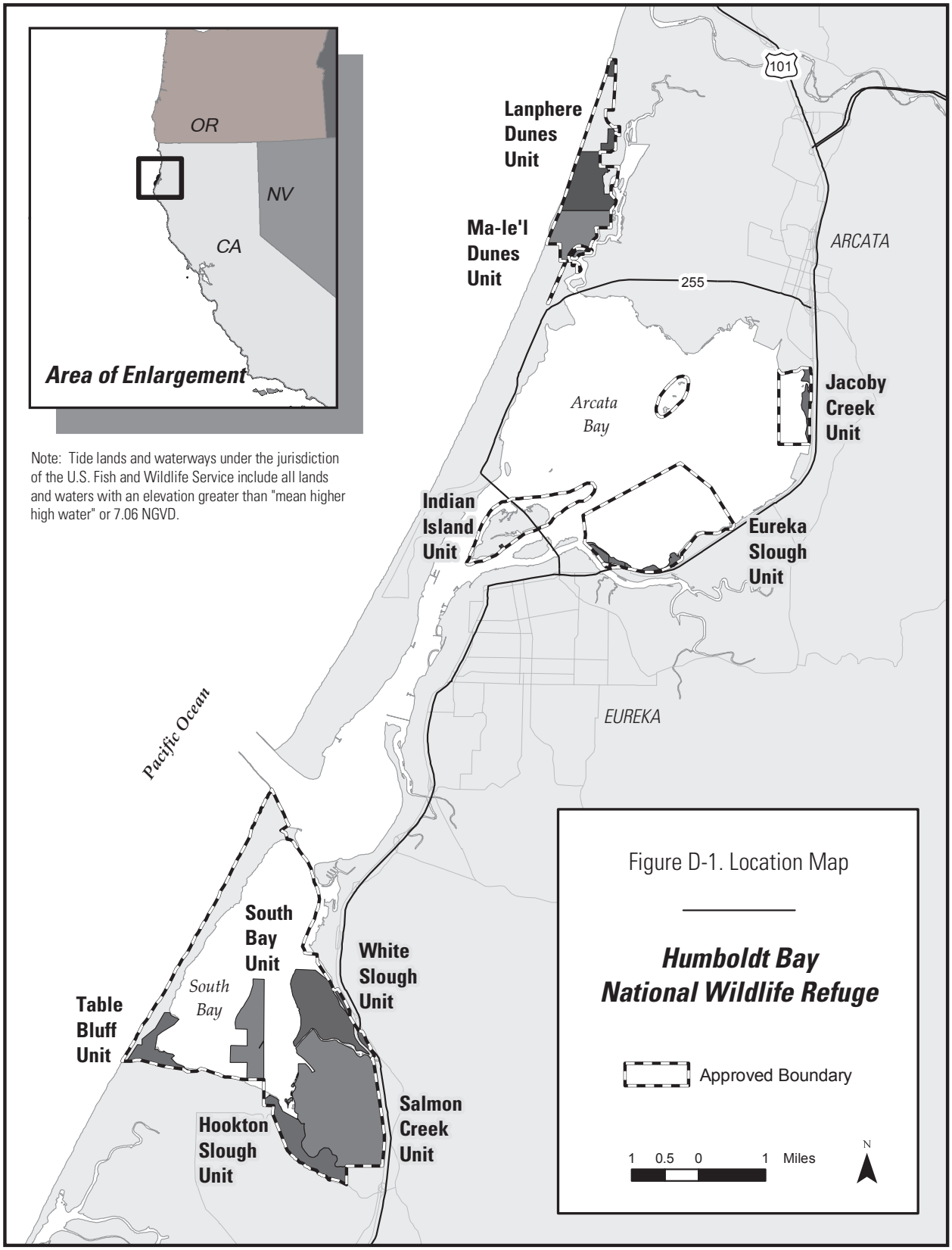

Figure D–1: General location and overview map of the Humboldt Bay NWR.

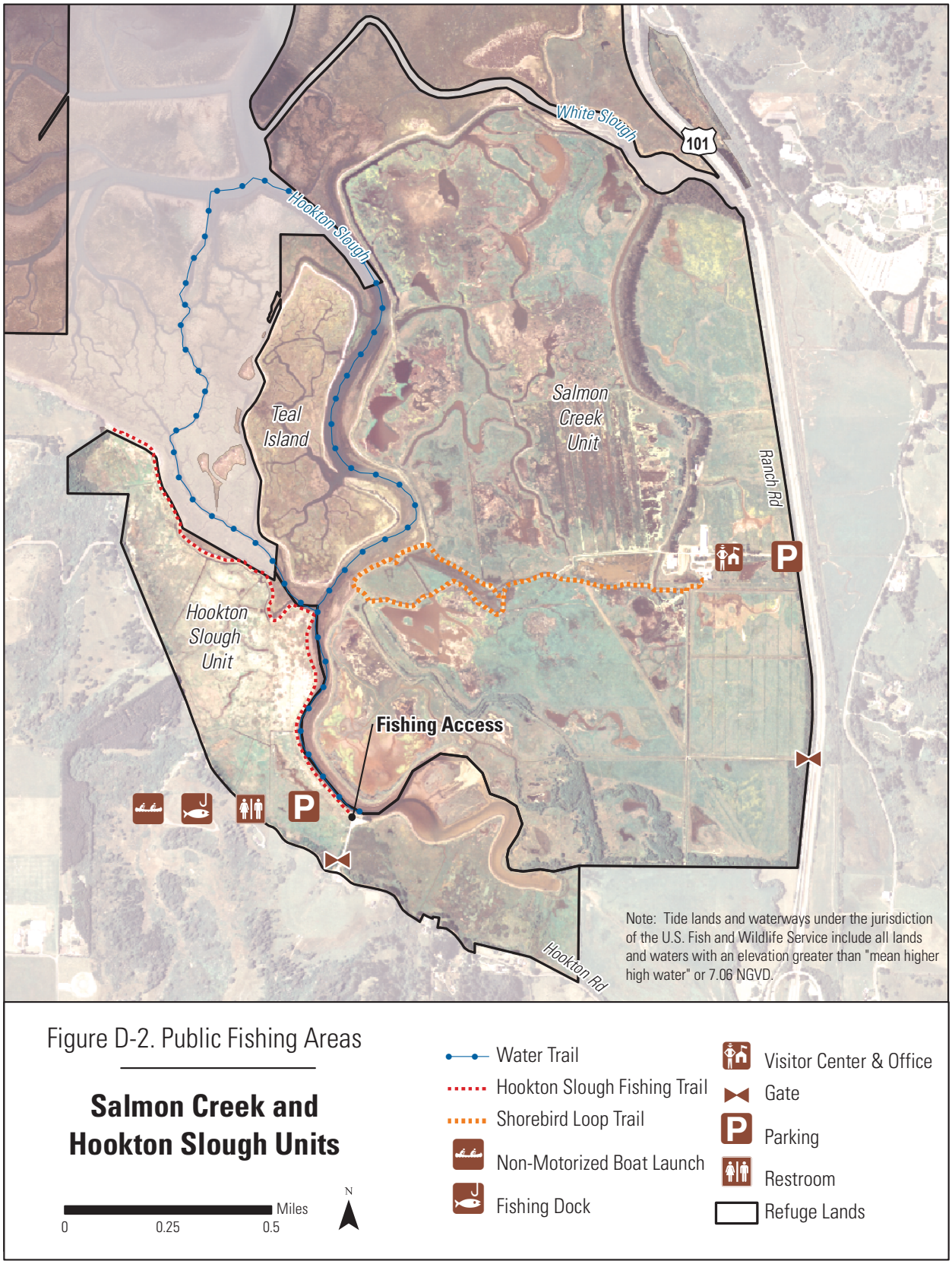

Figure D–2: Public fishing areas on the southern units of Humboldt Bay NWR.

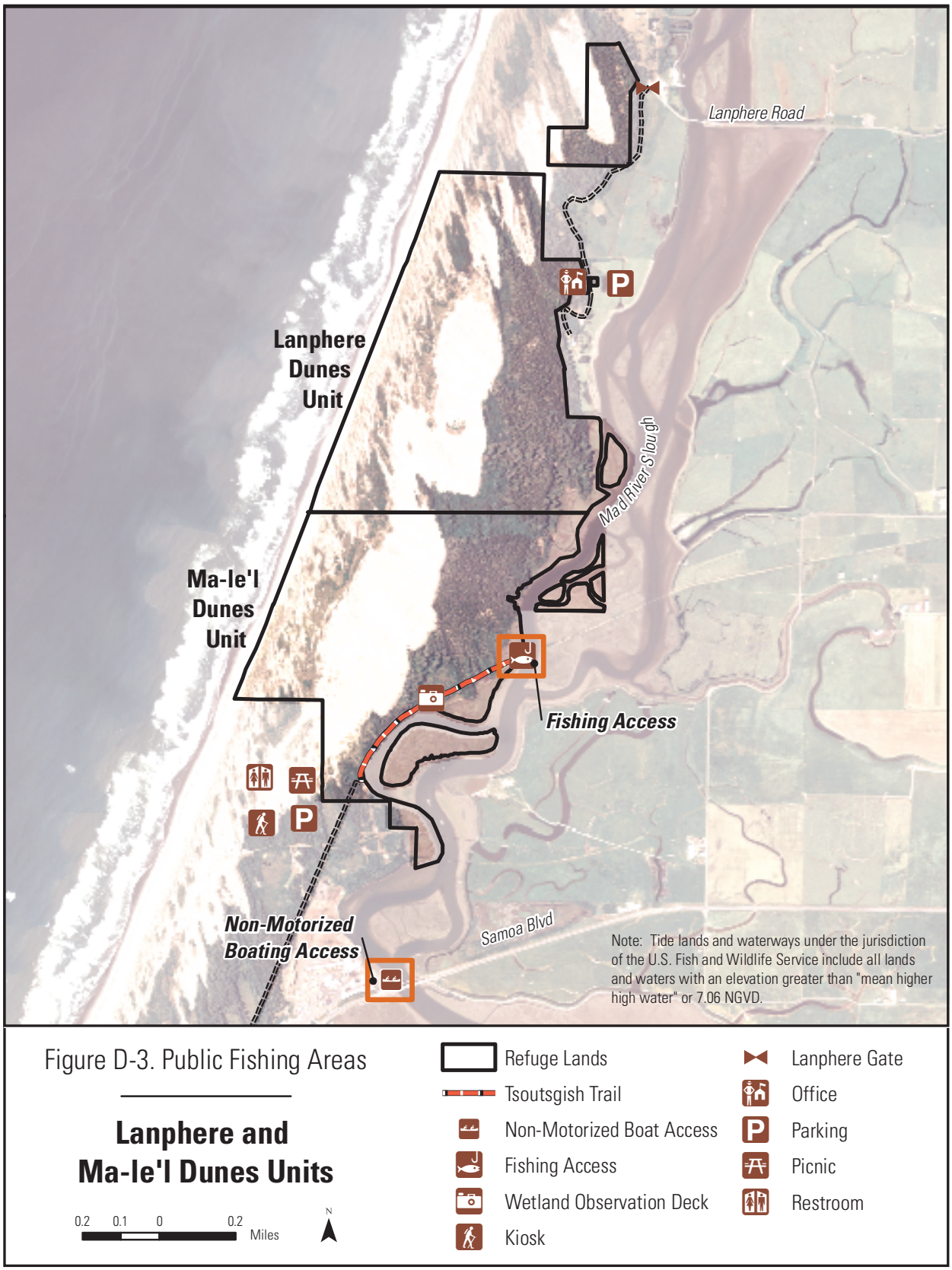

Figure D–3: Public fishing areas on the Ma-le'l Dunes Unit of Humboldt Bay NWR.

Appendix E: Final Environmental Assessment and Finding of No Significant Impact for the Humboldt Bay NWR Complex Comprehensive Conservation Plan

Final Environmental Assessment and Finding of No Significant Impact for the Humboldt Bay NWR Complex Comprehensive Conservation Plan

Prepared By:

U.S. Fish and Wildlife Service
Pacific Southwest Region
Refuge Planning
2800 Cottage Way, W-1832
Sacramento, CA 95825-1846

and

U. S. Fish and Wildlife Service
Humboldt Bay National Wildlife Refuge Complex
1020 Ranch Rd.
Loleta, CA 95551-9633

July 2009

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Chapter 1. Purpose and Need for Action

Introduction

This environmental assessment (EA) evaluates the environmental effects of three alternatives for managing the Humboldt Bay National Wildlife Refuge Complex (Complex), which includes the Humboldt Bay National Wildlife Refuge (NWR) and Castle Rock NWR. The U.S. Fish and Wildlife Service (Service) will use this EA to solicit public involvement in the refuge planning process and to determine whether implementation of the Comprehensive Conservation Plan (CCP) will have a significant effect on the quality of the human environment. This EA is part of the Service's decision-making process in accordance with the National Environmental Policy Act (NEPA).

Proposed Action

The Service proposes to implement Alternative C as the Comprehensive Conservation Plan for Humboldt Bay and Castle Rock NWRs, as described in this EA. Alternative C is described in more detail in Chapter 5 (Complex Vision, Goals, and Objectives) of the CCP. The Service examined a range of management alternatives. Specific details regarding the preferred alternative and the other alternatives that were evaluated are provided in Chapter 2 of this EA. Of these, Alternative C represents the Service's proposed action. However, the final decision can be any of the alternatives, and may reflect a modification of certain elements of any alternative analyzed based on consideration of public comment. Of the alternatives evaluated, Alternative C appears to best achieve the purpose, vision, and goals for the refuges, while also appropriately addressing the major issues and relevant mandates identified for each refuge during the CCP process.

Purpose of and Need for the Proposed Action

There is a need for written guidance on refuge operations, wildlife and habitat management, and visitor services to help ensure consistency among management of the refuge, year-to-year operations, and the refuge's purposes. The Proposed Action, the CCP, provides guidance for conducting general refuge operations, wildlife and habitat management, habitat enhancement and restoration, and visitor services. The CCP is intended to ensure that management actions are consistent with the purposes for which the refuges were established, the mandates of the Refuge System, and the refuges' goals and objectives. The purpose of the Proposed Action is to describe the desired future conditions of Humboldt Bay and Castle Rock NWRs over the next 15 years and provide guidance for achieving those conditions.

The CCP:
- Sets a long term vision for the refuges;
- Establishes management goals, objectives, and strategies for the refuges;
- Provides the refuges with a 15-year management plan for the conservation of fish, wildlife, and plant resources and their related habitats;
- Defines compatible public uses;
- Develops a plan that, when fully implemented, will achieve refuge purposes, help fulfill the mission of the system, and maintain and, where appropriate, restore ecological integrity;
- Communicates the Service's management priorities for the refuges to the public; and
- Provides a basis for budget needs to support staffing, operations, maintenance, and capital improvements.

The development of the CCP is also required to fulfill legislative obligations of the Service. The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act), requires that every refuge or related complex of refuges have a CCP in place within 15 years of the Improvement Act's enactment. The NEPA requires that an EA or environmental impact statement (EIS) be prepared to accompany the CCP to evaluate the effects of different alternatives that meet the goals of the refuges and identifies the Service's proposed action for implementing the CCP.

Project Area

The Humboldt Bay National Wildlife Refuge Complex, which includes Humboldt Bay National Wildlife Refuge (Humboldt Bay NWR) and Castle Rock National Wildlife Refuge (Castle Rock NWR), is located on the northern coast of California.

Humboldt Bay NWR is located on Humboldt Bay, the largest bay between San Francisco Bay and Coos Bay, Oregon, near the cities of Eureka and Arcata. In 1971, the refuge was established to conserve coastal habitats for a great diversity of animals and plants, especially migratory birds. In later years, the refuge added the Lanphere and Ma-le'l Dunes Units, to help conserve the most pristine remaining dune ecosystem on the west coast of the United States.

The Humboldt Bay NWR boundary consists of 9,502 acres (3,379 acres owned in fee title) of: freshwater, brackish, and salt marsh; agricultural wetlands, intertidal mudflats; eelgrass beds, as well as some of the most pristine dune habitats in the western United States.

Castle Rock NWR is a 14-acre nearshore island located in Del Norte County, California, less than a mile northwest of Crescent City consisting primarily of rock, with sparse vegetation. Castle Rock NWR hosts one of the largest and most diverse assemblages of breeding seabirds on the Pacific coast, provides a critical roost for thousands of Aleutian cackling geese prior to their transoceanic migration, and provides resting sites for seals and sea-lions.

See Figure E-1. Location Map for Humboldt Bay National Wildlife Refuge.

Decisions to be Made

Based on the analysis documented in the draft EA, the Regional Director must determine the type and extent of management and visitor access that will occur on the refuge and whether the selected management alternative would have a significant effect on the quality of the human environment.

The planning team recommends Alternative C to the Regional Director. The accompanying draft CCP was developed for implementation based on this recommendation.

Issues and Challenges Identification

The Service identified issues, concerns and opportunities through early planning discussions and the public scoping process. The scoping process officially began on January 29, 2007, when the Service published a Notice of Intent to prepare a CCP in the Federal Register (Vol. 72, No. 18, p. 4020). The first planning update was distributed in January 2007 to interested stakeholders that had been identified through other prior planning processes, to further solicit public input. A full discussion of the planning process and issues raised can be found in Chapter 2 and Chapter 4 of the CCP, respectively.

The planning team helped to further define the issues and challenges. The core planning team includes Service employees from the Humboldt Bay National Wildlife Refuge Complex and the California and Nevada Region, Refuge Planning.

Public Involvement

The first planning update was sent to 220 interested stakeholders announcing the public scoping meetings, and asking for comments on issues to be addressed in the CCP. An issues workbook was also distributed to the mailing list and at public meetings to help focus public input on issues relevant to the CCP.

Three public scoping meetings were held on February 13, 15, and 17, 2007, in Del Norte and Humboldt counties to receive public input on the Complex's CCP and associated NEPA document. Each public scoping meeting consisted of a presentation by Service staff on the CCP/NEPA process, a presentation on the history of the refuges, questions and answers, and documentation of public comments. The majority of each public meeting was spent documenting public comments.

The planning staff has incorporated public input received in response to these updates and workshops into the CCP and EA; a summary of major issues and challenges is included in Chapter 4 of the CCP and a summary of public scoping comments is included in Appendix M: Public Involvement Process for the Humboldt Bay NWR Complex CCP/EA and Appendix R: Responses to Comments on the Draft Comprehensive Conservation Plan and Environmental Assessment. The original comments are available for review in planning administrative files at the California and Nevada Region, Refuge Planning office, in Sacramento, California.

U.S. Fish and Wildlife Service and the National Wildlife Refuge System

The mission of the Service is working with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The Service is the primary Federal agency responsible for managing migratory birds, endangered plants and animals, certain marine mammals, and inter-jurisdictional fish. The responsibility to conserve our nation's fish and wildlife resources is shared with other Federal agencies, State and Tribal governments.

As part of this responsibility, the Service manages the National Wildlife Refuge System (Refuge System). The Refuge System is the largest system of lands in the world dedicated to the conservation of fish and wildlife. Operated and managed by the Service, it currently includes over 500 refuges with a combined area of more than 94 million acres. The mission of the Refuge System is to administer a national network of lands and waters for the consideration, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The refuges are managed as part of the Refuge System in accordance with the National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997, and other relevant legislation, Executive Orders, regulations, and policies. Chapter 1 of the CCP summarizes many relevant Acts, regulations, and policies and describes the goals of the Refuge System.

Humboldt Bay NWR Purposes

Humboldt Bay NWR was established under the authority of the Migratory Bird Conservation Act of 1929, the Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and the Endangered Species Act of 1973.

According to these authorities, Humboldt Bay NWR's purposes are:

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..."16 U.S.C. §§ 460k-1 and "... the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

Humboldt Bay NWR Goals

Goal 1. Conserve, manage, restore, and enhance estuarine and palustrine wetland habitats representative of the Humboldt Bay area to benefit their associated native fish, wildlife, plants, and special status species.

Goal 2. Conserve and restore globally rare dune and dune forest habitats, associated native plant and animal species and support recovery of threatened, endangered, and endemic species dependent upon these rare habitats.

Goal 3. Conserve and restore all refuge habitats through the prevention and control of invasive plants and animals.

Goal 4. Promote long-term viability of the Humboldt Bay estuarine and dune ecosystems through ecosystem-based management (including endangered and threatened species management across boundaries) coordinated with both public and private partners around the Bay.

Goal 5. Provide the public (and especially children) with accessible, safe, high-quality wildlife-dependent recreation opportunities to enhance public appreciation and understanding of fish, wildlife, plants, and habitats of Humboldt Bay and associated watersheds.

Goal 6. In cooperation with tribal representatives, identify and protect tribal cultural resources on the Humboldt Bay NWR. In addition, assess and manage the refuge's more recent cultural resources and structures.

Castle Rock NWR Purposes

Castle Rock National Wildlife Refuge was established under the authority of the Endangered Species Act of 1973.

According to this authority, Castle Rock NWR's purpose is:

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species .... or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

Castle Rock NWR Goals

Goal 1. Protect and maintain habitats for migratory birds and marine mammals, with an emphasis on seabirds, and Aleutian cackling geese.

Goal 2. Provide high quality environmental education, interpretive information, and outreach to the public highlighting the ecology and sensitivity of the wildlife of Castle Rock National Wildlife Refuge.

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes three alternatives for managing the Humboldt Bay National Wildlife Refuge Complex (Complex), which includes the Humboldt Bay National Wildlife Refuge (NWR) and Castle Rock NWR: Alternative A (No Action), Alternative B, and Alternative C (Preferred Alternative). These alternatives are described below. Figures E-2 through E-8 show a graphical representation of the alternatives described below. Two of the three alternatives presented in this chapter are "action alternatives" that would involve a change in the current management of the Complex. Under Alternative A, the No Action alternative, the Service would continue managing the Complex as it currently does. The Service's preferred alternative is Alternative C.

HUMBOLDT BAY NATIONAL WILDLIFE REFUGE

Current Management of Humboldt Bay NWR

For a complete description of the current management practices, please see Current Management of Humboldt Bay NWR and Current Management of Castle Rock NWR sections in Chapter 1 of the CCP.

Features Common to All Alternatives for Humboldt Bay NWR

Agricultural Grassland Maintenance

The Humboldt Bay NWR would continue to allow grazing and haying, through cooperative land management agreements with local ranchers, to maintain short-grass pasture habitat for migratory birds. Pasture soil pH would continue to be monitored every 3 to 5 years, and lime would be added as needed. In addition, refuge staff would continue to conduct seasonally appropriate mowing (outside of nesting season) in areas where grasslands merge into wetland plant communities. Mowing would continue to be used throughout the Salmon Creek Unit, along wetland edges where haying is not feasible, to maintain grasslands and to control non-native thistle (*Cirsium* spp.) and other weeds.

Invasive Plant Management

Invasive plants are having an ever increasing negative effect on refuge habitats (and adjacent private lands), and must be managed if future greater habitat losses are to be avoided. Although an Integrated Pest Management (IPM) plan has not yet been developed for the Humboldt Bay NWR, the refuge staff will continue to manage non-native invasive plant species by using IPM strategies (including a combination of mechanical, chemical, biological, and cultural means of managing invasives). If herbicides are used to control invasive species on the refuge, a Pesticide Use Proposal will be filed for each herbicide prior to use.

Throughout the refuge, staff will control non-native dense-flowered cordgrass (*Spartina densiflora)* in salt marsh and freshwater and brackish marsh through a combination of manual and mechanical methods. In addition, staff will work with Federal, State and local partners to eradicate *Spartina densiflora* in the greater Humboldt Bay area, which is a high priority project of the West Coast Governors Agreement. Refuge staff would continue to control and eradicate invasive plants in freshwater and brackish marsh on all Humboldt Bay NWR units. Upland invasive plants common to all units that need to be controlled include thistles, bristly oxtongue (*Picris echioides*), English ivy (*Hedera helix*), Himalayan blackberry (*Rubus discolor*) and false bindweed (*Calystegia sylvatica*). On the Hookton Slough Unit, restoration activities would include an emphasis on controlling newly established populations of marsh lotus (*Lotus uliginosus*), water iris (*Iris pseudacorus*), woodland ragwort (*Senecio sylvaticus*), reed canarygrass (*Phalaris arundinacea*), and Australasian fireweed (*Erechtites glomerata*). On the Table Bluff Unit, refuge staff would eradicate or control invasive plants, particularly bullthistle (*Cirsium vulgare*) and Australasian fireweed (*Erechtites glomerata*). refuge staff would also eradicate or control invasive species identified as early detection species in the Volunteer Invasive Species Mapping Program; reed canarygrass, Harding grass (*Phalaris aquatica*), barnyard grass (*Echinochloa crus-galli*), Andean pampas grass (*Cortaderia jubata*), and shortstalk false bindweed (*Calystegia sylvatica*). Refuge staff would use a combination of mechanical and chemical methods to remove non-native trees (including *Eucalyptus globulus*), such as cutting a tree at the base and then using a stump grinder or painting the stump with a Service-approved herbicide to prevent re-sprouting.

Refuge staff will implement large-scale experiments to determine the best methods of controlling or eradicating dune swale invasive plant species including rabbitsfoot grass (*Polypogon monspeliensis*), pennyroyal (*Mentha pulegium*), bird's-foot trefoil (*Lotus corniculatus*), and hyssop loosestrife (*Lythrum hyssopifolium*). These large-scale (0.5- to 1-acre) control experiments would involve the use of methods such as flaming, controlled burning, and mowing.

Refuge staff will continue to monitor and control invasive species such as English ivy, Francheti cotoneaster (*Cotoneaster franchetii*), and English holly (*Ilex aquifolium*) in coniferous dune forest, using a variety of manual and chemical methods, in coordination with partners such as the California Conservation Corp, the California Department of Forestry, and others. In some cases the staff may use the herbicide glyphosate to remove native poison oak (*Toxicodendron diversilobum*) plants, to be able to safely access and control non-native invasive plant species.

Herbicides that may be used, by refuge staff, to control invasive plants on the Humboldt Bay NWR include: Rodeo (glyphosate), Roundup pro (glyphosate), Roundup pro concentrate (glyphosate), Milestone (aminopyralid), Garlon 3A (triclopyr TEA salt, triethylamine, ethanol), and Crossbow (2,4,d , triclopyr). Prior to any herbicides being used to control invasive species on Humboldt Bay NWR, a Pesticide Use Proposal will be filed for each herbicide and associated surfactants. Pesticides will only be used in compliance with labeling instructions. In addition, refuge staff will also coordinate with Friends of the Dunes, which leads a monthly work day on the Ma-le'l Dunes Unit, and other volunteer groups.

Planting Native Plant Species
The refuge will enhance riparian swamp habitat by planting appropriate native, understory plant communities. Newly planted vegetation in riparian habitat would be protected from deer browsing with individual wire cages or similar exclusion devices. The refuge will increase populations of native dunegrass (*Leymus mollis*) on foredune communities, and will seek to develop a cooperative agreement with adjacent private land owners to collect native dune grass propagules.

Re-Introducing Endangered Plant Species
The refuge will develop partnerships to collect Humboldt Bay wallflower (*Erysimum menziesii* ssp. *eurekense*) seeds from the south spit and staff will use the south spit seeds to re-introduce Humboldt Bay wallflowers to the Table Bluff Unit where the wallflower is no longer present. In addition, the refuge will move seeds from occupied to unoccupied areas of wallflower habitat on the Lanphere and Ma-le'l Dunes Units. All work with endangered plants will be pursuant to required permits and results will be monitored.

Levee Maintenance and Water Management
The refuge will continue to provide basic maintenance to all levees and raise low points of levees on the White Slough Unit to facilitate future salt marsh restoration. In addition, the refuge will conduct maintenance repairs on the 2 existing White Slough tidegates. The refuge will continue with standard wetland management and maintain hydrologic connection where necessary to minimize the potential for fish stranding and mosquito production on all diked units.

Implementation of the Salmon Creek Delta Restoration
The refuge will continue to adaptively manage the implementation of Phase I of the Salmon Creek Restoration plan. NEPA compliance for Phase I of the Salmon Creek Restoration was previously completed (USFWS 1992). The refuge will continue the process of returning 1,500 linear feet of Salmon Creek and approximately 100 acres of lower Salmon Creek to tidal influence. Adaptive management of this restoration project will be coordinated with the Arcata Fish and Wildlife Ecological Services program and NOAA's National Marine Fisheries Service. Adaptive management may include augmentation of tide gate function to maximize anadromous fish passage. Adaptive management would be informed by monitoring species' use of habitats, any changes in channel cross-sections, changes in sediment transport, and changes in water quality. Upon completion of Phase II of the Salmon Creek Delta Restoration project, PCFWWRA will submit a summary report, including water quality findings, to CDFG and the refuge.

Monitoring
The refuge will continue with partners to monitor the use of Salmon Creek and Hookton Slough by salmonids, tidewater gobies, and amphibians. The refuge will establish a permanent tidal elevation station near the mouth of Salmon Creek on Hookton Slough to quantify tidal change over time in relation to tide gate function. The refuge and their partners would also seek to monitor for any potential impacts of Salmon Creek restoration on eelgrass beds in the South Bay.

The refuge staff will continue regular monitoring of rare and endangered plants and plant communities including beach layia (*Layia carnosa*), Humboldt Bay owl's clover (*Castilleja ambigua* ssp. *Humboldtiensis*), Point Reyes' birds beak (*Cordylanthus maritimus* ssp. *palustris*), and pink sand verbena (*Abronia umbellata* ssp. *breviflora*). The refuge will also monitor for snowy plovers where appropriate.

Visitor Services – Environmental Education and Interpretation
The refuge will maintain wheelchair accessibility of the Richard J. Guadagno Visitor Center and associated boardwalk out to the kiosk. The refuge would continue to coordinate with Friends of the Humboldt Bay NWR volunteers and Audubon volunteers who offer guided bird walks on the refuge units; Friends of the Dunes staff who would continue to offer guided natural history walks on the Lanphere Dunes Unit and the Ma-le'l Dunes Unit (once per month each) and who lead a restoration work day once per month on the Ma-le'l Dunes Unit; and host class tours on the dunes units. The refuge would complete the South Bay Historic Hunt Cabin as an interpretive exhibit on the Salmon Creek Unit. The refuge would also offer some special annual guided walks, environmental education and interpretation for events such as the Aleutian Goose Flyoff and National Wildlife Refuge Week.

All existing interpretive exhibits and panels on refuge units would be maintained. Refuge staff would continue to offer occasional presentations to community groups (four to six per year) at the Visitors Center and to allow up to 12 community groups to use the Visitors Center for meetings annually. The refuge will continue to seek funding for a full-time Visitor Services Assistant. If it is possible to hire a new volunteer coordinator, that person would develop volunteer services and training with a target of managing a 100-person volunteer corps.

Visitor Services - Hunting
Refuge staff will begin a program of regular, daily bag checks to verify the number and species of waterfowl harvested by hunters. Law enforcement will also be increased on the refuge, particularly during the waterfowl season, by contract or through support from other Service law enforcement staff. Hunting pit blinds at the Salmon Creek Unit will be modified to prevent stranding of wildlife. The refuge will install improved directional signs in the hunt area of the Salmon Creek Unit, and post additional boundary signs on the Eureka Slough Unit, Jacoby Creek Unit, Table Bluff Unit, Egret Island, Teal Island, and Hookton Slough.

Cultural Resource Management
The Service will identify, inventory, evaluate, and nominate to the National Register sites eligible for the National Register under Criteria A-D in consultation with the aforementioned tribal Governments. The refuge will work with the California and Nevada Regional Archeologist to ensure compliance with National Historic Preservation Act and to assess the long-term viability and cost of (restoring, maintaining, removing, or demolishing) several old refuge structures including the barn and bunkhouse at Salmon Creek and the quarters at Lanphere Dunes. Additional environmental compliance documentation would be completed as required by NEPA.

Table E-1. Summary of Alternatives: Humboldt Bay National Wildlife Refuge

NOTE: Acreages and linear footage distances indicated in the alternative descriptions are approximate. Acronyms used in the Summary of Alternatives are listed as a footnote at the bottom of the table. All actions are scheduled for completion within the life of the CCP (15 years) unless otherwise noted.

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
Goal 1. Conserve, manage, restore, and enhance estuarine and palustrine wetland habitats representative of the Humboldt Bay area to benefit their associated native fish, wildlife, plants, and special status species.			
Salmon Creek Delta Restoration	Adaptively manage 60 acres of Salmon Creek overflow and 50 acres adjacent to the main channel	Same as Alternative A	Same as Alternative B
	Monitor species, sediment transport in Salmon Creek	Within 3 years excavate 1,500 linear feet of Salmon Creek into a natural channel	Within 5 years excavate 500 linear feet to connect the new channel to salmon rearing habitat in Cattail Creek
	N/A	Implement Phase II of the Salmon Creek Restoration Project excavating historic channel	Same as Alternative B
	N/A	Construct off-channel estuarine wetlands and side-channels for salmonid rearing habitat	Same as Alternative B
	N/A	Replant riparian vegetation on sides of new channel to a minimum width of 100 feet	Same as Alternative B
	N/A	Install a fish screen or other appurtenances in the new channel	Same as Alternative B and secure large woody debris within Hookton Slough
	N/A	Use excavated material for salt marsh restoration or dike maintenance	Same as Alternative B
Salt Marsh Habitat	Manage 313 acres of existing salt marsh	Same as Alternative A and restore a total of 125 acres to native salt marsh	Same as Alternative B and restore a total of 235 acres to native salt marsh
	N/A	On WSU, restore 35 acres to native salt marsh (included in 125-acre total)	On WSU, restore an additional 45 acres to native salt marsh (included in 235-acre total)
	N/A	On HSU, restore 90 acres on HSU to native salt marsh (included in 125-acre total)	On HSU, restore an additional 90 acres to native salt marsh (included in 235-acre total)
	On WSU, repair dike to allow for restoration and remove remaining dike on west side of TBU	Same as Alternative A	On TBU, restore 100 acres of overflow to native salt marsh (included in 235-acre total)

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
	N/A	If feasible, raise tidal elevation of 60 acres of existing mudflat on Salmon Creek Overflow with clean fill and plant with native or propagated salt marsh vegetation	Same as Alternative B, and raise an additional 40 acres on lower Salmon Creek (total of 100 acres)
Freshwater and Brackish Marsh Habitat (FBM	On HSU, maintain 150 acres; on TBU maintain 25 acres; and on SCU maintain and enhance 630 acres of seasonal FBM	Same as Alternative A and on HSU and SCU enhance 100 of the 680 acres of FBM within 7 years	N/A
	N/A	On TBU, restore 13 acres of pasture vegetation to FBM within 7 years	Same as Alternative B
	On WSU, repair perimeter dike within 2 years	Same as Alternative A	Same as Alternative A
	On WSU, north and west areas, maintain 50 acres of FBM	On WSU, restore 4 acres of FBM	On WSU, maintain 7acres of FBM
	N/A	On WSU east area, enhance 14 acres of FBM	N/A
	On SCU, maintain and enhance 270 acres of short-grass pasture	On SCU and HSU, maintain and enhance 270 acres of grassland and restore 130 acres of wetland areas to short-grass pasture to improve ACG habitat	On SCU and HSU, maintain and enhance 270 acres of grassland and enhance 100 acres of wetland areas to short-grass pasture to improve ACG habitat
	On HSU, maintain hydrologic flushing to minimize mosquito breeding habitat	Same as Alternative A	Same as Alternative A
	Continue to use a CLMA to manage grasslands through a combination of grazing, mowing, and haying	Same as Alternative A	Same as Alternative A
	Continue soil testing in short-grass pasture and add lime when necessary to raise soil pH	Same as Alternative A	Same as Alternative A
	Continue seasonally appropriate mowing to maintain short-grass habitat and control thistle	On SCU, use seasonally appropriate mowing to promote short-grass species favorable to ACG	Same as Alternative B
	Promote plant communities that support ACG by seeding if needed	Same as Alternative A	Same as Alternative A

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
	N/A	On SCU, enhance inundation through construction of low contour interior levees to create independent water management areas near duck ponds and in floodgate pasture	Same as Alternative B and install a low contour levee on SCU to impound water to enhance FBM
	N/A	On HSU, in far eastern and western areas manage for FBM while managing central portion as short-grass pasture and FBM	Same as Alternative B except on HSU implement a restoration plan that allows muted tidal exchange to east and west areas while allowing for fish passage, salmonid rearing and tidewater goby habitat; and partial tidal restoration in central area
	N/A	Work with Caltrans to re-route Chism Creek so that it enters west WSU area rather than directly into the Bay	Same as Alternative B
	N/A	On HSU, middle portion use mowing and/or grazing to promote short-grass species favorable to ACG	N/A
	N/A	N/A	On SCU, enhance drainage in short-grass areas to create more favorable conditions for grass and ACG
	N/A	N/A	On SCU, remove interior dikes around Headquarters unit and adjacent to Long Pond to enhance wetland values
Riparian Swamp Habitat	On SCU, maintain 35 acres of existing riparian swamp habitat and on the east side of WSU, re-vegetate an additional 6 acres	Same as Alternative A and:	Same as Alternative B
	N/A	Within 15 years replace 20 acres of non-native trees with native riparian swamp vegetation	Same as Alternative B
	Enhance riparian swamp habitat by planting native under story plants and providing protection against deer browse	Same as Alternative A	Same as Alternative A

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
	N/A	If feasible, implement cooperative agreements to remove non-native trees and assist with native plantings	Same as Alternative B
Eelgrass and Mudflat Habitat	Participate in ongoing partnerships to conserve and manage eelgrass and mudflat habitat for long-term health	Same as Alternative A and create new partnerships to conserve and manage mudflat/eelgrass habitat for long-term health	Same as Alternative B
	Monitor eelgrass beds for potential effects of Salmon Creek restoration	Same as Alternative A	Same as Alternative A
	Continue partnership with the HBEBM program for eelgrass and mudflat habitat	Pursue additional funding for research and conservation through Service's coastal program to contribute to HBEBM program	Same as Alternative B
	N/A	Pursue an MOU with HBHRCD and CDFG to conserve inter-tidal areas within the refuge boundary	Same as Alternative B
Floodplain Management	Manage Humboldt Bay NWR floodplain consistent with local, State and Federal guidelines	Same as Alternative A and:	Same as Alternative B
	Continue to maintain all existing levees and conduct repairs to maintain function	Within 10 years, work toward achieving the relevant water quality objectives in Section 3 of the North Coast Basin Plan for the benefit of fish and wildlife resources	Same as Alternative B
	Implement habitat improvement strategies so that they do not worsen local or regional flooding, water quality, or erosion	Same as Alternative A	Same as Alternative A
	N/A	Develop a long-term water quality monitoring program for nonpoint sources of pollution entering the Humboldt Bay NWR	N/A
	N/A	With partners, develop a long-term water quality monitoring program to document effects of sediment flushing from Salmon Creek on eelgrass beds in southern Humboldt Bay	Same as Alternative B

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
Goal 2. Conserve and restore globally rare dune and dune forest habitats, associated native plant and animal species and support recovery of threatened, endangered, and endemic species dependent upon these rare habitats.			
Dune Mat/Foredune Grassland	On LDU, maintain 125 acres of dune mat/foredune grassland	Same as Alternative A and:	Same as Alternative B and:
	N/A	On all suitable parts of the LDU, MDU, and TBU restore native dune mat/foredune grassland communities	Same as Alternative B
	N/A	N/A	On LDU, create ongoing experimental dune blow-outs to assess effects on plants
	On MDU, TBU, and part of LDU, re-introduce HB wallflower	Same as Alternative A	Same as Alternative A
	Continue research on and monitor HB wallflower populations on HBNWR	Same as Alternative A and conduct research on cryptogamic mat and interactions between it and endemic insects	Same as Alternative B
	Seek agreements with adjacent landowners to assist them in managing populations of the HB wallflower and beach layia	Same as Alternative A	Same as Alternative A
	N/A	Inventory wildlife (including invertebrates) species in dune mat/ foredune grassland habitats	Same as Alternative B
Dune Swale	On LDU, MDU and TBU, maintain 67 acres of dune swale habitat	ON LDU, MDU and TBU, restore 67 acres of dune swale habitat and:	Same as Alternative B except within 10 years
	N/A	Inventory wildlife (including invertebrates) species in dune swale habitats	Same as Alternative B except within 10 years
Dune Riparian/Swamp	On the MDU and LDU, maintain 33 acres of dune riparian/swamp	On the MDU and LDU, maintain and restore 33 acres of dune riparian/ swamp within 10 years	Same as Alternative B except within 5 years
	N/A	Inventory wildlife (including invertebrates) in dune riparian swamp habitat	Same as Alternative B and on MDU and LDU after wildlife inventory enhance dune riparian/swamp
	N/A	Conduct continued research on neo-tropical migrant birds with partners	Same as Alternative B

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
Coniferous Dune Forest	On the MDU and LDU, maintain and restore 180 acres of coniferous dune forest	Same as Alternative A and:	Same as Alternative B and:
	N/A	Within 10 years, restore MDU forest margins to native coniferous dune forest	Within 5 years, restore MDU forest margins to native coniferous dune forest
	Restore plant communities by removing and revegetating little-used trails throughout the forest	Same as Alternative A except within 10 years	Same as Alternative A except within 5 years
	N/A	Pursue funding for partners to research coniferous dune forest ecology including tree wind-fall events	Same as Alternative B
	N/A	Pursue funding for partners to research neo-tropical migrant birds	Same as Alternative B
	N/A	Inventory wildlife (including invertebrates) of coniferous dune forest habitats	Same as Alternative B
	N/A	N/A	Grow or identify local sources for restoration plant materials
Goal 3: Conserve and restore all refuge habitats through the prevention and control of invasive plants and animals.			
General Invasive Species Management Program Actions	On TBU, work with the refuge invasives program and/or YCC and CDF to remove all species of invasive plants	Same as Alternative A	Same as Alternative A
	Monitor and strategically remove invasive plants as resources permit	Expand the existing volunteer program to control high priority target invasive plants	Same as Alternative B and:
	Coordinate with volunteer and partners to control invasive plants on HBNWR and adjacent lands	Same as Alternative A	Same as Alternative A
	N/A	N/A	Develop a Hazard Analysis and Critical Control Point Plan to prevent establishment of new invasive species

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
	Participate in local weed management area group that coordinates invasive plant management programs among 20 organizations	Same as Alternative A and pursue grant funding for partner invasive plant control program and implement if feasible	Same as Alternative B
	N/A	N/A	Create and implement an IPM step-down plan for the entire Humboldt Bay NWR
	N/A	N/A	Pursue grant funding to contract for invasive plant removal and implement if feasible
Salmon Creek Delta Restoration and Salt Marsh Habitat	Finalize IPM plan for invasive plant management plan	Same as Alternative A and control high priority target plant species to a maintenance level of ongoing control	Same as Alternative B and eradicate Spartina from HBNWR and work with partners on plan to eradicate from Humboldt Bay area
Freshwater and Brackish Marsh (FBM)	On HSU, maintain 150 acres of FBM through control of invasive plants	Same as Alternative A	Same as Alternative A
Riparian Swamp Habitat	Remove 20 acres of non-native trees	Same as Alternative A	Same as Alternative A
	Use IPM techniques to control the spread of non-native trees	Same as Alternative A	Same as Alternative A
Eelgrass and Mudflat Habitat	Continue partnerships for monitoring and research on invasive species that may affect eelgrass	Same as Alternative A	Same as Alternative A
Dune Swale	Implement large-scale eradication experiments on invasive plants in dune swale habitat	Same as Alternative A	Same as Alternative A
Dune Riparian/Swamp	Work with volunteers to complete forest invasive plants removal from dune riparian/swamp	Same as Alternative A	Same as Alternative A
	Monitor and treat new occurrences of forest invasive plants from dune riparian/swamp	Same as Alternative A	Same as Alternative A
Coniferous Dune Forest	Survey for and control invasive plants as resources permit	Same as Alternative A and pursue funding to bring all dune riparian/swamp invasives to a maintenance stage	Same as Alternative B

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
	Work with YCC, CCC, CDF, partners, and volunteers to complete removal of invasive plants in coniferous dune forest	Same as Alternative A	Same as Alternative A
Goal 4: Promote long-term viability of the Humboldt Bay estuarine and dune ecosystems through ecosystem-based management coordinated with both public and private partners around the bay.			
Ecosystem Management	Continue participation on ecosystem based management collaborations	Same as Alternative A and:	Same as Alternative B, except:
	N/A	Within 5 years devote an additional 1/4 FTE to serve an increased role in ecosystem-based management collaborations	Within 2 years devote an additional 1/4 FTE to serve an increased role in ecosystem-based management collaborations
	N/A	Create a combined AFWO/ NWR position to work on conservation partnerships and ecosystem based outreach	Same as Alternative B
Special Status Species (*Humboldt Bay wallflower and beach layia*)	Support recovery efforts of the HB wallflower and beach layia on Humboldt Bay NWR through restoration of 14 acres on MDU and 22 acres on TBU	Same as Alternative A and:	Same as Alternative B, except: within 5 years reintroduce HB wallflower and beach layia to unoccupied habitat at LDU (35 acres) and restored habitat at MDU and LDU
	N/A	Work with partners to protect South Spit, Elk River Spit, Samoa airport, and unprotected Manila populations of Humboldt Bay wallflower and beach layia	Same as Alternative B
	N/A	Work with AFWO to implement the Coastal Plants Recovery Plan on and off Humboldt Bay NWR	Same as Alternative B
	N/A	N/A	Within 10 years, pursue protection of 22 acres existing and 30 acres potential (restorable) habitat within approved refuge boundary
	N/A	N/A	Once protected carry out restoration of habitats and re-introduce populations of native endangered plants

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
	Re-introduce HB wallflower on MDU, part of LDU, and on TBU	Same as Alternative A	Same as Alternative A
	Seek coop. agreements with adjacent landowners to assist them in managing populations of the HB wallflower and beach layia on private lands	Same as Alternative A	Same as Alternative A
	Use existing methods to re-introduce wallflowers	Same as Alternative A	Same as Alternative A
	N/A	Work with City of Eureka and CDFG to develop access and interpretive infrastructure to reduce trampling of ESA-listed plants	Same as Alternative B
	N/A	Work with partners to monitor Elk River and South Spit population of HB wallflower	Same as Alternative B
	N/A	Work with partners to protect South Spit and Elk River Spit populations, of ESA-listed plants from deer browsing, trampling, and other human impacts	Same as Alternative B
	N/A	Work with partners (City of Eureka to increase habitat at EDPA and Samoa airport populations	Same as Alternative B
	N/A	Work with FOD, MCSD to increase viability of Manila populations	Same as Alternative B
	N/A	N/A	Pursue protection of remaining habitat for ESA-listed species within the HBNWR approved boundary through cooperative agreements, easements, donations, or acquisition
Goal 5. Provide public with accessible, safe, high-quality wildlife-dependent recreation opportunities to enhance public appreciation and understanding of fish, wildlife, plants, and habitats of Humboldt Bay and associated watersheds.			
Visitor Services - Wildlife Observation and Photography	Provide 20,000 annual, safe wildlife observation and photography visitor opportunities by land and water trails	Provide 30,000 annual, safe wildlife observation and photography visitor opportunities by land and water trails	Provide 35,000 annual, safe wildlife observation and photography visitor opportunities by land and water trails

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
	Maintain 2 miles of dune units trails	On SCU, improve to wheelchair accessible 0.25 mile of existing trail from parking lot to kiosk to increase wildlife viewing opportunities	On SCU, improve to wheelchair accessible 1.5 miles of existing trail (Shorebird Loop trail)
	N/A	On MDU, improve to wheelchair accessible 0.25 mile of existing trail to the overlook (Railroad Berm trail)	On MDU, improve to wheelchair accessible 0.5 mile of existing trail (Railroad Berm trail)
	N/A	N/A	On HSU, improve to wheelchair accessible 1.5 miles of exiting trail (Hookton Slough trail)
	Maintain wheelchair accessibility of visitor center and associated boardwalk	Same as Alternative A	Same as Alternative A
	Increase law enforcement on the refuge by contract or by support from other Service law enforcement	Same as Alternative A	Same as Alternative A
	N/A	Install a wildlife camera with feed back to the Visitor Center	Same as Alternative B
	N/A	Offer seasonally guided hikes through otherwise closed trails	Same as Alternative B
	N/A	Increase seasonal hiking opportunities around the hunt area by improving trails	N/A
	N/A	Add a non-motorized boat launch at the Ma-le'l Dunes Unit, if feasible	N/A
	N/A	On SCU, add wheelchair accessible photo blind	Same as Alternative B
Visitor Services - Environmental Education and Interpretation	Maintain wildlife-dependent educational opportunities for 4 school or community groups per month	Maintain wildlife-dependent educational opportunities for 6 school or community groups per month	Maintain wildlife-dependent educational opportunities for 8 school or community groups per month
	Offer 20,000 annual visitor opportunities for interpretive experiences on HBNWR lands and off refuge	Offer 30,000 annual visitor opportunities for interpretive experiences on HBNWR lands and off refuge	Offer 35,000 annual visitor opportunities for interpretive experiences on HBNWR lands and off refuge
	Offer guided natural history walks on LDU and MDU (once per month)	Same as Alternative A	Same as Alternative A

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
	Coordinate with FOD, which leads a restoration work day once per month on MDU	Same as Alternative A	Same as Alternative A
	Continue to host class tours on LDU and MDU	Same as Alternative A	Same as Alternative A
	N/A	Facilitate teacher training so teachers could lead environmental education field trips	Same as Alternative B
	N/A	Work with school districts to implement new Schoolyard Habitats Program	Same as Alternative B
	Complete the South Bay Historic Hunt Cabin	Same as Alternative A	Same as Alternative A
	N/A	Construct or convert the SCU barn into a covered outdoor structure for environmental education activities	Same as Alternative B
	N/A	Assist schools in visiting refuges (arranging shuttle busses, etc.)	Same as Alternative B
	N/A	Expand the outdoor youth day to a multi-day event	Same as Alternative B
	N/A	On SCU establish a children's outdoor exploration area ("connecting people with nature")	Same as Alternative B
Visitor Services - Outreach/Friends and Partners	Collaborate with regional partners to host at least 1 regionally based environmental education field trip, workshop, seminar, or study course each year	Collaborate with regional partners to host at least 2 regionally based environmental education field trip, workshop, seminar, or study course each year	Same as Alternative B
Visitor Services - Hunting	Maintain existing waterfowl, coot and snipe hunting program to accommodate 1,200 hunter day use opportunities per year on SCU	Same as Alternative A, and:	Same as Alternative A and implement 2008 Waterfowl Hunt Plan (Appx. C): open limited areas of the MDU to waterfowl, coot, and snipe hunting and retrieval and provide 2 additional youth only hunting days on SCU

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
	N/A	Provide additional undisturbed area for wildlife and reduce potential for hunter/ nonhunter conflicts by closing Teal Island and Hookton Slough areas to overwater hunting	N/A
	Increase law enforcement on the HBNWR by contract or by support from other Service law enforcement	Same as Alternative A	Same as Alternative A
	Modify pit blinds to prevent stranding of wildlife	Same as Alternative A	Same as Alternative A
	Post additional boundary signs on ESU, JCU,TBU, Egret Island, Teal Island, and HSU	Same as Alternative A	Same as Alternative A
Visitor Services - Fishing	Maintain existing sport fisheries program	Same as Alternative A and:	Implement 2008 Sport Fishing Plan (Appx. D)
	N/A	Increase signage at allowable sport fishing sites and outreach	Same as Alternative B
Goal 6. In cooperation with tribal representatives, identify and protect tribal cultural resources on the Humboldt Bay NWR. In addition, assess and manage refuge's more recent cultural resources and structures.			
Cultural Resources Management	Continue managing for and conserving HBNWR cultural resources in coordination with the Wiyot Tribe, Blue Lake Rancheria, Bear River Band of Rohnerville Rancheria and the FWSs Regional Archaeologist	Create and implement a basic Cultural Resources Management capability at HBNWR to respond to basic compliance requirements	Same as Alternative A
	Within 10 years, work with the Wiyot Tribe, Blue Lake Rancheria, and Bear River Band of Rohnerville Rancheria to develop an MOU for resource management issues and address at-risk cultural places	Same as Alternative A	Same as Alternative A
	Incorporate cultural resource values, issues, and requirements into design and implementation of the other habitat, wildlife, and public use activities and strategies conducted by the HBNWR	Same as Alternative A	Same as Alternative A

Issue Area	Alternative A (*No Action Alternative*)	Alternative B	Alternative C (*Preferred Alternative*)
	N/A	Develop and implement a plan to survey the refuge for both previously recorded and newly identified cultural resources	Same as Alternative B
	N/A	Assess costs to keep barn and other structures on SCU and LDU in use	Same as Alternative B
Cultural Resources Management - Partnerships	Continue current level of cultural resources interpretation	Within 5 years develop, in partnership with the Wiyot Tribe, Blue Lake Rancheria, Bear River Band of Rohnerville Rancheria and other preservation partners, a cultural resources overview of the HBNWR	Same as Alternative B
	N/A	Develop interpretive displays on the Headquarters Unit (SCU) that illustrate traditional dwellings, various subsistence strategies and traditional and contemporary lifestyle of local American Indian tribes	Same as Alternative B
Cultural Resources Management - Coordination	Work with the Wiyot Tribe, Blue Lake Rancheria, Bear River Band of Rohnerville Rancheria to restore habitats of important native plants and to harvest native plant foods (for traditional non-commercial purposes)	Same as Alternative A	Same as Alternative A
	Review and reissue, if appropriate, any special use permits for traditional activities such as plant collecting for basket weaving	Same as Alternative A	Same as Alternative A

N/A = Not applicable to and not included in that Alternative.

ACG=Aleutian cackling goose; HB=Humboldt Bay; HBNWR = Humboldt Bay NWR; HSU=Hookton Slough Unit; LDU=Lanphere Dunes Unit; MDU=Ma-le'l Dunes Unit; SCU=Salmon Creek Unit; TBU=Table Bluff Unit; WSU=White Slough Unit.

Acreages indicated in the alternative descriptions that follow are approximate.

Alternative A for Humboldt Bay NWR: No Action

Under Alternative A, the refuge would continue to be managed as it has been in the recent past (see Chapter 3 of the CCP). The focus of the refuge would remain the same: to provide enhancement, restoration, and management of a diversity of wetland and upland habitats for the benefit of all of the natural resources that those habitats help sustain. The refuge would continue to provide wildlife dependent recreation opportunities, including hunting, wildlife observations and photography, environmental education and interpretation, and hunting. Existing staffing and funding levels would remain approximately the same. In addition to actions described above in Features Common to All Alternatives for Humboldt Bay NWR, Alternative A would include the following. Figures E-2 through E-6 show graphical representations of the areas affected for each of the habitat management alternatives. The Summary of Alternatives table, above, provides a comparison of the actions in each alternative.

Salmon Creek Delta Restoration

Under Alternative A, the refuge would adaptively manage 60 acres of Salmon Creek overflow and 50 acres adjacent to the main channel to meet the goals of Phase I of the Salmon Creek Restoration project. Adaptive management includes monitoring species and sediment transport in Salmon Creek. The monitoring results would then be used to guide management activities.

Salt Marsh Habitat

Under Alternative A, the refuge would:

- manage 313 acres of existing coastal salt marsh habitat
- repair the dike at White Slough Unit to allow for planned restoration and
- remove the remaining dike on east side of Table Bluff Unit

Freshwater and Brackish Marsh Habitat (FBM)

Under Alternative A, the refuge would:

- continue to maintain all levees and conduct minimal repairs of existing levees as needed to maintain their functionality; levee work would be done by refuge staff or contractors
- on the White Slough Unit, the refuge would repair the perimeter dike within 2 years and passively maintain 50 acres of freshwater and brackish marsh in the northern and western areas
- on the Hookton Slough Unit, maintain 150 acres of freshwater and brackish marsh through control of invasive plant species
- on the Hookton Slough Unit, maintain hydrologic flushing to minimize mosquito breeding habitat
- on the Table Bluff Unit, maintain 25 acres of brackish and freshwater marsh
- on the Salmon Creek Unit, the refuge would maintain and enhance 630 acres of seasonal freshwater and brackish marsh primarily through management and control of invasive plants.
- on the Salmon Creek Unit, the refuge would continue to maintain and enhance 270 acres of short-grass pasture through control of invasive species, seeding, application of lime, and grazing, as needed.
- continue to use a cooperative land management agreement to manage grasslands through a combination of grazing, mowing, and haying
- continue soil testing and add lime when necessary to raise soil pH
- continue seasonally appropriate mowing to maintain short-grass pasture and control thistle
- promote plant communities that support Aleutian cackling geese by seeding, if needed

Riparian Swamp Habitat

Under Alternative A, the refuge would:

- on the east side of the White Slough Unit, manage 35 acres of existing riparian swamp habitat and re-vegetate an additional 6 acres with riparian swamp vegetation
- continue selective removal of 20 acres of non-native trees, including eucalyptus (over a 5-year period), Monterey pine, and Monterey cypress trees. The refuge would only remove non-native trees as variable staff and funding resources permit. This would result in removal of non-native trees within the life of the CCP (15 years).
- continue to work with volunteer groups or partners to complete small-scale plantings of native vegetation in areas where non-native trees are removed
- enhance riparian swamp habitat by planting native under story plants and providing deer browse protection on new plantings

Eelgrass and Mudflat Habitat
Under Alternative A, the refuge would:
- continue to participate in ongoing partnerships to conserve and manage eelgrass and mudflat habitat for the long-term health of the bay
- monitor potential effects to eelgrass beds from the ongoing Salmon Creek Restoration project
- continue partnership with the HBEBM program for eelgrass and mudflat habitat

Floodplain Management
Under Alternative A, the refuge would:
- continue to manage the Humboldt Bay NWR floodplain land in a manner consistent with local, State, and Federal guidelines; and flood management, sediment, and erosion control and water quality objectives
- continue to maintain all levees and would conduct minimal repairs of existing levees as needed to maintain their functionality
- implement habitat improvement strategies in a manner that does not worsen local or regional flooding, water quality, or erosion

Dune Mat/Foredune Grassland Habitat
Under Alternative A, the refuge would:
- on the Lanphere Dunes Unit, maintain 125 acres of dune mat/foredune grassland plant communities
- on the Ma-le'l Dunes Unit, part of Lanphere Dunes Unit, and on Table Bluff Unit, re-introduce Humboldt Bay wallflower
- continue research and monitoring of Humboldt Bay wallflower populations on the Humboldt Bay NWR
- seek cooperative agreements with adjacent landowners to assist them in managing populations of the Humboldt Bay wallflower and beach layia
- continue monitoring and re-introductions, as described above in Features Common to All Alternatives

Dune Swale
Under Alternative A, the refuge would:
- on the Lanphere Dunes, Ma-le'l Dunes, and Table Bluff Units, maintain 67 acres of dune swale plant communities

Dune Riparian/Swamp
Under Alternative A, the refuge would:
- on the Ma-le'l and Lanphere Dunes Units, maintain a total of 33 acres of dune riparian/swamp habitat

Coniferous Dune Forest
Under Alternative A, the refuge would:
- on the Ma-le'l and Lanphere Dunes Units, maintain 180 acres of coniferous dune forest habitat
- within 15 years, restore native plant communities to remove casual human trails throughout the coniferous forest

Invasive Species (Integrated Pest Management)
Under Alternative A, the refuge would implement the following management activities (actions are listed by general program actions or by habitat type below).

General Invasive Species Management Program Actions
- on Table Bluff Unit, work with the refuge invasives program and/or YCC and CDF to remove all species of invasive plants
- monitor and strategically remove invasive plants as resources permit
- continue coordination and collaboration with volunteers and partners from organizations such as the Friends of the Dunes, Friends of the Humboldt Bay NWR, the Fortuna Creeks Project, CCC, and CDF to control invasive plants on Humboldt Bay NWR and adjacent lands
- participate in the Humboldt-Del Norte County Weed Management Area group that coordinates and implements invasive plant management programs among 20 agencies and organizations

Salmon Creek Delta and Salt Marsh Habitat:
- finalize and implement an invasive plant management (IPM) plan

Freshwater and Brackish Marsh:
- on Hookton Slough Unit, maintain 150 acres of freshwater and brackish marsh through the control of invasive plants

Riparian Swamp Habitat:
- remove 20 acres of non-native trees from riparian swamp habitat
- use a combination of mechanical and chemical (IPM) techniques to control the spread of non-native trees

Eelgrass and Mudflat Habitat:
- continue partnerships for monitoring and research on invasive species that may affect eelgrass

Dune Habitats
- implement large-scale eradication experiments on existing invasive plants in the dune swale plant community
- work with volunteers to complete removal of forest invasive plants from the dune riparian/swamp
- monitor and treat new occurrences of forest invasive plants from the dune riparian swamp
- survey for and control of new occurrences of forest invasive plants as resources permit
- work with YCC, CCC, CDF, partners, and volunteers to complete removal of invasive plants in the coniferous dune forest

Ecosystem Management
Under Alternative A, the refuge would continue to coordinate participation with many partners to assure that habitat and species management efforts on Humboldt Bay NWR support those of related Humboldt Bay ecosystem-based management collaborations, as staff time and resources permit.

Special Status Species (Humboldt Bay wallflower and beach layia)
Under Alternative A, the refuge would continue to support recovery efforts for the Humboldt Bay wallflower and beach layia on the Humboldt Bay NWR through the following.
- complete habitat restoration on 14 acres of Ma-le'l Dunes Unit and 22 acres on Table Bluff Unit
- reintroduce the wallflower and layia to Ma-le'l Dunes and Table Bluff Units, and part of Lanphere Dunes Unit
- seek to develop cooperative agreements with adjacent landowners to assist them in managing populations of the Humboldt Bay wallflower and beach layia on privately owned lands
- use existing methods to re-introduce wallflowers

Visitor Services - Wildlife Observation and Photography
Figures E-7 and E-8 show a graphical representation of the Visitor Services features described in the alternatives.

Under Alternative A, the refuge would continue to maintain current opportunities for wildlife observation and photography. The refuge would:
- provide for up to 20,000 annual, safe wildlife observation and photography visitor opportunities on Humboldt Bay NWR by land and water trails
- maintain 2 miles of trails on the Lanphere and Ma-le'l Dunes Units
- on Salmon Creek Unit, maintain wheelchair accessibility to the Richard J. Guadagno Office and Visitor Center and associated boardwalk
- increase law enforcement on the refuge by contract or support from other Service law enforcement staff

Visitor Services - Environmental Education and Interpretation
Environmental education and interpretation opportunities on the Humboldt Bay NWR would continue to be offered by refuge staff and volunteers. For Alternative A, the refuge would:
- maintain wildlife-dependent educational opportunities for 4 school or community groups per month.
- offer up to 20,000 annual visitor opportunities for interpretive experiences on and off refuge lands
- offer guided natural history walks once per month on Lanphere Dunes Unit and Ma-le'l Dunes Unit

- coordinate with Friends of the Dunes, which leads a restoration work day once per month on Ma-le'l Dunes Unit
- continue to host class tours on Lanphere Dunes Unit and Ma-le'l Dunes Unit
- complete the South Bay Historic Hunt Cabin
- conduct a variety of outreach efforts including a volunteer services program

Visitor Services – Outreach/Friends and Partners
For Alternative A, the refuge would collaborate with regional partners to host at least 1 regionally based environmental education field trip, workshop, seminar, or study course each year

Visitor Services - Hunting
For Alternative A, the refuge would continue to be managed consistent with the existing the 1990 Humboldt Bay NWR Sport Hunting Plan, with no changes. Over the life of the CCP, the refuge would maintain the existing waterfowl, coot, and snipe hunting program to accommodate 1,200 hunter day use opportunities per year on the Salmon Creek Unit.
- increase law enforcement on the Humboldt Bay NWR by contract or through support from other Service law enforcement staff
- modify pit blinds to prevent stranding of wildlife
- post additional boundary signs on Eureka Slough Unit, Jacoby Creek Unit, Table Bluff Unit, Egret Island, Teal Island, and Hookton Slough Unit

Visitor Services - Fishing
For Alternative A, the fishing on the refuge would continue to be managed consistent with the existing 1992 Humboldt Bay NWR Fishery Management Plan, with no changes. The existing sports fisheries program would be maintained.

Most fishing in Humboldt Bay occurs from boats on navigable waters. Currently, boaters can access Mad River Slough from the existing boat ramp on Lanphere Road or from Samoa Boulevard. Fishing will also continue to be permitted from the Hookton Slough boat dock and off the Hookton Slough trail, west of the designated parking lot. This area is known as the "Hookton Slough Shoreline Fishing Trail". A California fishing license is required to fish on Hookton Slough, even from the dock because the dock does not quality as a "public fishing pier" under State of California Sport Fishing Regulations. Refuge staff estimates that 100 to 250 people anglers visit the refuge each year, including families often with children who also fish. Fishing on the refuge is primarily for species in the shark family and most successful with a high tide. Alcohol is banned on the refuge and therefore is not allowed at fishing locations. The non-tidally influenced areas (dikes and seasonal wetlands) will be closed to fishing to provide disturbance-free resting and foraging areas for migratory birds. Anglers will be monitored on an opportunistic basis to determine if any wildlife disturbance is occurring. Refuge staff will respond appropriately to observed disturbances to fulfill the multiple purposes of the refuge. Shell fishing is not allowed on the refuge. Refuge staff directs visitors inquiring about shell fishing (for clams) to go to more productive locations off-refuge.

As with hunting, these designated fishing areas are subject to Federal and State fishing laws and regulations. For seasons, limits, and other restrictions, refer to the State of California Sport Fishing Regulations.

Cultural Resources - Management
For Alternative A, the refuge would:
- continue managing for and conserving Humboldt Bay NWR's cultural resources by consulting with the Wiyot Tribe, Blue Lake Rancheria, Bear River Band of Rohnerville Rancheria, and the Service's California and Nevada Regional Archaeologist to collect relevant cultural resource background information prior to conducting projects
- work with Wiyot Tribe, Blue Lake Rancheria, and Bear River Band of Rohnerville Rancheria to develop a Memorandum of Understanding for resource management issues
- incorporate cultural resource values, issues, and requirements into design and implementation of the other habitat, wildlife, and public use activities and strategies conducted by the Humboldt Bay NWR

Cultural Resources - Education
For Alternative A, the refuge would:
- continue current levels of cultural resources interpretation at Humboldt Bay NWR

Cultural Resources - Coordination
For Alternative A, the refuge would:
- work with Wiyot Tribe and Blue Lake Rancheria and Bear River Band of Rohnerville Rancheria on projects to restore habitats of culturally important native plants and to harvest native plant foods (for traditional, non-commercial purposes)
- review and reissue, if appropriate, any special use permits for traditional activities such as plant collecting for basket weaving

Alternative B for Humboldt Bay NWR
Figures E-2 through E-6 show graphical representations of the areas affected for each of the habitat management alternatives. The Summary of Alternatives table, above, provides a comparison of the actions in each alternative.

Salmon Creek Delta Restoration
In addition to completing actions described under Alternative A, within 3 years of CCP approval, the refuge would also implement Phase II of the Salmon Creek Restoration project. The goal of the Salmon Creek Restoration Project is to restore estuarine habitat (associated plant communities) and function. The project objectives include: 1) Relocate upper reach of Salmon Creek channel within the refuge, which currently flows through a ditch. The new channel would be in the upper reach of a new tidally influence area and include a stable channel form, complexity and sinuosity, large wood, and efficient routing of sediment and flood waters; 2) Construct off-channel estuarine wetlands and side-channels in upper reach for salmonid rearing habitat and channel maintenance; and 3) Screen existing high-flow water diversion to eliminate stranding.

For Alternative B, the refuge would:
- relocate a reach of the Salmon Creek channel that currently flows through a linear ditch (from the refuge boundary to the first diversion structure) into a natural, meandering channel. Restoring this reach to a meandering channel would include excavation and restoration plantings on approximately 1,500 linear feet of the historic Salmon Creek channel that has been filled in, allowing the creek to more efficiently route sediment and flood waters. The new channel would be in the upper reach of a new tidally influenced area and include a stable channel form, complexity and sinuosity
- use excavated material on the refuge for salt marsh restoration or dike maintenance
- replant native, riparian forest vegetation on the sides of the new channel, to a minimum width of 100 feet
- install a fish screen in the newly excavated channel to reduce fish stranding, as needed

Salt Marsh Habitat
In addition to actions described under Alternative A, the refuge would restore historic, natural processes to portions of the Humboldt Bay NWR. For Alternative B, the refuge would:
- on the White Slough Unit, restore 35 acres of native salt marsh by removing existing dikes on the White Slough Unit and using the dike material and other appropriate, local fill material to raise the White Slough Unit elevation.
- on the Salmon Creek Overflow marsh plain, raise 60 acres to create additional salt marsh and to restore the tidal prism. If feasible, the refuge would raise areas of the White Slough Unit and Salmon Creek overflow marsh plain through a multi-step process. Prior to adding clean fill soil, native salt marsh plants would be salvaged and approximately 12 inches of topsoil would be removed from the site. The topsoil and salvaged plants would be stored on the Humboldt Bay NWR. Once topsoil had been removed, fill material would be spread on the marsh plain to raise the elevation of the plain. After fill material is placed to raise the marsh plain, the topsoil would be spread on top of the fill material. Finally, the salvaged native salt marsh plants and additional native plants would be used to vegetate the raised marsh plain.

Also for Alternative B, the refuge would restore through adaptive management a total of 125 acres of native salt marsh including:
- on White Slough Unit, restore 35 acres to native salt marsh
- on Hookton Slough Unit, restore 90 acres to native salt marsh
- raise tidal elevations of 60 acres of existing mudflat with clean fill, and plant with native or propagated salt marsh vegetation

Freshwater and Brackish Marsh Habitat (FBM)
For Alternative B, the refuge would:
- within 2 years, on the White Slough Unit, repair the perimeter dike (as in Alternative A), but maintain 23 acres of FBM in the north and west areas of the White Slough Unit (instead of 50 acres as in Alternative A)
- on White Slough Unit, restore 4 acres of FBM
- work with Caltrans to de-channelize Chism Creek so that it enters the west area of the White Slough Unit rather than directly flowing through a diversion ditch into Humboldt Bay
- within 7 years, at the east and west ends of Hookton Slough Unit, enhance and restore 80 acres of freshwater and brackish marsh
- within 7 years, on Salmon Creek Unit, enhance and restore 20 acres of freshwater and brackish marsh
- on Salmon Creek Unit use seasonally appropriate mowing to restore 92 acres of wetland areas to encourage growth of short-grass species favorable to Aleutian cackling goose
- on middle portion of Hookton Slough Unit, use seasonally appropriate mowing to restore 38 acres of wetland areas to encourage growth of short-grass species favorable to Aleutian cackling goose
- on the Hookton Slough Unit, enhance native grasslands through seeding and other cultivation activities, such as mowing and controlling invasive plants
- use existing water control structures to allow muted tidal exchange and to allow fish passage in the eastern and western areas of the Hookton Slough Unit
- on Hookton Slough Unit and Salmon Creek Unit, maintain and enhance 270 acres of grassland and restore 130 acres of wetland areas to short-grass pasture to improve Aleutian cackling goose habitat
- on the Salmon Creek Unit, construct low contour interior levees to create independent water management areas to increase wetlands
- within 7 years, on the Table Bluff Unit, maintain 25 acres of freshwater and brackish marsh
- on the Table Bluff Unit, restore 13 acres of short-grass pasture vegetation to brackish marsh by removing invasive species such as thistle (*Cirsium* spp.) and invasive fireweed (*Erechtites* sp.) and controlling non-native pasture grasses such as common velvetgrass (*Holcus lanatus*); then planting native brackish marsh species such as dune rush (*Juncus lesuerii*), and Lyngbye's sedge (*Carex lyngbei*)

Riparian Swamp Habitat
For Alternative B, the refuge would conduct the same management actions for riparian swamp habitat as that described under Alternative A, except that under Alternative B the work would be done within 5 years (instead of in 15 years as in Alternative A). For Alternative B, the refuge would:
- within 5 years, replace 20 acres of non-native trees with riparian swamp vegetation native to the area
- implement a cooperative agreement with interested parties to remove non-native trees and assist with the new plantings
- within 5 years, enhance and restore 14 acres of riparian swamp habitat in the eastern area of the White Slough Unit

Eelgrass and Mudflat Habitat
For Alternative B, the refuge would conduct the same management actions for eelgrass and mudflat habitat as that described under Alternative A, and:
- participate in ongoing and explore new partnerships to conserve and manage eelgrass and mudflat habitat for long-term health
- pursue a memorandum of understanding with the Humboldt Bay Harbor Recreation and Conservation District and the California Department of Fish and Game to conserve inter-tidal areas within the approved refuge boundary
- pursue additional funding for research and conservation through the Service's coastal program to contribute to HBEBM program

Floodplain Management
For Alternative B, the refuge would conduct the same floodplain management as that described under Alternative A and, in addition, the refuge would:
- within 10 years, work toward achieving the relevant water quality objectives as described in Section 3 of the North Coast Basin Plan objectives for the benefit of fish and wildlife resources North Coast Basin Plan (NCRWQCB 2007) objectives for inland surface waters, enclosed bays, and estuaries.
- develop a long-term water quality monitoring program for nonpoint sources of pollution from off-refuge entering the Humboldt Bay NWR
- with partners, develop a long-term water quality monitoring program to document effects of sediment flushing from Salmon Creek on eelgrass beds in southern Humboldt Bay.

Dune Mat/Foredune Grassland Habitat
For Alternative B, the refuge would conduct the same management actions for dune mat/foredune grassland habitat as that described under Alternative A, and in addition, the refuge would:
- on all suitable areas of the Lanphere and Ma-le'l Dunes Units restore native dune mat/foredune grassland communities
- within 5 years, on Table Bluff Unit, restore native dune mat/foredune grassland on 10 acres
- inventory wildlife (including invertebrate) species in dune mat/foredune grassland habitats.
- conduct research on cryptogamic mat and interactions between it and endemic insects

Dune Swale Habitat
For Alternative B, the refuge would:
- within 10 years, on the Lanphere and Ma-le'l Units, restore and maintain a total of 67 acres of dune swale plant communities as follows:
  46 acres on Lanphere Dunes Unit
  21 acres on Ma-le'l Dunes Unit
- within 10 years, on Table Bluff Unit restore 25 acres of dune swale
- inventory wildlife (including invertebrate) species in dune swale habitats

Dune Riparian/Swamp Habitat
For Alternative B, the refuge would:
- within 10 years, on the Ma-le'l and Lanphere Dunes Units, restore 33 total acres of riparian swamp habitat
- inventory wildlife (including invertebrate) species, in dune riparian/swamp habitat
- continue to collaboration with partners to conduct research on neo-tropical, migrant birds

Coniferous Dune Forest Habitat
For Alternative B, the refuge would:
- on the Ma-le'l and Lanphere Dunes Units, maintain 180 acres of coniferous dune forest habitat
- within 10 years, restore Ma-le'l Dunes Unit forest margins dominated by European beach grass to native coniferous forest communities
- within 10 years, restore native plant communities to remove casual human trails throughout the coniferous forest (instead of within 15 years under Alternative A)
- pursue funding and collaborate with Humboldt State University to conduct research on coniferous dune forest ecology including tree wind-fall events
- pursue funding and continue research on neo-tropical migrant birds by partners
- inventory wildlife species, including invertebrates, that utilize coniferous dune forest habitat

Ecosystem Management
For Alternative B, the refuge would:
- within 5 years, increase collaboration in Humboldt Bay ecosystem management to serve an increased role in ecosystem based management over the life of the CCP (15 years)
- coordinate with the Arcata Fish and Wildlife Office (AFWO) and combine efforts to work on conservation partnerships and ecosystem based outreach

Special Status Species (Humboldt Bay wallflower and beach layia)
For Alternative B, (as with Alternative A), the refuge would continue to support recovery efforts for the Humboldt Bay wallflower (wallflower) and beach layia (layia), on Humboldt Bay NWR, through restoration of 14 acres of Ma-le'l Dunes habitat and restoration of 22 acres of Table Bluff habitat. In addition, for Alternative B, the refuge would:

- work with partners to protect populations of Humboldt Bay wallflower and beach layia on the South Spit, Elk River Spit, Samoa airport, and the Manila layia
- work with the Service's AFWO Ecological Services Program to implement the Coastal Plants Recovery Plan on and off Humboldt Bay NWR
- work with City of Eureka and CDFG to develop access and interpretive infrastructure to reduce trampling of Federally protected plants
- work with partners to implement monitoring of Elk River and South Spit population of Humboldt Bay wallflower
- work with partners to protect South Spit and Elk River Spit populations of Federally-protected plants from deer browsing, trampling, and other human impacts
- work with partners (City of Eureka) to increase habitat for Federally protected plant species at EDPA and Samoa airport populations
- work with FOD, MCSD to increase viability of Manila populations of Federally-protected plants

Invasive Plant Species (Integrated Pest Management)
For Alternative B, over the life of the CCP (15 years from approval), the refuge would implement and expand Alternative A and the existing volunteer invasive plant control program to achieve a maintenance level of control of high priority target invasive plants species. The refuge would implement the following management activities (actions are listed by general program actions or by habitat type below).

General Invasive Species Management Program Actions:

- on Table Bluff Unit, work with the refuge invasives program and/or YCC and CDF to remove all species of invasive plants
- monitor and strategically remove invasive plants as resources permit *and*
- expand the existing volunteer program to control high priority target invasive plants
- continue coordination and collaboration with volunteers and partners from organizations such as the Friends of the Dunes, Friends of the Humboldt Bay NWR, the Fortuna Creeks Project, CCC, and CDF to control invasive plants on Humboldt Bay NWR and adjacent lands
- participate in the Humboldt-Del Norte County Weed Management Area group that coordinates and implements invasive plant management programs among 20 agencies and organizations *and*
- pursue grant funding for a partner invasive plant control program and implement, if feasible

Salmon Creek Delta and Salt Marsh Habitat:

- finalize and implement an invasive plant management (IPM) plan *and*
- control high priority target plant species to a maintenance level of ongoing control

Freshwater and Brackish Marsh:

- on Hookton Slough Unit, maintain 150 acres of freshwater and brackish marsh through the control of invasive plants

Riparian Swamp Habitat:

- remove 20 acres of non-native trees from riparian swamp habitat
- use a combination of mechanical and chemical (IPM) techniques to control the spread of non-native trees

Eelgrass and Mudflat Habitat:

- continue partnerships for monitoring and research on invasive species that may affect eelgrass

Dune Habitats:

- implement large-scale eradication experiments on existing invasive plants in the dune swale plant community
- work with volunteers to complete removal of forest invasive plants from the dune riparian/swamp
- monitor and treat new occurrences of forest invasive plants from the dune riparian/swamp

- survey for and control of new occurrences of forest invasive plants as resources permit *and* pursue funding to bring all riparian/swamp invasives to a maintenance level of control
- work with YCC, CCC, CDF, partners, and volunteers to complete removal of invasive plants in the coniferous dune forest

Visitor Services - Wildlife Observation and Photography
Figures E-7 and E-8 show a graphical representation of the Visitor Services features described in the alternatives.

For Alternative B, the refuge would:
- provide for up to 30,000 annual, safe wildlife observation and photography visitor opportunities on Humboldt Bay NWR by land and water trails
- on Salmon Creek Unit, improve 0.25 mile of exiting trail to wheelchair accessible trail from the parking lot to the kiosk to provide additional accessible wildlife viewing opportunities from trails
- on Ma-le'l Dunes Unit, improve 0.25 mile of exiting trail to wheelchair accessible trail to the overlook to provide additional accessible wildlife viewing opportunities from trails
- install a wildlife camera with feed back, which would provide additional opportunities for wildlife observation from closed portions on the Humboldt Bay NWR to a large screen television at the Visitor Center
- increase the number of seasonally guided hikes offered through otherwise closed trail areas (led by staff or volunteer docents) and increase seasonal hiking day use opportunities around the Humboldt Bay NWR hunt area by improving trails
- add a non-motorized boat launch at the Ma-le'l Dunes Unit, if feasible
- on Salmon Creek Unit, add a wheelchair accessible photo blind by improving the existing kiosk

To ensure that water quality is not adversely affected, the Service would implement the following measures as part of the alternative. The refuge will continue consultations with CDPH, HBHRCD, oyster growers, and non-motorized boating groups regarding water quality. The plan currently calls for vault toilets to be installed at the parking area at the north end of Ma-le'l Road in compliance with all Federal, State and local water quality and sanitation requirement to protect water quality. Further, the refuge would install signage and distribute brochures that explain the need to maintain water quality, proper disposal of waste, and the need to be responsible neighbors. The Ma-le'l Dunes Cooperative Management Area caretaker would patrol the shoreline of the Mad River Slough on a regular basis and properly dispose of any trash and waste. During the installation of the non-motorized boat launch, implementation of conservation measures (best management practices) and compliance with all applicable environmental regulations, including the Clean Water Act, would ensure that water quality is not adversely affected.

Visitor Services - Environmental Education and Interpretation
Under Alternative B, to expand upon current environmental education and interpretation opportunities, the refuge would:
- maintain and offer wildlife-dependent educational environmental education opportunities for 6 school or community groups per month
- offer opportunities for up to 30,000 annual visitor opportunities for interpretive experiences on Humboldt Bay NWR lands and off refuge
- offer guided natural history walks once per month on Lanphere Dunes Unit and Ma-le'l Dunes Unit
- coordinate with Friends of the Dunes, which leads a restoration work day once per month on Ma-le'l Dunes Unit
- continue to host class tours on Lanphere Dunes Unit and Ma-le'l Dunes Unit
- facilitate teacher training workshops so that teachers could independently lead environmental education field trips on Humboldt Bay NWR
- work with school districts in Humboldt and Del Norte counties to implement a new national program called Schoolyard Habitats
- complete the South Bay Historic Hunt Cabin
- either construct an environmental education building large enough for up to 30 people, convert the Salmon Creek Unit barn into an environmental/cultural resources education building, or make use of another existing refuge structure
- assist school groups in visiting Humboldt Bay NWR through chartering (i.e., shuttle buses, etc.) or providing similar transportation

- expand the annual outdoor youth day to an overnight multi-day event
- the Salmon Creek Unit in the vicinity of the Richard J. Guadagno Visitor Center, establish a children's outdoor exploration ("discovery") area to offer an additional opportunity for children to "connect with nature"

Visitor Services – Outreach/Friends and Partners
For Alternative B, the refuge would:
- collaborate with regional partners to host at least 2 regionally based environmental education field trips, workshops, seminars, or study courses each year

Visitor Services - Hunting
For Alternative B, the refuge would:
- continue to offer hunting opportunities on Humboldt Bay NWR as described in Alternative A and
- provide additional undisturbed areas for wildlife and reduce the potential for hunter/nonhunter conflicts by closing Teal Island and Hookton Slough areas to overwater hunting of waterfowl, coot, and snipe.

Visitor Services - Fishing
For Alternative B, the refuge would:
- offer fishing opportunities on Humboldt Bay NWR as described in Alternative A.
- collaborate with CDFG and other local agencies and private entities to increase awareness of fishing opportunities on Humboldt Bay NWR through increased signage at all allowable sport fishing sites and public outreach.

Cultural Resources - Management
Under Alternative B, the refuge would:
- create and implement a basic cultural resources management capability at Humboldt Bay NWR to respond to the basic compliance requirements
- within 10 years, work with Wiyot Tribe, Blue Lake Rancheria, and Bear River Band of Rohnerville Rancheria to develop a Memorandum of Understanding for resource management issues and inventory, evaluation and treatment of at-risk cultural places on the Complex
- incorporate cultural resource values, issues, and requirements into design and implementation of the other habitat, wildlife, and public use activities and strategies conducted by the Humboldt Bay NWR
- develop and implement a plan to survey the refuge for newly identified cultural resources
- assess the safety and maintenance costs to keep the barn and other old structures on Salmon Creek and Lanphere Dunes Units in use

Cultural Resources - Education
Under Alternative B, the refuge would:
- within 5 years develop, in partnership with the Wiyot Tribe, Blue Lake Rancheria and Bear River Band of Rohnerville Rancheria and other preservation partners, a cultural resources overview of the Humboldt Bay NWR
- either construct an environmental education building large enough for up to 30 people or convert the Salmon Creek Unit barn into an environmental/cultural resources education building (same as described under Visitor Services – Environmental Education, for Alternative B, above, due to dual function)
- develop interpretive displays on the Headquarters Unit that illustrate traditional dwellings, various subsistence strategies, the overall lifestyle of local American Indian tribes, and the contemporary tribal communities and cultural activities

Cultural Resources - Coordination
Under Alternative B, cultural resources coordination would be identical to those described in Alternative A. For Alternative B, the refuge would also:
- work with Wiyot Tribe and Blue Lake Rancheria and Bear River Band of Rohnerville Rancheria on projects to restore habitats of culturally important native plants and to harvest native plant foods (for traditional, non-commercial purposes)
- review and reissue, if appropriate, any special use permits for traditional activities such as plant collecting for basket weaving

Alternative C for Humboldt Bay NWR: Preferred Alternative

Figures E-2 through E-6 show graphical representations of the areas affected for each of the habitat management alternatives. The Summary of Alternatives table, above, provides a comparison of the actions in each alternative.

Salmon Creek Delta Restoration

In addition to completing actions described in Alternative B, under Alternative C, within 5 years of CCP approval, the refuge would also excavate 500 linear feet to connect the new channel to off-channel salmonid rearing habitat (in Cattail Creek) and seek approvals to secure placement of large woody debris within Hookton Slough estuary to provide salmonids and other estuarine fish more natural conditions that include both feeding areas and refuge from predators.

Salt Marsh Habitat

For Alternative C, the refuge would implement all of the salt marsh habitat management strategies described in Alternative B and, in addition, restore 235 acres of the 313 acres of salt marsh existing on Humboldt Bay NWR. The refuge would restore 235 acres to native and/or muted salt marsh habitat as follows:

- restore 45 acres on the White Slough Unit
- restore 90 acres on the Hookton Slough Unit
- restore 100 acres on the Table Bluff Unit
- raise tidal elevation of a total of 100 acres of existing mudflat on or near Salmon Creek Overflow with clean fill and plant with native or propagated salt marsh vegetation (raising 40 more acres than Alternative B)

Freshwater and Brackish Marsh Habitat

All pasture lands at Humboldt Bay NWR were formerly salt marsh before they were diked. After the salt marshes were diked, they became freshwater and brackish marsh (FBM) habitat. FBM can be improved as Aleutian cackling goose habitat by increasing and/or improving short-grass pasture vegetation. Under Alternative C, the refuge would implement some of the same strategies for FBM as in Alternative B and, in addition, for Alternative C, the refuge would implement the following.

- within 2 years, on White Slough Unit repair perimeter dike
- on White Slough Unit, maintain 7 acres FBM
- within 7 years, on Table Bluff Unit restore 13 acres of short-grass pasture to brackish marsh, using the same strategies described under Alternative B, by removing invasive species such as thistle (*Cirsium* spp.) and invasive fireweed (*Erechtites* sp.) and controlling non-native pasture grasses such as common velvetgrass (*Holcus lanatus*); then planting native brackish marsh species such as dune rush (*Juncus lesuerii*), and Lyngbye's sedge (*Carex lyngbei*)
- on Salmon Creek Unit, maintain 270 acres of short-grass pasture and of the 270 acres enhance 100 acres for Aleutian cackling goose and other species through control of invasives, seeding, liming, and grazing
- on the Salmon Creek Unit, enhance drainage in short-grass areas to create more favorable conditions for grass and Aleutian cackling goose
- on Salmon Creek Unit, remove interior dikes around Headquarters and adjacent to Long Pond to enhance wetland values
- on Salmon Creek Unit, install a low contour levee to impound water to enhance FBM
- on the Hookton Slough Unit, implement a restoration plan that allows for muted tidal influence to central and east areas, while allowing for fish passage, salmonid rearing and tidewater goby habitat
- on Hookton Slough Unit, maintain approximately 80 acres of FBM

Riparian Swamp Habitat

Under Alternative C, riparian swamp habitat management actions would be identical to those described in Alternative B, as follows.

- on the east side of the White Slough Unit, manage 35 acres of existing riparian swamp habitat and re-vegetate an additional 6 acres with riparian swamp vegetation
- continue selective removal of 20 acres of non-native trees, including eucalyptus (over a 5-year period), Monterey pine, and Monterey cypress trees. The refuge would only remove non-native trees as variable staff and funding resources permit. This would result in removal of non-native trees within the life of the CCP (15 years)
- continue to work with volunteer groups or partners to complete small-scale plantings of native vegetation in areas where non-native trees are removed

- enhance riparian swamp habitat by planting native under story plants and providing deer browse protection on new plantings
- within 15 years, replace 20 acres of non-native trees with riparian swamp vegetation native to the area
- implement a cooperative agreement with interested parties to remove non-native trees and assist with the new plantings
- within 5 years, enhance and restore 14 acres of riparian swamp habitat in the eastern area of the White Slough Unit

Eelgrass and Mudflat Habitat

Under Alternative C, eelgrass and mudflat habitat management actions would be identical to those described in Alternative A plus Alternative B, as follows.

- continue to participate in ongoing partnerships and explore new partnerships to conserve and manage eelgrass and mudflat habitat for the long-term health of the bay
- monitor potential effects to eelgrass beds from the ongoing Salmon Creek Restoration project
- continue partnership with the HBHRCD and HBEBM program for continued research into the ecology of eelgrass, algae, and mudflat habitats
- pursue a memorandum of understanding with the Humboldt Bay Harbor Recreation and Conservation District and the California Department of Fish and Game to conserve inter-tidal areas within the approved refuge boundary
- pursue additional funding for research and conservation through the Service's coastal program to contribute to HBEBM program

Floodplain Management

Under Alternative C, floodplain management actions would be identical to those described in Alternative B, as follows.

- continue to manage the Humboldt Bay NWR floodplain land in a manner consistent with local, State, and Federal guidelines; and flood management, sediment, and erosion control and water quality objectives
- continue to maintain all levees and would conduct minimal repairs of existing levees as needed to maintain their functionality
- implement habitat improvement strategies in a manner that does not worsen local or regional flooding, water quality, or erosion
- within 10 years, work toward achieving the relevant water quality objectives as described in Section 3 of the North Coast Basin Plan objectives for the benefit of fish and wildlife resources North Coast Basin Plan (NCRWQCB 2007) objectives for inland surface waters, enclosed bays, and estuaries
- with partners such as HBHRCD, develop or continue a long-term water quality monitoring program to document effects of sediment flushing from Salmon Creek on eelgrass beds in southern Humboldt Bay

Dune Mat/Foredune Grassland Habitat

Under Alternative C, dunemat/foredune grassland management actions would include all of those actions described in Alternative A and in Alternative B, as follows.

- on the Lanphere Dunes Unit, maintain 125 acres of dune mat/foredune grassland plant communities
- on the Ma-le'l Dunes Unit, part of Lanphere Dunes Unit, and on Table Bluff Unit, re-introduce Humboldt Bay wallflower
- continue research and monitoring of Humboldt Bay wallflower populations on the Humboldt Bay NWR
- seek cooperative agreements with adjacent landowners to assist them in managing populations of the Humboldt Bay wallflower and beach layia
- continue monitoring and native plantings (re-introductions), as described above in Features Common to All Alternatives
- on all suitable areas of the Lanphere and Ma-le'l Dunes Units restore native dune mat/foredune grassland communities
- within 5 years, on Table Bluff Unit, restore native dune mat/foredune grassland on 10 acres
- inventory wildlife (including invertebrate) species in dune mat/foredune grassland habitats
- conduct research on cryptogamic mat and interactions between the mat and endemic insects
- create ongoing experimental dune blow-outs to mimic natural disturbance and to assess the impacts on existing plant communities and special status plants on the Lanphere Dunes Unit.

Dune Swale Habitat
Under Alternative C, the refuge would restore and maintain dune swale plant communities as described in Alternative B; however, under Alternative C all restoration work would be completed within 10 years (instead of within 15 years as in Alternative B).

On the dunes units restore and maintain a total of 67 acres of dune swale plant communities as follows:
- within 10 years, on Lanphere Dunes Unit, restore and maintain 46 acres of dune swale
- within 10 years, on Ma-le'l Dunes Unit, restore and maintain 21 acres of dune swale

and
- within 10 years, on Table Bluff Unit, restore 25 acres of dune swale habitat
- inventory wildlife (including invertebrates) species in dune swale habitat
- re-vegetate dune swales with native, local plants as needed

Dune Riparian/Swamp Habitat
Under Alternative C, the refuge would restore dune riparian/swamp habitat as described in Alternative B, as follows; however, under Alternative C restoration work would be completed over a 5-year period (instead of over 10 years as in Alternative B). In addition, under Alternative C the refuge would begin to implement strategies to enhance dune riparian/swamp habitat, on the Ma-le'l and Lanphere Dunes Units, once the refuge gains a more comprehensive understanding of plant and animal species that inhabit dune riparian/swamp habitat. To enhance dune riparian/swamp habitat, native dune riparian/swamp species would be planted where invasive plants were removed or gaps in native vegetation exist and are vulnerable to re-infestation by invasives, as appropriate.
- within 5 years, on the Lanphere and Ma-le'l Dunes Units, restore 33 total acres of dune riparian/swamp habitat
- inventory wildlife (including invertebrate) species, in dune riparian/swamp habitat
- continue to collaboration with partners to conduct research on neo-tropical, migrant birds

Coniferous Dune Forest Habitat
Under Alternative C, the refuge would:
- within 5 years, restore Ma-le'l Dunes Unit forest margins dominated by European beach grass to native coniferous forest communities (instead of within 10 years as in Alternative B or within 15 years in Alternative A)
- within 5 years, restore native plant communities to remove casual human trails throughout the coniferous forest (instead of within 10 years as in Alternative B or within 15 years in Alternative A)
- pursue funding and collaborate with Humboldt State University to conduct research on coniferous dune forest ecology including tree wind-fall events
- pursue funding and continue research on neo-tropical migrant birds by partners
- inventory wildlife species, including invertebrates, that utilize coniferous dune forest habitat
- grow or identify local sources for restoration plant materials

Ecosystem Management
Under Alternative C, the refuge would engage in ongoing ecosystem management activities as described under Alternative B. However, within 2 years the refuge would devote additional staff time to serve an increased role in ecosystem based management collaborations for a 15 year period.

Special Status Species (Humboldt Bay wallflower and beach layia)
Under Alternative C, the refuge would implement the same special status species management actions as described under Alternative B and, in addition, the refuge would:
- within 5 years, reintroduce Humboldt Bay wallflower and beach layia to unoccupied habitat at Lanphere Dunes Unit (35 acres) and restored habitat at Ma-le'l Dunes Unit
- within 10 years, protect an additional 22 acres of land currently populated with Humboldt Bay wallflower (wallflower) and beach layia (layia) within the approved refuge boundary
- within 10 years, protect 30 acres of potentially restorable habitat within the approved refuge boundary
- once protected, carry out restoration of habitats and re-introduce populations of native endangered plants
- pursue protection of remaining habitat for Federally-protected species within the Humboldt Bay NWR approved boundary through cooperative agreements, easements, donations, or acquisition

The actions and effects analysis for the Federally listed salmonids and tidewater goby are discussed under the Salmon Creek Delta Restoration sections for each alterative.

Invasive Species (Integrated Pest Management)
Under Alternative C, over the life of the CCP (15 years from approval), the refuge would implement all of Alternative B *and* expand management to include the additional actions as noted below. The refuge would implement the following management activities (actions are listed by general program actions or by habitat type).

General Invasive Species Management Program Actions:
- if feasible, eradicate Spartina densiflora from Humboldt Bay NWR and work with regional partners to develop and implement a plan to eradicate *Spartina densiflora* from the greater Humboldt Bay area
- on Table Bluff Unit, work with the refuge invasives program and/or YCC and CDF to remove all species of invasive plants
- monitor and strategically remove invasive plants as resources permit *and* expand the existing volunteer program to control high priority target invasive plants
- continue coordination and collaboration with volunteers and partners from organizations such as the Friends of the Dunes, Friends of the Humboldt Bay NWR, the Fortuna Creeks Project, CCC, and CDF to control invasive plants on Humboldt Bay NWR and adjacent lands
- participate in the Humboldt-Del Norte County Weed Management Area group that coordinates and implements invasive plant management programs among 20 agencies and organizations
- pursue grant funding for a partner invasive plant control program and implement, if feasible
- develop a Hazard Analysis and Critical Control Point Plan to prevent establishment of new invasive species
- create and implement an IPM step-down plan for the entire Humboldt Bay NWR
- pursue grant funding to contract out invasive plant removal and implement, if feasible

Salmon Creek Delta and Salt Marsh Habitat:
- finalize and implement an invasive plant management (IPM) plan *and*
- Control high priority target plant species to a maintenance level of ongoing control

Freshwater and Brackish Marsh:
- on Hookton Slough Unit, maintain 150 acres of freshwater and brackish marsh through the control of invasive plants

Riparian Swamp Habitat:
- remove 20 acres of non-native trees from riparian swamp habitat
- use a combination of mechanical and chemical (IPM) techniques to control the spread of non-native trees

Eelgrass and Mudflat Habitat:
- continue partnerships for monitoring and research on invasive species that may affect eelgrass

Dune Habitats:
- implement large-scale eradication experiments on existing invasive plants in the dune swale plant community
- work with volunteers to complete removal of forest invasive plants from the dune riparian/swamp
- monitor and treat new occurrences of forest invasive plants from the dune riparian swamp
- survey for and control of new occurrences of forest invasive plants as resources permit
- pursue funding to bring all riparian/swamp invasives to a maintenance level of control
- work with YCC, CCC, CDF, partners, and volunteers to complete removal of invasive plants in the coniferous dune forest

Visitor Services - Wildlife Observation and Photography
Figures E-7 and E-8 show a graphical representation of areas of Visitor Services features described in the alternatives.

Under Alternative C, the refuge would expand upon current opportunities for wildlife observation and photography as described in Alternative B by implementing the following actions.

- provide for up to 35,000 annual, safe wildlife observation and photography visitor opportunities on Humboldt Bay NWR by land and water trails
- on the Salmon Creek Unit, expand wheelchair access on trails to include the entire Shorebird Loop Trail (1.5 miles) to increase wildlife viewing opportunities
- on Ma-le'l Dunes Unit, expand wheelchair access on trails to include the entire Railroad Berm Trail (0.5 miles) to increase wildlife viewing opportunities
- on the Hookton Slough Unit, expand wheelchair access on trails to include the entire Hookton Slough Trail (1.5 miles) to increase wildlife viewing opportunities
- on Salmon Creek Unit, maintain wheelchair accessibility to the Richard J. Guadagno Office and Visitor Center and associated boardwalk
- increase law enforcement on the refuge by contract or support from other Service law enforcement staff
- install a wildlife camera with feed back, which would provide additional opportunities for wildlife observation from closed portions on the Humboldt Bay NWR to a large screen television at the Visitor Center
- increase the number of seasonally guided hikes offered through otherwise closed trail areas (led by staff or volunteer docents) and increase seasonal hiking day use opportunities around the Humboldt Bay NWR hunt area by improving trails.
- on Salmon Creek Unit, add a wheelchair accessible photo blind by modifying the existing kiosk

Visitor Services - Environmental Education and Interpretation

Under Alternative C, the refuge would:

- offer environmental education opportunities for 8 school or community groups per month
- offer opportunities for up to 35,000 annual visitor opportunities for interpretive experiences on Humboldt Bay NWR lands and off refuge
- offer guided natural history walks once per month on Lanphere Dunes Unit and Ma-le'l Dunes Unit
- coordinate with Friends of the Dunes, which leads a restoration work day once per month on Ma-le'l Dunes Unit
- continue to host class tours on Lanphere Dunes Unit and Ma-le'l Dunes Unit
- facilitate teacher training workshops so that teachers could independently lead environmental education field trips on Humboldt Bay NWR
- work with school districts in Humboldt and Del Norte counties to implement a new national program called Schoolyard Habitats
- complete the South Bay Historic Hunt Cabin
- either construct an environmental education building large enough for up to 30 people or convert the Salmon Creek Unit barn into an environmental/cultural resources education building, or make use of another existing refuge structure
- assist school groups in visiting Humboldt Bay NWR through chartering (i.e., shuttle buses, etc.) or providing similar transportation
- expand the annual outdoor youth day to an overnight multi-day event
- the Salmon Creek Unit in the vicinity of the Richard J. Guadagno Visitor Center, establish a children's outdoor exploration ("discovery") area to offer an additional opportunity for children to "connect with nature"

Visitor Services – Outreach/Friends and Partners

Under Alternative C, the refuge would offer opportunities identical to those described in Alternative B, as follows.

- collaborate with regional partners to host at least 2 regionally based environmental education field trips, workshops, seminars, or study courses each year

Visitor Services - Hunting

Under Alternative C, the refuge would implement the 2008 Draft Waterfowl Hunt Plan (see Appendix C) and, in addition, the refuge would:

- open limited areas of the Ma-le'l Dunes Unit to waterfowl, coot, and snipe hunting and/or retrieval and offer 2 additional youth only hunting days on the Salmon Creek Unit

Visitor Services - Fishing
Under Alternative C, the refuge would implement the 2008 Draft Sport Fishing Plan (see Appendix D of the CCP). This 2008 Plan:
- offer fishing opportunities on Humboldt Bay NWR as described in Alternative A (maintains existing fishing opportunities) and
- collaborate with CDFG and other local agencies and private entities to increase awareness of fishing opportunities on Humboldt Bay NWR through increased signage at all allowable sport fishing sites and public outreach as described in Alternative B and
- creates additional fishing opportunities to the public at the end of the Tsoutsgish Trail (end of the railroad berm) at the Ma-le'l Dunes Unit

Cultural Resources - Management
Under Alternative C, the refuge would:
- continue managing for and conserving Humboldt Bay NWR's cultural resources by consulting with the Wiyot Tribe, Blue Lake Rancheria, Bear River Band of Rohnerville Rancheria, and the Service's Pacific Southwest Regional Archaeologist to collect relevant cultural resource background information prior to conducting projects
- within 10 years, work with Wiyot Tribe, Blue Lake Rancheria, and Bear River Band of Rohnerville Rancheria to develop a Memorandum of Understanding for resource management issues and inventory, evaluation and treatment of at-risk cultural places on the Complex.
- incorporate cultural resource values, issues, and requirements into design and implementation of the other habitat, wildlife, and public use activities and strategies conducted by the Humboldt Bay NWR
- develop and implement a plan to survey the refuge for both previously recorded and newly identified cultural resources

Cultural Resources - Education
Under Alternative C, cultural resources education actions would be identical to those described in Alternative B, as follows.
- within 5 years develop, in partnership with the Wiyot Tribe, Blue Lake Rancheria and Bear River Band of Rohnerville Rancheria and other preservation partners, a cultural resources overview of the Humboldt Bay NWR
- either construct an environmental education building large enough for up to 30 people, convert the Salmon Creek Unit barn into an environmental/cultural resources education building, or make use of another existing refuge structure (same as described under Visitor Services – Environmental Education/ Interpretation, for Alternative B, above, due to dual function)
- develop interpretive displays on the Headquarters Unit that illustrate traditional dwellings, various subsistence strategies, the overall lifestyle of local American Indian tribes, and contemporary tribal communities and cultural activities

Cultural Resources - Coordination
Under Alternative C, cultural resources coordination actions would be identical to those described in Alternative B (which is also identical to Alternative A), as follows.
- work with Wiyot Tribe and Blue Lake Rancheria and Bear River Band of Rohnerville Rancheria on projects to restore habitats of culturally important native plants and to harvest native plant foods (for traditional, non-commercial purposes)
- review and reissue, if appropriate, any special use permits for traditional activities such as plant collecting for basket weaving

Management Actions Considered but Eliminated from Detailed Analysis as Part of Humboldt Bay NWR Alternatives

During the public scoping period, many alternative actions for managing the refuges were suggested. Many of these suggestions were consistent with refuge purposes and the mission of the Refuge System and influenced the action alternatives. Some of the public suggestions for refuge uses were found to be not appropriate, through an appropriate use determination, and were removed from further consideration. Others actions were found to be infeasible for the reasons described below.

Dog Walking
The public suggested that dog walking should be allowed on the Humboldt Bay NWR. This activity was found to be not appropriate because the presence of dogs is disruptive to wildlife and some dogs can also disturb other visitors engaging in wildlife-dependent activities. Therefore, dogs, both on a leash and off, are not appropriate on the refuge.

Dog Field Training
The public suggested that the refuge should allow hunting dog field training on the Humboldt Bay NWR. This activity was found to be not appropriate because the field training would be unnecessarily disruptive to wildlife and could not be adequately managed with available staff time and resources.

Creating a 2-3 Week Day Camp for Grades K through 12 Students
The public suggested that the refuge should offer a 2- to 3-week summer day camp for kindergarten through 12th grade students on Humboldt Bay NWR. This activity was found to be not appropriate due to limitations on staff time and inadequate facilities to manage a 2–3 week day camp.

Camping
The public suggested that camping should be allowed on the Humboldt Bay NWR. This activity was found to be not appropriate because camping would pose an unacceptable risk to cultural resource sites and disturbance to wildlife.

Bicycling
The public suggested that the Humboldt Bay NWR should allow bicycling on walking trails and dune units. Currently, bicycling is only allowed on the entrance road, along with other forms of mechanical transportation. Bicycling was found to be not appropriate for two primary reasons. The dune units preserve fragile ecosystems and impacts from bicycles on dune unit plant communities would be severe. Bicycling on walking trails would be unnecessarily disruptive to wildlife and to other visitors engaging in wildlife-dependent activities such as wildlife observation. Bicycling will continue to be allowed on the paved entrance road at the Salmon Creek Unit and the entrance road at Ma-le'l Dunes Unit, along with other forms of mechanical transportation. Bicycling on all other parts of the refuge was found to be not appropriate because it could disturb wildlife and other visitors.

Potential for Larger Scale Salt Marsh/Estuary Restoration
Large scale salt marsh/estuary restoration including breaching of diked areas is being done (or proposed) elsewhere at multiple places on Humboldt Bay (McDaniel Slough) and other locations on the west coast (including the Nisqually NWR near Olympia, Washington; Nestucca Bay and Bandon on the Oregon coast; and in San Francisco Bay). The Service considered potential salt marsh/estuarine restoration opportunities at Humboldt Bay NWR on a larger scale than what is included in the Draft EA, including dike breaching on the Salmon Creek Unit. However, in all of these large scale restorations in other areas, there was one common factor that does not currently exist at the Salmon Creek Unit: agency ownership of adjacent lands and/or infrastructure that would be susceptible to impacts by flooding. In addition to this key factor, the refuge does not currently have the necessary information on hydrology, topography, and sea level rise that would inform a decision this significant. It is anticipated that this information will be being gathered relatively soon for future decision-making processes all around the bay. Therefore, larger scale salt marsh/estuary restoration was eliminated from further consideration in this EA.

Salt Marsh Restoration at Teal Island
Prior to being diked in the 1960s, Teal Island historically supported about 90 acres of salt marsh habitat. Since failure of the tidegates during the 1960s and 1970s, the earthen dikes have been deteriorating due to erosion from wave wash. There are now large sections where the former dikes are no longer present. Teal Island now has daily tidal flows; and with the exception of one 100 square-foot area of non-native salt marsh, the area formerly contained by dikes is currently all mudflat. To reestablish salt marsh vegetation on Teal Island, fill material would be required to raise the elevation of the island. Due to the cost and logistics of importing enough fill material to raise the elevation of Teal Island and projected sea level rise due to climate change, the feasibility of restoring salt marsh on Teal Island is unlikely at this time. For the aforementioned reasons, salt marsh restoration at Teal Island was not carried forward for detailed consideration in this EA. If a change in circumstances (such as availability of dredge spoil) warrants reconsideration in the future, a proposal could be evaluated at that time.

CASTLE ROCK NATIONAL WILDLIFE REFUGE

Current Management of Castle Rock NWR

Castle Rock NWR Management and Monitoring
Because Castle Rock NWR is rich with sensitive wildlife species and fragile habitat only very limited access for research, monitoring, and management can be allowed while fulfilling the purposes for which the Castle Rock NWR was established. Limited, remote observation of Castle Rock NWR has been allowed for research purposes. The refuge collaborates with partners such as the National Oceanic and Atmospheric Administration, Humboldt State University, the California Department of Fish and Game (CDFG), and the Arcata Fish and Wildlife Office (AFWO) to conduct photo surveys of birds and marine mammals utilizing Castle Rock NWR and associated habitat. The refuge works with partners from Humboldt State University to maintain a remote, automatic camera on Castle Rock NWR that can be viewed by the public over the internet on a seasonal basis. Interpretive panels highlighting Castle Rock NWR wildlife are located on Pebble Beach Drive in Crescent City, adjacent to the shore overlooking Castle Rock NWR.

For a complete description of the current management practices, please see "Current Management of Castle Rock NWR" in Chapter 1 of the CCP.

Features Common to All Alternatives for Castle Rock NWR

Monitoring Seabirds and Marine Mammals
The refuge would continue to collaborate with partners such as the National Oceanic and Atmospheric Administration, Humboldt State University, CDFG, and the AFWO to continue photographic surveys of birds and marine mammals utilizing Castle Rock NWR habitat. Surveys would continue to be conducted both aerially and by remote camera to help determine population estimates of wildlife using Castle Rock NWR habitat.

Alternative A for Castle Rock NWR: No Action

Habitat Management
Under Alternative A, Castle Rock NWR would continue to be protected from disturbance. Periodic visits to the island would continue to be conducted to maintain a remote, seabird viewing camera. Any visits to the island to maintain remote viewing equipment would occur outside of seabird and pinniped breeding seasons. Additional surveys for terrestrial plants and wildlife, beyond birds and marine mammals, would be conducted every 5 years.

Special Designation
Under Alternative A, Castle Rock NWR would continue to be designated as a National Wildlife Refuge and would not be recommended for any special designations.

Environmental Education and Interpretation
Under Alternative A, environmental education and interpretation efforts for Castle Rock NWR and its wildlife and habitat would be coordinated with that of larger State, Regional, and other California Current System seabird programs. The California Current System, which extends from Baja Mexico to British Columbia, is a complex and extremely productive system of currents, counter currents, undercurrents and other oceanographic processes, such as upwelling, that supports millions of breeding and seasonally migrating seabirds. Over the life of the plan, partnerships might expand and the refuge staff would continue to participate in at least one annual community event, typically the Aleutian Cackling Goose Festival.

Alternative B for Castle Rock NWR

Habitat Management
Under Alternative B, habitat management would be the same as Alternative A except that seabird and marine mammal monitoring and research would only be allowed to occur from off-island.

Special Designation
Under Alternative B, Castle Rock NWR would continue to be designated as a National Wildlife Refuge and would not be recommended for any special designations.

Environmental Education and Interpretation
Under Alternative B, environmental education and interpretation would be the same as under Alternative A. In addition, within 5 years refuge staff would collaborate with National and State organizations to develop and provide additional outreach to students, community groups, and others and participate in an additional three community events annually. The refuge staff would coordinate with local tribal entities, BLM, NPS, CDFG, and Del Norte County to provide interpretation of traditional uses of Castle Rock NWR.

Alternative C for Castle Rock NWR: Preferred Alternative

Habitat Management
Under Alternative C, habitat management would be the same as Alternative A except that refuge staff and associated researchers would assess the potential to experiment with various options for seabird habitat restoration by assessing possibilities for excluding Aleutian cackling geese from certain key habitat locations.

Special Designation
Under Alternative C, Castle Rock NWR would be recommended for Wilderness designation based on the Wilderness Inventory presented in Appendix G. As required by the Wilderness Act, a legislative EIS would be prepared to analyze the effects of the action.

Environmental Education and Interpretation
Under Alternative C, environmental education and interpretation would be the same as under Alternative A and within 3 years refuge staff would collaborate with National and State organizations to develop and provide additional outreach to students, community groups, and others and participate in an additional two community events annually. The refuge staff would coordinate with local Tribal entities to provide interpretation of traditional uses of Castle Rock NWR.

Proposed Action Criteria

The planning policy that implements the Improvement Act of 1997 requires the Service to select a preferred alternative that becomes its proposed action, as required by NEPA. The written description of this proposed action is effectively the draft CCP. Alternative C is the proposed action for the refuge because it best meets the following criteria:

- achieves the mission of the National Wildlife Refuge System;
- achieves the purposes of both refuges in the Complex;
- provides guidance for achieving the each refuge's vision and 15-year goals;
- maintains and restores the ecological integrity of the habitats and populations on each of the refuges;
- addresses the important issues and challenges identified during the scoping process;
- addresses the legal mandates of the Service and the Refuge System; and
- is consistent with the scientific principles of sound fish and wildlife management and listed species recovery.

The preferred alternative was identified based on the analysis presented in the Draft CCP/EA, which may be modified following the completion of the public comment period based on comments received from other agencies, tribal governments, non-governmental organizations, or individuals.

Table E-2. Summary of Alternatives: Castle Rock NWR

Issue Area	Alternative A (*No Action*)	Alternative B	Alternative C (*Preferred Alternative*)
Goal 1. Protect and maintain habitats for migratory birds marine mammals, with an emphasis on seabirds, and Aleutian cackling geese.			
Habitat Management	Monitor seabirds and marine mammals through aerial photo surveys and by maintaining a remote camera on island	Same as Alternative A but:	Same as Alternative A but:
	Experiment with exclusions for ACG	Same as Alternative A	N/A
	N/A	Monitoring and remote research would only be allowed off-island	Conduct surveys every 5 years for fauna and flora including: amphibians, invertebrates, rare and invasive plants
	N/A	Evaluate options for remote monitoring of seabirds and ACG on CRNWR	Assess potential to experiment with habitat restoration by excluding ACG from key locations
Wilderness	Manage CRNWR under current designation	Do not recommend CRNWR for Wilderness designation	Recommend CRNWR for Wilderness designation and prepare required EIS
Goal 2. Provide high quality enviornmental education, interpretive information, and outreach to the public highlighting the ecology and sensitivity of the wildlife of Castle Rock National Wildlife Refuge.			
Environmental Education and Interpretation	Coordinate environmental education and interpretation with State, regional and CCS seabird programs	Same as Alternative A and in addition:	Same as Alternative A and:
	N/A	Within 5 years, collaborate with National and State organizations to provide outreach to students, community groups, and others.	Within 3 years, collaborate with National and State organizations to provide outreach to students, community groups, and others.
	Refuge staff would continue to participate in at least 1 community event annually.	Refuge staff would participate in an additional 3 community events annually.	Refuge staff would participate in an additional 2 community events annually.
	N/A	Coordinate with local tribal entities, BLM, NPS, CDFG, and Del Norte County to provide interpretation of traditional uses of Castle Rock NWR.	Coordinate with local tribal entities to provide interpretation of traditional uses of Castle Rock NWR.

N/A = Not applicable to and not included in that Alternative; ACG=Aleutian cackling goose; CCS = California Current System; CRNWR=Castle Rock NWR; EIS = Environmental Impact Statement.

Chapter 3. Affected Environment

Chapter 3 of the CCP provides a detailed description of the affected environment for the Humboldt Bay National Wildlife Refuge and the Castle Rock National Wildlife Refuge.

Chapter 4. Environmental Consequences

Overview of the NEPA Analysis Parameters

This chapter analyzes the direct, indirect and cumulative effects expected to occur from the implementation of each of the alternatives described in Chapter 2. The analysis is organized by each aspect of the environments described in Chapter 3, including physical, biological, social, and economic resources. The purpose of the analysis is to provide the *context* and *intensity* of the impacts of the action, such that a determination of significance can be made by the decision-makers.

The National Environmental Policy Act (NEPA) requires mitigation measures to be identified and discussed for adverse impacts to habitats, wildlife, or the human environment. While the purpose of the CCP is to develop a management plan for the refuge that maintains and improves the quality of habitat available for fish and wildlife, and improves the visitor's experience; implementation of the plan may result in temporary adverse effects to soil, water quality, or air quality. Therefore, the Service is including a number of conservation measures as an integral part of the implementation of the preferred alternative. These conservation measures will further minimize any adverse effects from implementation. For a description of the conservation measures, see Appendix 1 to the EA.

In describing the significance of impacts, the Service defers to the Council on Environmental Quality's regulations implementing NEPA at 40 CFR 1508.27.

"Significantly" as used in NEPA requires considerations of both context and intensity:

Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short-and long-term effects are relevant.

Intensity. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action.

Significance of impacts to the human environment determines whether preparation of an EIS is warranted. Thus, an EA provides a discussion of the magnitude of the impacts within the context of the situation for each impact topic.

The context of the action alternatives is the Humboldt Bay area (for Humboldt Bay NWR actions) and the adjacent coastline and waters surrounding the island of Castle Rock NWR (for Castle Rock NWR actions).

Alternative A, the No Action Alternative, is a continuation of current management practices; it serves as the baseline against which Alternatives B and C are compared. Discussion of the action alternatives (Alternatives B and C) follow each discussion of the No Action Alternative (Alternative A). Cumulative effects are discussed at the end of the section for each resource. Cumulative impacts to the environment would result when the incremental impact of an action is added to other, closely related past, present, or reasonably foreseeable future actions.

Many of the effects related to restoration of Salmon Creek are discussed and analyzed as part of the Environmental Assessment prepared for the Humboldt Bay NWR in 1992 (USFWS 1992). This document is hereby incorporated by reference. It is available for review at the Humboldt Bay NWR Complex Headquarters office. Summaries of the effects are reflected in the discussions that follow under each resource type.

HUMBOLDT BAY NATIONAL WILDLIFE REFUGE

Soils

Common to All Alternatives

Habitat Management Activities

Standard habitat management activities; including mowing, disking, tilling, prescribed fire, grazing, and irrigation; may have some effect on soils. Pesticides (including herbicides) are also used for habitat management. The effects of habitat management activities and pesticide use are discussed below.

Under all alternatives, the refuge would continue to maintain and enhance 270 acres of agricultural grasslands (pasture) for Aleutian cackling goose habitat. Soil disturbance for maintenance activities would be expected to be temporary and localized during periodic mowing, plowing, and incorporating applications of lime to increase productivity. The amount of dust from mowing, plowing and other maintenance activities is expected to be negligible because of the high soil moisture levels at the refuge and the Humboldt Bay vicinity, particularly in the springtime when the management activities would primarily be performed. When periodic plowing is needed, it would be done infrequently (less than 20 acres per year) and in the spring when soil moisture is high. Pastureland soils are plowed one field at a time in late April, prior to seeding. Cattle grazing may also be used to maintain cover of emergent vegetation in seasonal wetland impoundments (agricultural wetland). Grazing pressure would be surveyed periodically and cattle removed prior to compaction or erosion. Management activities that involve soil disturbance may temporarily increase erosion rates in the project area. These maintenance activities are comparable in scope to those performed on neighboring agricultural lands, but may not be conducted in the same season.

No adverse effects to soils are anticipated from fertilizers. The refuge does not apply fertilizer to all pasturelands in any one year because the amount of fertilizer that would be effective would be cost prohibitive for these large acreages (hundreds of acres). If used, fertilizers are applied sparingly and in accordance with manufacturer's recommendations to avoid potentially adverse effects to water quality (effects to water quality are discussed in the section below). In accordance with recommendations by the manufacturer and the University of California Cooperative Extension (UCCE) livestock/natural resources advisor, lime is applied to pasturelands on the refuge to balance the pH of the soil. Adding lime is done to balance soil pH and improve productivity for pasture vegetation. Since pH levels in the area are low (5.0 to 6.0), the application of lime to pasturelands is a common practice used by ranchers locally and regionally to raise soil pH. The UCCE livestock/natural resources advisor recommends the application of lime at 3.0 to 3.5 tons per acre to improve productivity of pasturelands by raising the pH; lime may be applied at this rate every 2 years (Bowers pers. comm.). The refuge typically applies lime at this recommended rate every 3 to 5 years. The refuge applies lime in the late summer or early fall, well in advance of the heavy rains typical for the north coast in November. The rates and frequency of lime application done by the refuge on pasturelands is a widely accepted practice throughout the county and the State to improve vegetation productivity without any known adverse effects to soils. The effects to soils from lime application are expected to be minor, localized, and wholly beneficial to the management of agricultural grasslands.

Based on the rates, frequency, and seasonal timing of maintenance activities on the refuge, the Service has concluded that maintenance activities that disturb the soil are expected to result in an overall beneficial effect to agricultural grassland soils in all alternatives.

Pesticides/Surfactants

Refuge maintenance activities periodically include the use of Service-approved pesticides. Service-approved pesticides would be used with all alternatives. Pesticide Use Proposals (PUP) are required for pest management activities on lands owned or managed by the Service. PUPs specify the appropriate and safe use of pesticides and require that the pesticide use is also in compliance with applicable State pesticide laws and regulations. A PUP is prepared for all pesticides use on the refuge. This approach includes a detailed evaluation of the proposed pesticide use noting environmental hazards, efficacy, vulnerability of the target pest, and the State-issued Certified Pesticide Applicators' identification number for proposed use of any restricted use pesticides. In addition, the refuge's use of integrated pest management strategies (selecting from mechanical, biological, cultural and chemical management methods) results in minimizing the use of pesticides and subsequently, leads to minor effects on soils.

Under all alternatives, the refuge would continue to periodically use Service-approved aquatic herbicides including: Rodeo (glyphosate), AquaMaster and Remedy; and terrestrial herbicides such as Roundup pro (glyphosate) and Roundup pro concentrate (glyphosate), and 2, 4-D to control invasive plants on the Humboldt Bay NWR. Glyphosate, the active ingredient in Rodeo, Roundup pro, and Roundup pro concentrate is considered non-mobile in soils and sediments because it rapidly and strongly adheres to soil particles and degrades in the soil. Glyphosate is moderately persistent in the soil. Glyphosate has no known effect on soil microorganisms. Glyphosate is highly adsorbed on most soils especially those with high organic content. The compound is so strongly attracted to the soil that little is expected to leach from the applied area. Microbes are primarily responsible for the breakdown of the product. The time it takes for half of the product to break down (half-life) ranges from 1 to 174 days. Because glyphosate is so tightly bound to the soil, little is transferred by rain or irrigation water. One estimate showed less than 2 percent of the applied chemical was lost to runoff (USFS 1984). The herbicide could move when attached to soil particles in erosion run-off. In water, glyphosate is strongly adsorbed to suspended organic and mineral matter and is broken down primarily by microorganisms also. Its half-life in pond water ranges from 12 days to 10 weeks. (Cornell University 1994)

Triclopyr is not strongly adsorbed to soil particles, has the potential to be mobile, and is fairly rapidly degraded by soil microorganisms. Concentrations of 500 ppm had no apparent effects on the growth of common soil microorganisms. Triclopyr was tested but not found in a host of groundwater sites throughout the country (Williams et al. 1988). The half-life of triclopyr in soil is from 30 to 90 days, depending on soil type and environmental conditions, with an average of about 46 days. The half-life of one of the breakdown products (trichloro-pyridinol) in 15 soil types (similar to those at the refuge) ranged from 8-279 days with 12 of the tested soils having half-lives of less than 90 days. Longer half-lives occur in cold or arid conditions.

The World Health Organization (1984) concluded that 2, 4-D does not accumulate or persist in the environment. The primary degradation mechanism is microbial metabolism, but mineralization and possibly photolysis may also play a role. The average half-life of 2, 4-D is 10 days (Tu et al. 2001).

Based on the above information and the Service's PUP requirements, the Service has concluded that the use of these PUP-regulated herbicides would result in no adverse effects to soils and soil microorganisms on and near the refuge for all alternatives.

Alternative A: No Action

Factors that could affect soils, including maintenance activities, pesticide use, soil compaction and soil erosion are not expected to change with Alternative A. Since 1971, when the refuge was established, the pasturelands have remained productive and supported cattle and wildlife. Based on the analysis in the section Common to All Alternatives and above, the Service has concluded that no changes to soils and no adverse effects are anticipated with Alternative A, the continuation of current management and restoration activities.

Alternative B

As part of Alternative B, the refuge would excavate and restore approximately 1,500 linear feet of Salmon Creek into a meandering channel. The volume of excavated soil is estimated at 10,000 cubic yards. These restoration activities are expected to have generally localized effects. Alternative B also proposes to raise 35 acres of the White Slough Unit and 90 acres of Salmon Creek overflow marsh plain (a total of 125 acres). The soil excavated from the meandering channel would be used to raise the marsh plain, so no imported soil is needed. The effects of action Alternative B on soils are expected to be localized within the 125 acres of the salt marsh habitat as described below.

The first step in the salt marsh restoration process would be to remove approximately 12 inches of exiting topsoil and native marsh plants for storage on the refuge. After the topsoil and plants have been salvaged, clean fill soil would be spread on the marsh plain to raise the elevation. After the fill soil is placed, the salvaged and stockpiled native topsoil would be spread on top of the fill material. The heavy (earth moving) equipment that is used to place fill and replace topsoil is expected to cause some temporary and localized soil compaction. Alternative B also proposes either conversion of the existing barn near the Visitor Center or new construction of a covered outdoor structure for environmental education activities. Soils that will be directly beneath the foundation of a new structure (a foot-print of approximately 1,000 square feet) are required to be compacted for stability of the structure.

For construction activities related to the Salmon Creek restoration, salt marsh restoration, and the environmental education structure, conservation measures would be required as part of the construction contracts to minimize the extent and severity of soil compaction and erosion. Earth moving activities could result in large areas of bare soil that could be subject to erosion during the rainy season (November through April); however, the requirement of conservation measures is expected to minimize soil erosion. Excavation of 1,500 linear feet of creek, restoration of 125 acres of salt marsh, or construction of the environmental education facility each could be completed within 1 construction season (the drier months of 1 calendar year); 1 year of construction activities within the 15-year period of analysis ("life of the CCP") or relatively short-term. Erosion due to flowing water is expected to be short-term, minor and localized because earth moving would occur primarily during months with less precipitation, the terrain is relatively flat, and the refuge would employ conservation measures to minimize soil erosion. For a description of conservation measures, refer to Appendix 1 to this EA.

Because conservation measures would be employed to mitigate soil erosion and compaction due to maintenance activities, Salmon Creek restoration activities, and construction (or conversion) of an education building and raising Salmon Creek overflow marsh plain, any adverse effects to soils are expected to be temporary and localized. Based on the climatic conditions at the refuge and use of conservation measures to mitigate any potential adverse effects to soils, the Service has concluded that adverse effects to soils are anticipated to be greater than Alternative A (the no action alternative), but minimal with Alternative B.

Alternative C: Preferred Alternative

The effects of Alternative C to soils are expected to be similar to those described under Alternative B except that an additional 500 linear feet of creek profile would be excavated to connect the new meandering Salmon Creek channel to salmonid rearing habitat (Cattail Creek) and 110 acres more are being restored to salt marsh habitat (as compared to Alternative B). The volume of excavated soil is estimated at 2,000 cubic yards, which would be used to raise the salt marsh plain. These restoration activities are expected to have generally localized effects. The effects of Alternative C on soils are expected to be localized on portions the total of 235 acres of salt marsh on the refuge. Only portions of the salt marsh restoration would be restored

Table E-3. Herbicides that May be Used to Control Invasive Plants on Humboldt Bay NWR

Herbicide	Active ingredient(s)	Target invasive plant	Ecotoxicology (*from manufacturer's MSDS**)
Rodeo, AquaMaster	glyphosate	harding grass, reed canary grass, bind weed, poison oak**	practically non-toxic to aquatic organisms on an acute basis
Roundup pro	glyphosate	fennel	moderately toxic to fish, slightly toxic to aquatic invertebrates, slightly toxic to green algae, practically non-toxic to: birds, arthropods, earthworms
Roundup pro concentrate	glyphosate	fennel	same as for Roundup pro
Milestone	aminopyralid	Canada thistle	not toxic to bees and non-toxic to aquatic organisms on an acute basis, practically non-toxic to birds on an acute or dietary basis
Garlon 3A	triclopyr TEA salt, triethylamine, ethanol	Himalayan blackberry	slightly toxic to aquatic organisms on an acute basis

**MSDS - A Material Safety Data Sheet (MSDS) is required under the US Dept. of Labor's Occupational Safety and Health Administration (OSHA) Hazard Communication Standard. The MSDS is a detailed informational document prepared by the manufacturer or importer of a hazardous chemical. It describes the physical and chemical properties of the product. MSDSs contain useful information such as flash point, toxicity, procedures for spills and leaks, and storage guidelines. Information included in a Material Safety Data Sheet aids in the selection of safe products*
***Poison oak is a target invasive plant where its occurrence prevents safe treatment of English ivy.*

at any one time; not all 235 acres would be restored at once. Excavation of the additional 500 linear feet and restoration of an additional 110 acres of salt marsh for Alternative C may take an additional construction season (a total of 2 calendar years, but construction activities would not be done in wet weather in the winter); 2 years of construction activities within the 15-year period of analysis or relatively short-term. As with Alternative B, conservation measures would be required and employed throughout restoration and construction activities. The Service has concluded that although more acreage is being restored in Alternative C, because conservation measures would be employed to mitigate soil erosion and compaction, any adverse effects to soils are expected to be temporary and localized. Based on the climatic conditions at the refuge and use of conservation measures to mitigate any potential adverse effects to soils, the Service has concluded that adverse effects to soils are anticipated to be to be minimal under Alternative C but greater than Alternative A (the no action alternative) or Alternative B.

Cumulative Effects

Refuge management activities including mowing, disking, tilling, prescribed fire, grazing, herbicide/pesticide treatments, and irrigation are done when necessary on applicable units as stated in the descriptions of alternatives. Restoration activities and the potential for associated soil compaction and soil erosion would occur sporadically during the 15-year period of analysis and only on applicable units. Based on this, the Service has concluded that the incremental contribution of refuge maintenance activities and restoration activities (from any alternative) to the regional cumulative impact on soils would be less than cumulatively considerable.

Water Quality

Common to All Alternatives

Many bodies of water are located on the refuge including freshwater and brackish marshes, flooded pasturelands, sloughs, creeks, ponds (small impoundments of water), and the Humboldt Bay. All of these water bodies or drainages provide multiple benefits to fish and wildlife (see the Fish and Wildlife section below for a discussion of benefits). The quality of the refuge's and adjacent water resources is of foremost importance to the refuge to uphold the Service's conservation mission and the purposes for which the refuge was established (see Chapter 1).

Habitat Management Activities

Standard habitat management activities; including mowing, disking, tilling, prescribed fire, grazing, and irrigation; are not expected to adversely affect water quality. Pesticides (including herbicides) are also used for habitat management. The effects of habitat management activities and pesticide (and their surfactants) use on water quality are discussed below.

Under all alternatives, the refuge would continue to maintain and enhance 300 acres of agricultural grasslands (pasture) for Aleutian cackling goose habitat. Periodic plowing would be done infrequently (less than 20 acres per year). Pastureland soils are plowed one field at a time in late April, prior to seeding. Plowing is done in the spring when soil moisture is high and after the severe storm season, which reduces the potential for runoff and erosion of newly plowed soils. Therefore, the Service anticipates that there would be minimal soil erosion resulting from maintenance activities; and that would be temporary, and localized during periodic mowing and plowing. Cattle grazing may also be used to maintain cover of emergent vegetation in seasonal wetland impoundments (agricultural wetland). Grazing allotments would be surveyed periodically and grazing animals removed prior degradation of resources including erosion or degradation of drainages. Grazing is and will continue to be excluded from areas where grazing may adversely affect water quality. Riparian areas, ephemeral streams, and seeps, and habitat for rare and protected species would not be grazed.

Refuge staff removes dense-flowered cordgrass from the salt marsh as part of their invasive plant species management activities. After refuge staff removes (uproots) the dense-flowered cordgrass from the salt marsh, the uprooted or dead plant material (biomass) is raked into piles and burned. Dense-flowered cordgrass is removed from about 50 acres at a time. While biomass piles and removal is concentrated in areas away from stream channels, these management actions can cause short-term turbidity in localized areas on the salt marsh plain. Associated turbidity is expected to dissipate without adversely affecting the water quality on the refuge or adjacent lands. Effects to air quality and fish and wildlife are discussed in those sections, below.

Habitat management activities may also involve large earthmoving equipment that could result in the introduction of various contaminants, such as fuel oils, grease, and other petroleum products, either from direct contact between the equipment and the water or through surface runoff. Effects of contaminants on soils are discussed in that section above, and effects on fish or wildlife are discussed in the section on Fish and Wildlife, below. The refuge has established spill-prevention and countermeasure plans to protect water from contaminants. These plans include on-site handling criteria to avoid introducing contaminants into waterways. Staging, washing, and storage areas for equipment, construction materials, fuels, lubricants, solvents, and other possible contaminants are provided away from waterways. These criteria are a part of the conservation measures for protection of water quality. Conservation measures would be employed to avoid and minimize any potentially adverse effects to water quality on the refuge and in adjacent waters. (See Appendix 1 to the EA for a description of conservation measures.)

These conservation measures apply to pesticides (including herbicides and surfactants). Under all alternatives, for habitat maintenance in aquatic environments, the refuge would continue to use Service-approved aquatic herbicides including: Rodeo (glyphosate), AquaMaster, and Remedy periodically to control invasive plants on the Humboldt Bay NWR. In most cases, glyphosate will dissipate rapidly from natural water bodies through adsorption to the organic substances and inorganic clays, degradation and dilution (Folmar et al. 1979, Feng et al. 1990). See also the discussion of these herbicides in the Soils, Common to All Alternatives section within this chapter.

With the implementation of measures to avoid contaminating water (the conservation measures), no adverse effects to water quality from the use of aquatic herbicides, other habitat management and restoration activities, or from compatible uses are anticipated with any of the alternatives.

Alternative A: No Action

Factors that could affect water quality, such as rainfall runoff and recreational use, are not expected to change. The Service expects no adverse effects to the beneficial uses of water bodies on the refuge. The Service has concluded that no changes to water quality are anticipated and no adverse effects to water quality would result with Alternative A, the continuation of current management practices.

Alternative B

Restoration of approximately 1,500 linear feet of Salmon Creek Restoration activities could result in temporary, short-term adverse effects to water quality due to the potential for increased turbidity from erosion, sedimentation, and the potential for incidental introduction of contaminants from earth-moving or other construction equipment. These potential effects would be minimized through conservation measures (see Appendix 1 of this EA). After restoration, with a fully functioning estuarine ecosystem, the Service expects a long-term beneficial effect of improved water quality to result from the proposed habitat restoration. The Service expects improvement and no adverse effects to water quality on and off of the refuge.

Alternative B proposes the addition of a launch area at the Ma-le'l Dunes Unit for non-motorized boats and associated signage to inform the public about water quality requirements. The Service has noted that since water quality sampling was begun by the oyster growers in the mid-1970s, there has been increasing use of the Mad River Slough area (as well as the rest of the bay) by non-motorized boaters with no corresponding increase in required oyster harvest closures by CDPH; by inference, no decrease in water quality. Further, while the Ma-le'l dunes area was receiving substantially increased public use (when it was formerly open to the public during the period from 1990 to 1994) again, there was no increase in harvest closures. During that time of increased use from 1990 to 1994, there was an above-ground composting toilet in place. Adding a non-motorized boat launch may increase public use of the slough, but the amount of use a new non-motorized boat launch would receive is speculative at this time.

With implementation of the conservation measures, and compliance with the Clean Water Act, the Service has concluded that no adverse effects to water quality would result with Alternative B.

Alternative C: Preferred Alternative

Restoration of approximately 500 linear feet of Salmon Creek could result in temporary, short-term adverse effects to water quality due to the potential for increased turbidity due to erosion, sedimentation, and introduction of contaminants from equipment. As discussed in the Soils section above, these potential

effects would be minimized through using conservation measures (see Appendix 1) during construction. The Service expects that long-term beneficial effects of improved water quality would result from habitat restoration. The refuge will continue consultations with CDPH, HBHRCD, the oyster growers, and non-motorized boating groups regarding water quality.

With implementation of the conservation measures, and compliance with the Clean Water Act, the Service has concluded that no adverse effects to water quality would result with Alternative C.

Cumulative Effects

With conservation measures, no adverse effects to water quality are expected with any of the alternatives. After completion of restoration projects and several years for plant growth, restoration is expected to have a beneficial effect on water quality. Based on the above analysis, the Service has concluded that the incremental contribution from any alternative to the regional cumulative impact on water quality would be beneficial, but less than cumulatively considerable.

Air Quality

Common to All Alternatives

All alternatives include maintaining or restoring agricultural grasslands (pasture land). Maintenance or management activities include periodically disking, mowing, plowing, dike repair, related vehicular traffic, and/or cattle grazing agricultural grasslands. The North Coast Unified Air Quality Management District (NCUAQMD) does not require permits for maintenance activities such as these or new construction. Soil disturbance from maintenance activities may result in temporary, short-term increases in fugitive dust (particulate matter less than 10 microns [PM10]) and tailpipe emissions of PM10 and nitrogen oxides (NOx) from the maintenance equipment.

The amount of dust from mowing, plowing and other maintenance activities is expected to continue to be negligible because of the high soil moisture levels at the refuge and the Humboldt Bay vicinity, particularly in the springtime when the management activities would primarily be performed. When periodic plowing is needed, it would be done infrequently (less than 10 acres per year) and in the spring when soil moisture is high. Agricultural grassland or pastureland soils are plowed one field at a time in late April, prior to seeding. Therefore, fugitive dust from maintenance activities is expected to be low. Emissions from the maintenance equipment is expected to have a negligible effect on air quality because the equipment would be operated primarily during the spring, a time of year when the North Coast is in attainment of the EPA standards for these pollutants.

Periodic controlled burning is occasionally used by the refuge for vegetation management and/or burning of brush piles. For example, refuge staff removes dense-flowered cordgrass from the salt marsh as part of their invasive plant species management activities. After the dense-flowered cordgrass is removed (uprooted from the mud or singed in place with backpack torches), the uprooted or dead plant material (biomass) is raked into piles and burned. Dense-flowered cordgrass is removed from about 50 acres at a time. Brushpiles also result from eucalyptus control. When periodic controlled burning is needed, the refuge coordinates with NCUAQMD, which monitors PM10 and other pollutant levels, and regulates prescriptive burning. Prescriptive burning directly affects PM10 levels. The NCUAQMD allows prescriptive burns on the refuge and elsewhere on the north coast when conditions and PM10 levels permit. Any potentially adverse effects to air quality from controlled burning of vegetation are mitigated through the timing and other requirements of the approved burn plans coordinated with the NCUAQMD. The increase in emissions at the refuge associated with maintenance activities would be negligible in comparison to the emissions from the adjacent Highway 101. Based on the above analysis, the Service has concluded that no adverse effects to air quality are anticipated from maintaining or restoring agricultural grasslands in any of the alternatives.

Alternative A: No Action

Factors that could affect air quality, such as disking, mowing, dike repair, and traffic would not change. The effects of these are discussed above. Based on the above, the Service has concluded that no changes to air quality are anticipated and effects to air quality are expected to be negligible with Alternative A, the continuation of current management actions.

Alternative B

Alternative B may result in localized and temporary effects to air quality from heavy equipment operation during re-alignment of 1,500 linear feet of creek channel as part of the Salmon Creek Restoration project. Equipment could include a wheeled scraper (wheeled), a bulldozer or excavator (tracked) or other type of excavator, 1 or 2 dump trucks and workers' vehicles. As part of raising the elevation of the salt marsh plain, placing fill and replacing topsoil is expected to result in temporary and localized increase in fugitive dust. The same types of earth moving equipment could be used to place the fill soil. Fugitive dust is expected during the use of heavy equipment, but it is expected to be minimal due to the high soil moisture on the refuge. Although the work must be done when the soil is dry enough to use the equipment effectively, construction would be done in the spring when the area is still in attainment with air quality requirements. Restoration work is expected to take 1 construction season (the drier months).

Alternative B includes construction of a covered outdoor structure large enough for up to 30 people (up to 1,000 square feet in area) for environmental education or conversion of the existing barn to accommodate this use. Also, Alternative B includes modifying 0.25-mile of trails to wheelchair accessible trails. Tailpipe emissions from construction equipment and worker trips to and from the job site could be expected to increase temporarily during construction. The increase would be temporary and localized and primarily during the spring when the area is in attainment.

If a new or remodeled environmental education structure or more accessible trails result in an increase in the number of visitors, it would not necessarily result in more vehicle trips. Under Alternative B, the refuge expects to increase visitor opportunities by 10,000 opportunities per year more than Alternative A (currently). Although more visitor opportunities are provided to the public, it is difficult to estimate how many more visitor trips will result from more opportunities being available. It is reasonable to assume that an increase in visitor use at the refuge may reflect visitors' choosing the refuge as their destination rather than another location offering similar opportunities in the Humboldt Bay area. Therefore, an increase in visitor use at the refuge may not result in more vehicle trips in the area or in an increase in tailpipe emissions on and near the refuge. If there is an increase in tailpipe emissions associated with an increase in visitors, it would be negligible. Based on the above analysis, the Service has concluded that this minimal increase in emissions at the refuge associated with more vehicle trips by construction equipment or visitors is not expected to adversely affect the refuge resources or the ambient air quality.

The NCUAQMD does not require permits for maintenance activities or new construction. However, NCUAQMD does require permitting for remodeling, demolishing or renovating structures. If the Service determines that the existing barn will be renovated to accommodate the proposed environmental education facility or that other existing structures on Salmon Creek and Lanphere Dunes, a permit from the NCUAQMD and further analysis would be required to determine if contaminants are present and evaluate the environmental effects of renovating the barn.

Alternative C: Preferred Alternative

Alternative C includes restoration of approximately 10 acres of agricultural grasslands (pasturelands) to riparian swamp (3 acres) or salt marsh (7 acres of 45 acres total). Riparian swamp or salt marsh would require less (if any) maintenance activities than pastureland. A decrease in these activities is expected to result in a decrease in fugitive dust. Therefore, the Service expects that there would be a slight decrease in PM10 in the vicinity of the White Slough Unit.

Alternative C may result in localized and temporary effects to air quality from heavy equipment operation during re-alignment of 1,500 linear feet of creek channel plus excavation of an additional 500 linear feet of creek channel connecting the newly re-aligned channel to Cattail Creek as part of the Salmon Creek Restoration project. As with Alternative B, equipment could include a wheeled scraper (wheeled), a bulldozer or excavator (tracked) or other type of excavator, 1 or 2 dump trucks and workers' vehicles. As part of raising the elevation of the salt marsh plain, placing fill and replacing topsoil is expected to result in temporary and localized increase in fugitive dust. The same types of earth moving equipment could be used to place fill. Fugitive dust is expected during the use of heavy equipment, but it is expected to be minimal due to the high soil moisture on the refuge. Although the work must be done when the soil is dry enough to use the equipment effectively, construction would be done in the spring when the area is still in attainment

with air quality requirements. No more equipment would be needed, but with the additional 500 linear feet of excavation, Alternative C is expected to take a total of 2 construction seasons (work would occur during the drier months and not during the winter when soils are too wet for the equipment to work).

Alternative C includes construction of a covered outdoor structure large enough for up to 30 people (up to 1,000 square feet in area) for environmental education or conversion of the existing barn to accommodate this use. Also, Alternative C includes an increase in wheelchair accessible trails (0.50-mile more than Alternative A and 0.25-mile more than Alternative B). If more accessible trails result in an increase in the number of visitors, it would not necessarily result in more vehicle trips. Under Alternative B, the refuge expects to increase visitor opportunities by 15,000 opportunities per year more than Alternative A (currently). Although more visitor opportunities are provided to the public, it is difficult to estimate how many more visitor trips will result from more opportunities being available. It is reasonable to assume that an increase in visitor use at the refuge may reflect visitors' choosing the refuge as their destination rather than another location offering similar opportunities in the Humboldt Bay area. Therefore, an increase in visitor use at the refuge may not result in more vehicle trips in the area or in an increase in tailpipe emissions on and near the refuge. If there is an increase in tailpipe emissions associated with an increase in visitors, it would be negligible. Based on the above analysis, the Service has concluded that this minimal increase in emissions at the refuge associated with more vehicle trips by construction equipment or visitors is not expected to adversely affect the refuge resources or the ambient air quality.

The NCUAQMD does not require permits for maintenance activities or new construction. However, NCUAQMD does require permitting for remodeling, demolishing or renovating structures. If the Service determines that the existing barn will be renovated to accommodate the proposed environmental education facility or that other existing structures on Salmon Creek and Lanphere Dunes, a permit from the NCUAQMD and further analysis would be required to determine if contaminants are present and evaluate the environmental effects of renovating the barn.

Based on the above analysis, the Service has concluded that this minimal increase in emissions at the refuge associated with more vehicle trips by construction equipment or visitors is not expected to adversely affect the refuge resources or the ambient air quality.

Cumulative Effects

Based on the above analysis, the Service has concluded that the incremental contribution of habitat maintenance activities, construction of the features of the Salmon Creek Delta Restoration or the environmental education structure and any increase in visitors (from any alternative) to the regional cumulative impact on air quality would be less than cumulatively considerable.

Plant Communities

Common to All Alternatives

Disking, mowing, chemical treatments, and cattle grazing would be used periodically to maintain cover of emergent vegetation in seasonal wetland impoundments (also known as agricultural wetland). The refuge would continue to use mechanical and chemical methods to control undesirable invasive plant species such as dense-flowered cordgrass (*Spartina densiflora*). The refuge would continue to mow and graze grassland habitat to provide short-grass pasture for use by Aleutian cackling geese and other species.

Alternative A: No Action

After refuge staff removes dense-flowered cordgrass from the salt marsh through manual (digging) and mechanical (mowing, flaming) methods, the areas would then be re-vegetated with native species including salt grass (*Distichlis spicata*), pickleweed (*Salicornia virginica*), and minor jaumea (*Jaumea carnosa*). Non-native cordgrass can have many negative effects on Humboldt Bay NWR habitats and associated species including: competing with and displacing native salt marsh plant communities; converting intertidal mudflat to non-native salt marsh; decreasing shorebird foraging habitat; and filling in channels and altering marsh hydrology. Therefore, re-vegetating the salt marsh with native species is expected to allow native salt marsh plant communities to recover; decrease the loss of mudflat; increase shorebird foraging habitat; and allow channels to remain clear of vegetation and functional for longer periods of time. Although on-going invasive plant species management activities are expected to continue to improve the habitat quality

or value of the plant communities on the refuge, reducing or eliminating invasive plants would not convert the plant community to another type of community. The Service has concluded that there would be no changes to the total acreages of existing plant communities and no adverse effects would be anticipated with Alternative A, the no action alternative.

Alternative B

Salmon Creek Delta Restoration

Alternative B also includes planting riparian vegetation on the sides of the new 1,500 linear-foot channel to a minimum width of 100 feet (150,000 square feet or 3.4 acres). These plantings of riparian vegetation would convert 3.4 acres of primarily non-native short-grass pasture to riparian habitat (increasing the total acreage of riparian swamp on refuge lands by 3.4 acres and decreasing the acreage of short-grass pasture commensurately). This additional riparian habitat would offset any that might be lost due to increased tidal influence in lower Salmon Creek.

Salt Marsh Habitat

Restoration activities on Salmon Creek Unit would convert mudflat to salt marsh habitat, as it was historically. The restoration of 125 acres of mudflat to salt marsh would increase the total acreage of salt marsh on refuge lands from 313 acres to 438 acres (a 40 percent increase) Salt marsh contributes invaluable nutrients to the estuarine ecosystem; provides valuable habitat for fish and wildlife; filters out pollutants; and buffers adjacent lands from flood tides and storms. Salt marshes provide habitat for fish, invertebrates, many shorebirds, and some waterbirds. In addition, salt marshes likely provide habitat for the endangered tidewater goby; several species of threatened salmonids; and eulachon, a CDFG California Species of Special Concern. Because of extensive diking, the Humboldt Bay estuary has sustained significant losses of salt marsh, primary productivity, and natural hydrology resulting in changes to sedimentation, deposition, currents, habitat for estuarine plant and animal species, and water quality. Restoring mudflat to historic salt marsh is considered beneficial to the refuge and to the region because salt marsh is a threatened habitat type in Humboldt Bay and throughout the United States. The Service expects that by increasing and improving the salt marsh plant community on the refuge, it would result in the long-term, local and regional beneficial effects described above.

Freshwater and Brackish Marsh (FBM)

Alternative B includes restoring 130 acres of FBM to short-grass pasture to improve Aleutian cackling goose habitat (increasing the total acreage of short-grass pasture on refuge lands by 130 acres and decreasing the acreage of FBM commensurately). Allowing cattle grazing on the central portion of the Hookton Slough Unit will promote the growth of short-grass pasture. Providing more short-grass pasture on the refuge is expected to increase the intensity of Aleutian cackling goose use on the refuge and reduce the intensity of goose use on the adjacent private pasturelands. Units managed by the refuge as short-grass pasture are still considered and managed as seasonal freshwater marsh, supporting other species in addition to Aleutian cackling goose. Therefore, although the species composition of the pastureland or marsh may change slightly to favor short-grass species, the freshwater marsh plant community or any other plant community would not change. The Service expects that by increasing and improving short-grass species in the FBM plant communities on the refuge, it would result in the long-term, local and regional beneficial effects described above.

Riparian Swamp Habitat

Alternative B includes replacing 20 acres of non-native trees with riparian swamp species over the course of 5 years. The restoration of 20 acres of non-native trees to riparian swamp would increase the total acreage of riparian swamp habitat on refuge lands from 105 acres to 125 acres.

Riparian habitat is very rare now compared to what existed historically in the Humboldt Bay area. This diverse vegetative community provides valuable travel corridors for wildlife and habitat supporting biological integrity and environmental health on the refuge. Riparian forests provide rich habitat for a wide variety of plant species, mammals, reptiles, amphibians, and especially migrating and nesting songbirds, and improve conditions for fish by contributing nutrients, shade, and cover to streams. Therefore, the Service expects that by increasing and improving the riparian swamp plant community on the refuge, it would result in long-term, local and regional beneficial effects described above.

Dune Habitats (including dune mat/foredune grassland, dune swale, dune riparian/swamp, and coniferous dune forest)
Alternative B includes various restoration and enhancement activities on the dune habitats at Humboldt Bay NWR. The refuge includes over 400 acres of dune habitats.

The dune mat habitat on the Humboldt Bay NWR is some of the most pristine habitat of its type on the west coast of the United States, containing native plant communities that are globally declining. Foredune plant communities are globally rare and the Lanphere Dunes represent some of the most pristine dunes left in the United States. As with other rare dune habitats, pristine dune swales are rare on the west coast of the United States, occurring only north of the central coast in California (Pickart and Barbour 2007). Given the rarity of dune swale habitat and its value to wildlife, restoration of native plant species is necessary for the maintenance of the biological integrity, diversity, and environmental health of the dune ecosystem as well as to protect many California Species of Special Concern.

Coniferous dune forest is also a globally declining habitat type. It supports many of Humboldt Bay NWR's mammal species, including the rare white-footed vole, a CDFG California Species of Special Concern (CDFG 2007). Several CDFG California Bird Species of Special Concern also use coniferous dune forest habitat including Cooper's hawk, yellow warbler, osprey, and black-capped chickadee. Coniferous dune forest provides habitat for several species of amphibians and reptiles. Many plant species such as sugar stick (*Allotropa virgata*), spotted coral-root (*Corallorhiza maculata*), calypso orchid (*Calypso bulbosa*), and twayblade (*Listera cordata*), are uncommon close to the coast, and have been found only in a few locations in the coniferous dune forest habitat. Maintaining and restoring healthy native plant communities in the coniferous dune forest contributes greatly to the overall biological integrity, diversity, and environmental health of the refuge and surrounding area.

Based on the uniqueness and rarity of dune habitats, the Service expects that restoration of dune habitats would result in long-term, local, regional, and globally beneficial effects. There would be no change in acreage of dune plant communities as a result of Alternative B.

Based on the above analysis, the Service has concluded that there would be beneficial changes to the plant communities at the Humboldt Bay NWR and no adverse effects would be anticipated with Alternative B.

Alternative C: Preferred Alternative

Salmon Creek Delta Restoration
Alternative C includes the same Salmon Creek Restoration activities as Alternative B. The effects to plant communities from the Salmon Creek Delta Restoration are the same as described in Alternative B; planting riparian vegetation on the sides of the new 1,500 linear-foot channel to a minimum width of 100 feet (150,000 square feet or 3.4 acres). These plantings of riparian vegetation would convert 3.4 acres of primarily non-native short-grass pasture to riparian habitat (increasing the total acreage of riparian swamp on refuge lands by 3.4 acres and decreasing the acreage of short-grass pasture commensurately).

Alternative C also includes an additional 500 linear feet of creek profile would be excavated to connect the new meandering Salmon Creek channel to salmonid rearing habitat (Cattail Creek).
Alternative C does not include plantings of riparian vegetation along the 500 linear feet; however, the Service expects that recruitment of riparian species would occur along the new creek profile. The Service expects that this would result in the conversion of some non-native short-grass pasture to riparian habitat; slightly increasing the total acreage of riparian swamp on refuge lands by a negligible acreage and decreasing the acreage of short-grass pasture commensurately. Although the actual surface area of such recruitment may be small in acreage, the Service expects that the increase in riparian habitat would be beneficial to the species dependent on riparian habitat (see Appendix K).

Salt Marsh Habitat
Alternative C includes restoring an additional 38 acres of salt marsh on Hookton Slough Unit, 60 acres on Table Bluff Unit, and 45 acres on White Slough Unit. Increasing salt marsh habitat would be expected to further increase invaluable nutrients to the estuarine ecosystem; provide valuable habitat for fish and wildlife; filter out pollutants; and buffer adjacent lands from flood tides and storms. Alternative B provides 143 acres more of salt marsh restoration than Alternative B. The additional acres of salt marsh restoration

with Alternative C would increase salt marsh habitat for fish, invertebrates, many shorebirds, and some waterbirds. In addition, it may provide habitat for the endangered tidewater goby; several species of threatened salmonids; and eulachon, a CDFG California Species of Special Concern. Because of extensive diking, the Humboldt Bay estuary has sustained significant losses of salt marsh, primary productivity, and natural hydrology resulting in changes to sedimentation, deposition, currents, habitat for estuarine plant and animal species, and water quality. Restoring mudflat to historic salt marsh is considered beneficial to the refuge and to the region because salt marsh is a threatened habitat type in Humboldt Bay and throughout the United States. Therefore, the Service expects that by increasing and improving the salt marsh plant community on the refuge, it would result in the long-term, local and regional beneficial effects.

Additional restoration activities on White Slough, Hookton Slough, and Table Bluff Unit overflow would convert an additional 110 acres of mudflat to salt marsh habitat (a total of 235 acres). The restoration of 235 acres of mudflat to salt marsh would increase the total acreage of salt marsh on refuge lands from 313 acres to 548 acres (75 percent more salt marsh). With Alternative C, more than 60 acres of mudflat on Salmon Creek Overflow would be raised to restore the tidal prism and create additional salt marsh. This is expected to provide additional beneficial effects (relative to Alternative B) by improving water quality and increasing salt marsh habitat.

Based on the analysis presented under Alternative B and above, the Service has concluded that there would be beneficial changes to the plant communities at the Humboldt Bay NWR and no adverse effects would be anticipated with Alternative C.

Freshwater and Brackish Marsh
Alternative C includes construction of a low contour dike that allows muted tidal exchange north of the dike (see Figure E-3).

Riparian Swamp Habitat
The effects of Alternative C on riparian swamp habitat would be the same as under Alternative B, except 3 acres of short-grass pasture habitat would be restored to riparian swamp habitat. As in Alternative B, Alternative C includes replacing 20 acres of non-native trees with riparian swamp species over the course of 5 years.

Riparian habitat is very rare now compared to what existed historically in the Humboldt Bay area. This diverse vegetative community provides valuable travel corridors for wildlife and habitat supporting biological integrity and environmental health on the refuge. Riparian forests provide rich habitat for a wide variety of plant species, mammals, reptiles, amphibians, and especially migrating and nesting songbirds, and improve conditions for fish by contributing nutrients, shade, and cover to streams. Therefore, the Service expects that by increasing and improving the riparian swamp plant community on the refuge, it would result in long-term, local and regional beneficial effects described above.

Dune Habitats (including dune mat/foredune grassland, dune swale, dune riparian/swamp, and coniferous dune forest)
The effects of Alternative C on dune habitats would be the same as under Alternative B except for: dune swale, dune riparian/swamp, and coniferous dune forest, the restoration the effects would be expected to occur 5 years earlier because the actions would be implemented 5 years earlier.

Based on the above analysis, the Service has concluded that there would be beneficial changes to the plant communities at the Humboldt Bay NWR and no adverse effects would be anticipated with Alternative C.

Cumulative Effects
The Service has concluded that incremental contribution of Alternative C to the regional cumulative impact on plant communities would be less than cumulatively considerable except for the dune mat/foredune grasslands and dune riparian swamp habitat. Pristine examples of the dune plant communities are rare on the west coast of North America. Therefore, the cumulative impacts of proposed restoration and enhancement actions on dune mat/foredune grassland and dune riparian swamp plant communities are expected to be cumulatively beneficial to plant communities.

Fish and Wildlife

Common to All Alternatives

Existing habitats will be either maintained or restored. Some management activities will lead to a habitat changing from one type to another, which in general will result in gains to some habitats and species and losses for others. Any disturbance to wildlife species due to restoration is likely to be temporary while these activities occur. Motile species are expected to move away from areas being disturbed, and they or their progeny are likely to return to the site when restoration activity ceases. While a small number of individual animals may be harmed through refuge operations such as restoration activities, in general, fish and wildlife populations are expected to benefit from actions taken by refuge staff because that is the purpose and goal of these activities. The effects of hunting on wildlife are also discussed within this section, below.

The invasive non-native dense-flowered cordgrass can have many adverse effects on Humboldt Bay NWR habitats and their associated wildlife species including decreasing shorebird foraging habitat. Strategies for managing and reducing invasive species are analyzed in more detail above in the Plant Communities section. Removal of invasive species and re-vegetating salt marsh with native species is expected to allow native salt marsh plant communities to recover, increase shorebird foraging habitat and decrease the need for clearing vegetation from the channels. After refuge staff removes (uproots) the dense-flowered cordgrass from the salt marsh, the uprooted or dead plant material (biomass) is raked into piles and burned. Dense-flowered cordgrass is removed from about 50 acres at a time. These management actions can cause short-term turbidity in localized areas. These actions and any associated turbidity would not occur in fish spawning areas. Effects to water and air quality are discussed in those sections, above. Because invasive species management activities are done to improve habitat values on the refuge, the Service has concluded that invasive species management would have beneficial effects on fish and wildlife.

Guided by this goal and the expertise of the refuge staff, and the technical expertise of the Service's Arcata Fish and Wildlife Office and the National Marine Fisheries Service, the Service has concluded that the long-term effects of any of the management alternative on fish and wildlife are expected to be generally beneficial for native species using the refuge. Effects on species protected by the Federal and State Endangered Species Acts are discussed in the Special Status Species section, below.

Salmon Creek Delta Restoration

This restoration project would fulfill goals set forth in the 1989 Humboldt Bay National Wildlife Refuge Management Plan. The Salmon Creek Unit consists of about 1,350 acres and the proposed restoration area encompasses approximately 197 acres of diked freshwater and muted tidal wetland habitats. The refuge will continue to adaptively manage the implementation of Phase I of the Salmon Creek Restoration project. NEPA compliance was completed for Phase I of the Salmon Creek Restoration project in a separate NEPA document (USFWS 1992). Phase I is expected to benefit fish and other estuarine dependent species, some passerine birds, and some species of other wildlife and plants. A riparian component is included in the restoration plan.

Adaptive management of this restoration project is coordinated with the Arcata Fish and Wildlife office's Ecological Services program and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries Service). Adaptive management may include augmentation of tide gate function to maximize anadromous fish passage and placement of large woody debris in channels. Adaptive management would be informed by monitoring species' use of habitats, any changes in channel cross-sections, changes in sediment transport, and changes in water quality.

Salmon Creek historically had large runs of Coho salmon (*Oncorhynchus kisutch*) and anadromous steelhead (*O. mykiss*). In addition, Chinook salmon (*O. tshawytscha*) and coastal cutthroat (*O. clarki clarki*) trout were historically found throughout the watershed. Although the stream continues to support populations of all four native anadromous salmonid species, their populations are believed to have dramatically declined over the past 150 years due to human-caused changes throughout the watershed. Coastal populations of Chinook, Coho, and steelhead are Federally listed as threatened species. In addition, the Hookton Slough area is habitat for the Federally threatened tidewater goby (*Eucyclogobius newberryi*). Mammals associated with the area include river otter, black-tailed deer, grey fox, striped skunk, and raccoon. Other small rodents and mammals are associated with this area of the refuge as well. The marsh

habitats of the refuge are used by geese, ducks, other waterbirds such as herons and egrets, and shorebirds, such as marbled godwits and willets. Amphibians that occur in the local area include the rough-skinned newt (*Taricha granulose*), pacific tree frog (*Hyla regilla*), and northern red-legged frog (*Rana aurora aurora*). These amphibians are associated with the various freshwater wetland habitats on the Humboldt Bay NWR and breed in freshwater ponds near Salmon Creek (see Appendix K of the CCP for species list).

Monitoring
The refuge will continue with partners to monitor the use of Salmon Creek and Hookton Slough habitats by salmonids, tidewater gobies, amphibians, and passerine birds. The refuge will establish a permanent tidal elevation station on Hookton Slough to quantify tidal change over time and tide gate function. The refuge will coordinate with partners to monitor for any potential effects from the Salmon Creek restoration activities on eelgrass beds. See also the discussion of monitoring during hunting, below.

Hunting
Monitoring is expanded upon during hunting season when the refuge staff conducts hunters' bag checks. The refuge staff conducts daily bag checks to verify the number and species of waterfowl harvested to promote compliance with regulations and allow the refuge to keep biological data on species harvest to further assessment of cumulative impacts. The effects of hunting are discussed below.

This section includes the anticipated direct and indirect effects of hunting on wildlife species. Hunting would be allowed in each of the proposed alternatives. Hunting is a compatible public use and a wildlife management tool that can be used to help manage wildlife populations. Some wildlife disturbance will occur during the hunting seasons. Proper zoning and regulations will be designated to minimize any negative impacts to wildlife populations and other public visitors using the refuge.

Direct effects of hunting include mortality, wounding, and disturbance (DeLong 2002). Hunting can alter behavior (i.e., foraging time), population structure, and distribution patterns of wildlife (Owens 1977, Raveling 1979, White-Robinson 1982, Thomas 1983, Madsen 1985, Bartelt 1987, Cole and Knight 1990). There also appears to be an inverse relationship between the numbers of birds using an area and hunting intensity (DeLong 2002). In Connecticut, lesser scaup were observed to forage less in areas that were heavily hunted (Cronan 1957). In California, the numbers of northern pintails on Sacramento NWR Refuge non-hunt areas increased after the first week of hunting and remained high until the season was over in early January (Heitmeyer and Raveling 1988). Following the close of hunting season, ducks generally increased their use of the hunt area; however, use was lower than before the hunting season began. Human-caused disturbances to wildlife that are associated with hunting includes loud noises and rapid movements, such as those produced by shotguns and boats powered by outboard motors. This disturbance, especially when repeated over a period of time, can cause waterfowl to change food habits, feed only at night, lose weight, or desert feeding areas (Madsen 1995, Wolder 1993).

These impacts can be reduced by the presence of adjacent sanctuary areas where hunting does not occur and birds can feed and rest relatively undisturbed. Sanctuaries, or non-hunt areas, have been identified as the most common solution to disturbance problems caused from hunting (Havera et al. 1992). Prolonged and extensive disturbances may cause large numbers of waterfowl to leave disturbed areas and migrate elsewhere (Madsen 1995, Paulus 1984). In Denmark, hunting disturbance effects were experimentally tested by establishing two sanctuaries (Madsen 1995). Over a 5-year period, these sanctuaries became two of the most important staging areas for coastal waterfowl. Numbers of dabbling ducks and geese increased 4 to 20 fold within the sanctuary (Madsen 1995). Thus, sanctuary and non-hunt areas are very important to minimize disturbance to waterfowl populations to ensure their continued use of the refuges.

Intermittent hunting can be a means of minimizing disturbance, especially if rest periods in between hunting events are weeks rather than days (Fox and Madsen 1997). It is common for refuges to manage hunt programs with non-hunt days. At Sacramento Refuge, 3 to 16 percent of pintails were located on hunted units during non-hunt days, but were almost entirely absent in those same units on hunt days (Wolder 1993). In addition, northern pintails, American wigeon, and northern shovelers decreased time spent feeding on days when hunting occurred on public shooting areas, as compared to non-hunt days (Heitmeyer and Raveling 1988). However, intermittent hunting may not always greatly reduce hunting impacts.

The California Department of Fish and Game (CDFG) is California's lead agency for management of

fish, wildlife, and native plants - collectively called "wildlife." CDFG has trustee responsibility for the conservation and management of wildlife for the benefit and enjoyment of the public.

Resident game species are protected on refuges by both Federal and State laws and regulations to ensure that harvest rates do not negatively impact populations. The following table contains a summary of hunting seasons and bag limits for 2002-2007 for the game species on Humboldt Bay NWR.

Table E-4. 5-Year Hunt Program Summary, Humboldt Bay NWR

Hunt Season	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Permits Issued	481	843	1074	1255	1187
Fees Collected	1,972.50	3,533.50	4,715.00	5,651.50	4,815.00
Adult Hunters	380	669	900	1120	1037
Junior Hunters	78	140	124	98	118
Disabled Hunters	23	34	50	37	32
Refilled	N/A	N/A	246	163	247
Hunters Turned Away	485	762	777	933	842
Hunters	481	843	1057	1255	1187
Harvested Birds	901	1641	1829	2481	2218
Bird Average	1.9	1.9	1.7	1.8	1.9
Green-winged Teal	311	654	625	845	974
Wigeon	270	460	650	553	746
Shoveler	212	332	393	332	380
Pintail	75	131	139	245	298
Mallard	33	64	57	105	84
Goose (Aleutian)	N/A	N/A	65	274	240
Goose (Western)	N/A	N/A	230	127	166

Wildlife populations on the refuge are able to sustain hunting and also support other wildlife-dependent priority uses. To manage the populations to support hunting, the refuges adopt harvest regulations set by the State within Federal framework guidelines. The regulatory procedures that govern harvest are described in the section below.

By its very nature, hunting has very few positive effects on the target species while the activity is occurring. However, the Service has concluded that hunting has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving wildlife habitat, which has ultimately contributed to the Refuge System mission. In addition, hunters have contributed tens of millions of dollars towards the purchase and conservation of hundreds of thousands of acres of habitat. Furthermore, a goal of Humboldt Bay NWR is to provide visitors of all ages an opportunity to enjoy wildlife-dependent recreation. Of key concern to the refuge is to offer a safe and quality program and ensure adverse effects are minimal.

Recreational hunting will remove individual animals, but does not negatively affect wildlife populations. To assure that populations are sustainable, the California Fish and Game Commission, in consultation with the CDFG, annually review the population censuses to establish season lengths and harvest levels. Each year the refuge staff conducts habitat management reviews of each unit on the refuge to evaluate habitat conditions and visitor service activities. The Service has concluded that, to date, wildlife population levels are sustainable and that the areas on the refuge that are closed to hunting activities provide adequate sanctuaries for wildlife.

Harvest Management - Regulatory Procedures
Waterfowl populations throughout the United States are managed through an administrative process known as flyways, of which there are four (Pacific, Central, Mississippi and Atlantic) in the U.S. Humboldt Bay is within the Pacific Flyway (see Figure 1, in the CCP). The review of the policies, processes and procedures for waterfowl hunting are covered in the following documents.

NEPA considerations by the Service for hunted migratory game bird species are addressed by the programmatic document, "Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88–14)," filed with the Environmental Protection Agency on June 9, 1988. The Service published a Notice of Availability in the Federal Register on June 16, 1988 (53 FR 22582) and the Record of Decision on August 18, 1988 (53 FR 31341). Annual NEPA considerations for waterfowl hunting frameworks are covered under a separate NEPA documentation. Further, in a notice published in the September 8, 2005, Federal Register (70 FR 53776); the Service announced its intent to develop a new Supplemental EIS for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006, as announced in a March 9, 2006, Federal Register notice (71 FR 12216).

Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations (50 CFR Part 20) establishing the Migratory Bird Hunting Frameworks. The frameworks are essentially permissive in that hunting of migratory birds would not be permitted without them. Thus, in effect, Federal annual regulations both allow and limit the hunting of migratory birds.

The Migratory Bird Hunting Frameworks provide season dates, bag limits, and other options for the States to select that should result in the level of harvest determined to be appropriate based upon Service-prepared annual biological assessments detailing the status of migratory game bird populations. In North America, the process for establishing waterfowl hunting regulations is conducted annually. In the United States, the process involves a number of scheduled meetings (Flyway Study Committees, Flyway Councils, Service Regulations Committee, etc,) in which information regarding the status of waterfowl populations and their habitats is presented to individuals within the agencies responsible for setting hunting regulations. In addition, public hearings are held and the proposed regulations are published in the Federal Register to allow public comment.

For waterfowl, these annual assessments include the Breeding Population and Habitat Survey, which is conducted throughout portions of the United States and Canada, and is used to establish a Waterfowl Population Status Report annually. In addition, the number of waterfowl hunters and resulting harvest are closely monitored through both the Harvest Information Program (HIP) and Parts Survey (Wing Bee). Since 1995, such information has been used to support the adaptive harvest management (AHM) process for setting duck-hunting regulations. Under AHM, a number of decision-making protocols render the choice (package) of pre-determined regulations (appropriate levels of harvest), which comprise the framework offered to the States that year. California's Fish and Game Commission then selects season dates, bag limits, shooting hours and other options from the Pacific Flyway package. Their selections can be more restrictive, but can not be more liberal than AHM allows. Thus, the level of hunting opportunity afforded each State increases or decreases each year in accordance with the annual status of waterfowl populations.

Waterfowl - Flyway Analysis
As a result of the recent regulations, the estimated average annual duck harvest for the Pacific Flyway is 2.5 million birds, which represents approximately 18 percent of the estimated average annual U.S. harvest of 14 million ducks (USFWS 2005). The estimated average annual goose harvest for the Pacific Flyway is 383,091, which represents 10.8 percent of the estimated annual U.S. harvest of over 3.5 million geese.

For comparison, in 2005, the breeding duck population estimate for those areas surveyed (California, Oregon, Nevada, Utah and Washington) in the Pacific Flyway was 1,097,276 birds, which was a 22.7 percent increase from the 2004 average (USFWS 2005). The estimated average duck breeding population for these areas from 1994 to 2005 was approximately 1.10 million birds. Furthermore, by itself the 2007 Midwinter Waterfowl Survey Index for ducks wintering in California was approximately 4,000,000. These numbers serve to demonstrate the relative importance of these areas (especially California) in the Pacific Flyway for

wintering waterfowl, rather than for waterfowl production. In fact, the vast majority of waterfowl wintering and subsequently harvested in California and throughout the Pacific Flyway come from breeding grounds to the north.

Waterfowl - Regional Analysis
The estimated breeding duck population in California in 2005 was 618,241 birds, which was a 49 percent increase from the 2004 estimate (USFWS 2005). The average estimated breeding duck population for California from 1990 to 2005 was 605,263 birds. Mallards generally comprise more than half of each year's breeding population estimate. In addition to mallards, an estimated few thousand breeding Western Canada Geese can be added to comprise a general picture of the magnitude of California's waterfowl reproduction on an annual basis. In contrast, the Mid-winter Waterfowl Survey index for California totals 4 million ducks and 1 million geese in recent years, further illustrating the relative importance of California's overall wintering waterfowl capacity within the Pacific Flyway.

Annual harvest estimates for California indicate that approximately 1.5 million ducks and 130,000 geese have been harvested in recent years by some 65,000 waterfowl hunters (based on Federal Duck Stamp sales) (USFWS 2005).

For Humboldt County, where the refuge is located, the estimated duck harvest was 15,713. The goose harvest for Humboldt County was 5,750. The estimated number of duck and goose hunters for Humboldt County in 2004 was 917 and 1,066 respectively. The harvest of common snipe (*Gallinago delicate*) in the county was 124, and there are no estimates for American coots (*Fulica americana*) (coots) and common moorhens (*Gallinula chloropus*) (moorhen) (CDFG 2006).

Waterfowl - Local Analysis
Waterfowl harvest is tracked at the refuge by collecting information at the refuge hunting check station. In 2005 to 2006, 1,255 hunters at the refuge harvested 2,481 birds (2,080 ducks, 401 geese), with an average of 1.8 birds/hunter. Under Alternative A, effects of waterfowl harvest are expected to be similar to previous years. Harvest would be less under Alternative B, and slightly more under Alternative C.

Waterfowl - Conclusion
The hunting of waterfowl in the United States is based upon a thorough regulatory setting process that involves numerous sources of waterfowl population and harvest monitoring data. As a result of the regulatory options produced (AHM) in recent years, California hunter's estimated harvest of nearly 1.5 million ducks is approximately 12 percent of the total U.S. harvest of 12.3 million and 55 percent of the Pacific Flyway's 2.65 million harvest estimates (USFWS 2005). The comparative numbers for the estimated goose harvest yield percentages of 4.1 percent and 33 percent of the U.S. and Pacific Flyway totals, respectively. Furthermore, some forty CDFG administered public hunt areas allow take of approximately 12 to 15 percent and 7 percent of California's estimated duck and goose harvest, respectively. In California, the refuge represents nearly 0.14 and 0.27 percent of all ducks and geese harvested, respectively (PFDB 2007). Because the percentage of all ducks and geese harvested on the refuge is a fraction of the CDFG allowable percentages, the Service has concluded that the effects of hunting on the refuge on these populations to be negligible. Although the percentage of waterfowl harvested at the refuge is low, the refuge takes additional steps to protect waterfowl populations by providing sanctuary areas and maintaining a program of intermittent hunt days. Maintaining these restrictions means that opening limited areas of the Ma-le'l Dunes Unit and providing two additional youth only hunt days at the Salmon Creek Unit as proposed under the preferred alternative would have only a negligible effect on waterfowl populations.

Based on this analysis, the Service has concluded that hunting associated with each of the alternatives would not have an adverse effect on local, regional, or Pacific Flyway waterfowl populations.

Wilson's snipe - Regional Analysis
Wilson's snipe, formally called common snipe (*Gallinago delicate*), is particularly well camouflaged with a striped head and back, white belly, and rusty tail. They are usually only seen when flushed from the edge of a marsh or pond. In flight they are fast and erratic.

Wilson's snipe is found throughout the United States. The U.S. Shorebird Conservation Plan (Brown et al. 2001) population estimates for snipe are two million. They breed from northern Alaska and Canada south

to the southwestern and northeastern United States and winter throughout much of the United States, all of Central America, the Caribbean, and northern South America. Snipe are fairly common from October to April on wet meadow and short, emergent wetland habitats throughout much of California. They are a year-round resident in parts of northeastern California (Airola 1980).

The 2006 Hunter Survey (CDFG 2006) reported a statewide harvest of 13,260 snipe with 124 birds harvested in Humboldt County. During 2005, the number of snipe hunters statewide was 1,512 with 74 hunters reported for Humboldt County (CDFG 2006).

Wilson's Snipe - Local Analysis
The refuge has no information on the numbers of snipe taken on the refuge. California State game regulations allow snipe hunting to occur the third Saturday in October extending for 107 days. Bag limits for snipe are eight birds per day. Snipe harvest rates are not expected to change significantly over time under any of the alternatives, because the hunting program will not change much over any of the alternatives – under the preferred alternative the refuge will open Ma-le'l Dunes Unit to snipe hunting, but the refuge staff does not anticipate a high demand for snipe hunting on the newly opened unit, due to their presence on small islands that are accessible by boat only, and through discussions with hunters.

Wilson's snipe - Conclusion
The Service has concluded that hunting associated with each of the alternatives will not have an adverse effect on local populations or statewide populations of Wilson's snipe.

Coot and Common Moorhen - Regional and Local Analysis
No regional or local data is available from the State Department of Fish and Game for either the coot or the common moorhen. California State game regulations allow a daily bag limit of 25 birds of either species (mixed or separate) per day.

Coot - Conclusion
The refuge has no information on the numbers of coot taken on the refuge. The Service does not expect coot harvest rates to change significantly over the life of the CCP (15 years) under any of the alternatives.

Common Moorhen - Conclusion
The refuge has no information on the numbers of common moorhen taken on the refuge. The Service does not expect common moorhen harvest rates to change significantly over the life of the CCP (15 years) under any of the alternatives. Common moorhens are not that common to the refuge, as they are listed in local field guides as "accidental occurrences".

Effects of Hunting on Other Non-hunted Wildlife Species
Hunted species and other wildlife will possibly compete for habitat. While each species occupies a unique niche, there is only a finite amount of space available to satisfy various habitat requirements of water, food, cover, breeding, roosting, and fawning areas. So, while individuals of a species compete for habitat within the species niche, most species occupy space to the exclusion of many other species. Hunted species (waterfowl, coot, common moorhen, pheasant, and snipe) generally do not prey on other species at unacceptable levels. Harvesting these species would not result in a substantial decrease in biological diversity on the refuges.

Hunting is a highly regulated activity and generally takes place at specific times and seasons (dawn, fall and winter) when the game animal is less vulnerable. Hunting is an appropriate wildlife management tool that can be used to manage game populations. Although, some wildlife disturbance to non-hunted wildlife will occur during the hunting seasons, proper zoning, regulations, and refuge seasons will be designated to minimize any adverse effects to wildlife populations using the refuges.

Human disturbance associated with hunting includes loud noises and rapid movements, such as those produced by shotguns. This disturbance, especially when repeated over a period of time, may compel waterfowl to change food habits, feed only at night, lose weight, or desert feeding areas (Wolder 1993, Madsen 1995). Presumably these same behavioral changes may occur by non-hunted wildlife species as a result of hunting-related noises and movements.

These indirect impacts are not significant on the refuges since they can be reduced by the availability of adjacent sanctuary areas where hunting does not occur, and both hunted and non-hunted wildlife can feed and rest relatively undisturbed. Sanctuaries or non-hunt areas have been identified as the most common solution to disturbance problems caused from hunting (Havera et al. 1992).

Biological conflicts (all alternatives) would be minimized by applying the following management practices:
- Proper hunting zoning and regulations will be designated to minimize adverse effects to wildlife.
- The check station will process the hunters entry to and exit from the Salmon Creek Unit hunting area
- Federally approved non-toxic shot will be used for all hunting to help minimize the possibility of lead poisoning.
- No hunting will be allowed during the breeding season. Hunting will be allowed only during designated seasons for waterfowl and upland game birds.
- The areas closed to hunting activities will provide adequate sanctuaries for wildlife.
- Law enforcement presence will help minimize excessive harvest and other infractions (illegal use of lead shot, take of non-game species, littering, etc.).
- Firearms are permitted on the refuge for public hunting under the provisions of 50 CFR part 32. Persons may carry unloaded firearms on the refuges that are dismantled or cased in vehicles (50 CFR 27.42).
- ESA, section 7 consultations with USFWS and NOAA Fisheries Service will be completed to determine effects of the CCP on special status species/designated critical habitat on the refuges. The refuge will implement the conservation measures identified during section 7 consultation.
- The refuge will provide information in refuge kiosks about preventing the spread of invasive terrestrial and aquatic plant species.

Based on the above analysis, the Service has concluded that harvesting of hunted species (waterfowl, coot, common moorhen, and snipe) would not result in a substantial decrease in biodiversity or adversely affect populations of hunted or non-hunted species.

Fishing
Because the demand for fishing is expected to remain light, fishing areas are limited on the refuge, and multiple other fishing opportunities are available within 15 minutes from the refuge and throughout the Humboldt Bay area, the Service has concluded that fishing on the refuge would have no adverse effects on fish or wildlife populations.

Alternative A: No Action

Under Alternative A, current management of the refuge would continue unchanged. The refuge would continue to provide high quality habitat for migratory waterfowl, shorebirds, and other waterbirds through intensive habitat management activities. Other wildlife species would also benefit from the current management plan. These species include raptors, songbirds, and other migratory and resident fish and wildlife. The refuge's visitor services program, including the hunting program, would also continue unchanged. Overall there will be a positive effect on wildlife from the current habitat management plan.

Hunting
Alternative A would continue the existing hunt program; therefore, harvest levels are expected to remain similar to previous years. The effects of hunting with Alternative A would be as described under the Common to All Alternatives section, above. As stated above, the Service does not anticipate adverse impacts to non target wildlife populations due to hunting.

Fishing
Alternative A has no changes proposed to the existing fishing plan and fishing would continue to be managed by the State of California. Alternative A would allow public sport fishing to continue as it does now within the refuge boundary. Because the demand for fishing is expected to remain light fishing areas are limited on the refuge, and multiple other fishing opportunities are available within minutes from the refuge and throughout the Humboldt Bay area, the Service has concluded that fishing on the refuge under Alternative A would have no adverse effects on fish or wildlife populations.

Salmon Creek Delta Restoration
Under Alternative A, Phase II of the Salmon Creek Restoration Plan will not be occurring.

Salt Marsh Habitat
Alternative A states that the refuge will maintain 313 acres of existing coastal salt marsh habitat. The salt marsh provides habitat for fish, invertebrates, many shorebirds, and some waterbirds. The salt marsh provides habitat for the endangered tidewater goby; several species of threatened salmonids; and eulachon, a California Species of Special Concern currently under the Endangered Species Act (ESA). Without improved habitat, salmonid use of the project area would not increase and may continue to decline. This action would also provide additional benefits to other wildlife species that use salt marsh and brackish marsh habitat. A complete list of species that use this habitat is included in Appendix K.

Freshwater and Brackish Marsh
Maintenance of existing freshwater and brackish marsh is outlined in Alternative A. Short-grass pasture will be enhanced for use by Aleutian cackling goose population. Soil testing and pH maintenance will be ongoing. These two habitat types help sustain a variety of waterfowl, shorebirds, passerines, and wading birds, as well as the raptors that prey upon them and other animals. In addition, otters, weasels, frogs, salamanders, and invertebrates use freshwater marsh habitat. Sloughs lined by brackish marsh are used by threatened salmonids and endangered tidewater gobies. Without improved habitat, salmonid use of the project area would not increase and may continue to decline. This action will not provide additional benefits to other wildlife species that use salt marsh and brackish marsh habitat.

Riparian Swamp Habitat
With Alternative A, within the life of the CCP, refuge staff would continue to maintain 35 acres of existing riparian swamp habitat and continue to plant native riparian swamp vegetation in portions of agricultural wetlands. Over a 5-year period, the refuge would also selectively remove 20 acres of non-native eucalyptus trees. The riparian swamp is a diverse vegetative community that provides valuable travel corridors for wildlife and habitat supporting biological integrity and environmental health on the refuge. Riparian forests provide rich habitat for a wide variety of plant species, mammals, reptiles, amphibians, and especially migrating and nesting songbirds, and improve conditions for fish by contributing nutrients, shade, and cover to streams. These actions would benefit all wildlife that use these habitats. For a list of species and their primary habitat types, please see Appendix K.

Dune Habitats (including dune mat/foredune grassland, dune swale, dune riparian/swamp, and coniferous dune forest)
Under Alternative A, the refuge would maintain 125 acres of dune mat/foredune grassland, maintain 67 acres of dune swale, maintain 33 acres of dune riparian/swamp habitat, and maintain and restore 180 acres of coniferous dune forest plant communities. While dune mat/foredune grasslands are known to be rich habitats wildlife, the lack of adequate information on wildlife use of this habitat makes it difficult to prioritize management of this habitat when compared with other management needs of the refuge.

Dune swales provide valuable habitat for several species of reptiles and amphibians including the northern red-legged frog, a California Species of Special Concern (SSC). Several bird SSC also use dune swale habitat including black-capped chickadee, yellow warbler, and Cooper's hawk. Many mammal species also use this habitat for foraging and cover, as well as for breeding by small mammals. Given the rarity of dune swale habitat and its value to wildlife, removal of invasive plant species and restoration of native plant species is necessary for the maintenance of the biological integrity, diversity, and environmental health of the dune ecosystem as well as to protect many California Species of Special Concern. A list of species that would benefit from increasing this habitat type is included in Appendix K.

Dune riparian/swamp habitat provides valuable habitat for several species of reptiles and amphibians. Many species of migratory birds use dune riparian/swamp habitat; as well as several SSC bird species including: Vaux's swift, willow flycatcher, yellow-breasted chat, and a CESA-listed threatened bird, the bank swallow. The SSC yellow warbler is a bird that nests in this habitat type. Many mammals also make use of dune riparian/swamp habitat for foraging, cover, and breeding. Maintaining and restoring this habitat will contribute to the biological integrity, diversity, and environmental health of these rare dune habitat types. Currently there are no adequate surveys of plants and wildlife species, including invertebrates, that are resident or migratory inhabitants of riparian/swamp habitats on the dune units. While riparian swamps are known to be rich habitats for wildlife, the lack of adequate information on wildlife use of dune riparian/swamp habitat makes it difficult to estimate impacts from refuge management activities. Some wildlife

will be temporarily displaced while restoration work is being done, but return after work is complete and humans leave the area. However, some individuals, particularly plants and invertebrates may be harmed during restoration activities. With the use of conservation measures, (Appendix 1) overall, populations of species that use dune habitats (listed in Appendix K) would benefit from the restoration portion of Alternative A.

Based on the above analysis, the Service has concluded that overall, because of proposed restoration activities, beneficial effects to fish and wildlife are anticipated with Alternative A, which continues the current habitat management, hunting, and fishing programs.

Alternative B

Under Alternative B, habitat management and restoration will be increased over alternative A to provide a greater level of benefit to waterfowl, other wetland-dependent birds, other migratory birds, and resident fish and wildlife. Food and cover production, water quality, and overall habitat availability based on annual abundance and migratory patterns will be optimized. Relative to Alternative A, the number and frequency of surveys would be increased to monitor a more comprehensive list of fish and wildlife species and the habitat upon which they depend. Examples would include a greater level of monitoring for the abundance/distribution of waterfowl, shorebirds, raptors, neo-tropical migrants, fish and water quality, vegetation in all habitat types, aquatic and terrestrial insects, and other species or habitat communities. This will allow for more detailed information to further refine and improve management of the refuge.

Overall, this alternative will have additional positive impacts on wildlife compared to Alternative A, as there are additional restoration and improvement goals. As described in the section in Plant Communities, Alternative B would allow mowing and/or cattle grazing on the central portion of the Hookton Slough Unit, which should promote short-grass pasture favored by Aleutian cackling geese and associated species. In conjunction with the existing hazing program, providing more short-grass pasture on the refuge is expected to increase the presence of Aleutian cackling goose use on the refuge and reduce the intensity of goose use on adjacent private pastureland.

Hunting

Alternative B provides additional undisturbed area for wildlife and reduces potential for hunter/nonhunter conflicts by closing Teal Island and Hookton Slough areas to overwater hunting. As stated under the Common to All Alternatives section on hunting, the Service does not anticipate adverse impacts to non target wildlife populations due to hunting.

Fishing

Alternative B is similar to Alternative A, but includes increased signage and outreach. Placing additional signage at the refuge would include digging post holes and associated minor construction involved with installing signs. No additional impacts to fish would occur because all work would be done on existing trails or developed facilities. There would be no work in the water. Because of the relatively limited opportunity for fishing, there will be no facilities developed or managed specifically for the use of anglers. Fishing is not expected to increase significantly with increased signage and outreach, Because the demand for fishing is expected to remain light, fishing areas are limited on the refuge, and multiple other fishing opportunities are available within minutes from the refuge and throughout the Humboldt Bay area, the Service has concluded that fishing on the refuge under Alternative B would have no adverse effects on fish or wildlife populations.

Salmon Creek Delta Restoration

Alternative B includes Phase II of the Salmon Creek Restoration, which includes:

- Relocation of the reach of Salmon Creek channel within the refuge that currently flows through a linear ditch. A new channel will be constructed in the upper reach of tidal influence, and include a stable channel form, historic habitat complexity and sinuosity, and improved routing of sediment and flood waters.
- Construct off-channel estuarine wetlands and side-channels in upper reach for salmonid rearing habitat and channel maintenance.
- Screen existing high-flow water diversion to eliminate stranding.

Relocation of Salmon Creek to restore the sinuosity involves replacing a straightened channel section and creating one that is more sinuous. The excavation of the 1,500 linear foot channel would be done "in the dry"; the only work in the water involves removing the plugs to connect the new channel section to the existing creek, thus replacing the straightened channel with one that is meandering and "natural" in function and appearance.

The off-channel estuarine wetlands and side-channels would also be constructed in the dry, until opening them up to Salmon Creek.

Earth removed from these excavations will be used to raise the Salmon Creek overflow marsh, and some areas of the White Slough Unit. Prior to raising the elevation of the marsh, plants and topsoil will be salvaged (removed and stored in a manner to ensure viability for transplanting). After the existing salt marsh vegetation is salvaged from the restoration site, approximately 12 inches of topsoil would be removed from the site. The native topsoil is saved to retain the native soil micronutrients and soil organisms. The stockpiled topsoil and salvaged plants would be stored as near as possible to the salt marsh restoration area on Humboldt Bay NWR lands. Topsoil stockpile locations would be placed at least 100 feet away from a body of water and protected from erosion to avoid loss of soil and runoff. Conservation measures would be required as part of the restoration activities to protect water quality and avoid soil compaction in areas outside of the restoration area. Once topsoil had been removed, clean, appropriate fill material would be spread on the marsh plain to raise the elevation of the plain. The Service expects that the estimated 10,000 to 12,000 cubic yards of soil excavated to create the meandering creek channel for the proposed Phase II of Salmon Creek Restoration project on the refuge would be the source of the fill soil. After the fill material is placed to raise the marsh plain, the stockpiled topsoil would be spread on top of the fill material. Finally, the salvaged native salt marsh plants and additional native plants would be used to revegetate the raised marsh plain.

Phase II of the Salmon Creek Restoration project will result in the direct adverse impact to amphibians, insect, and other small instream and riparian fauna in the immediate project area. Small mammals and other less mobile life forms, which use the area, may suffer direct mortality. Indirect adverse impacts will include a reduction of insect, amphibian, and other aquatic flora and fauna in the immediate vicinity, and downstream of, the project reach resulting from increased sediment loads caused by restoration activity. Conservation measures will be used to minimize sediment loads and other impacts.

The Salmon Creek restoration activities involve earthmoving equipment that could introduce various contaminants, such as fuel oils, grease, and other petroleum products, either directly from equipment or indirectly through surface runoff. Contaminants could temporarily adversely affect fish and wildlife if the following conditions occur: accidental spill of construction-related or hazardous materials, increased sedimentation or erosion, Effects to water quality from an accidental spill of construction-related or hazardous materials, and increased sedimentation or erosion, are included in the Water Quality section. The conservation measures to avoid or minimize adverse affects to water quality will also avoid or minimize adverse affects to fish and wildlife (see Appendix 1).

Direct benefits of the Salmon Creek Restoration include restoring habitat for salmonids and other fish species to habitat which had become less diverse, with higher velocity due to unnatural causes, and is expected to reduce fish strandings during high water events. Indirect benefits include: 1) creating instream and side channel habitat complexity to provide escape cover for juvenile salmonids and other aquatic species; 2) increasing stream bank stability, leading to decreased sedimentation to the stream and lower levels of turbidity and aggradation – increasing the extent of suitable salmonid spawning areas and survival of fry and smolts, 3) enhanced survival of riparian vegetative cover, which promotes cleaner, colder water; increasing survival of young salmonids; 4) creation of pools, backwater areas, and side channels – which provide habitat as refugia from current velocity and temperature extremes. For a discussion of effects on salmonids and the tidewater goby, please see the section on Special Status Species, below.

Salt Marsh Habitat

In addition to what is detailed in Alternative A, Alternative B proposes to restore of 90 acres of salt marsh habitat on the Hookton Slough Unit, and 35 acres on the White Slough Unit. Restoration of this habitat may harm some species during the restoration phase, but will be a long-term benefit overall. Efforts to

minimize fish and wildlife disturbance will be employed, such as using the conservation measures found in Appendix 1, timing to avoid nesting birds, and surveys before any activities that have the potential to disturb fish and wildlife. The salt marsh provides habitat for fish, invertebrates, many shorebirds, and some waterbirds. The salt marsh provides habitat for the endangered tidewater goby; several species of threatened salmonids; and eulachon, a California Species of Special Concern currently under the Federal ESA.

Some wildlife will be temporarily displaced while restoration work is being done, but return after work is complete and humans leave the area. However, some individuals, particularly plants and invertebrates may be harmed during restoration activities. With the use of conservation measures (Appendix 1), overall, populations of species that use salt marsh would benefit from the restoration of salt marsh habitat included in Alternative B is included in Appendix K.

Freshwater and Brackish Marsh

In addition to what is detailed in Alternative A, Alternative B proposes to improve 100 acres of freshwater brackish marsh on the SCU and HSU. On the TBU, 13 acres of pasture vegetation will be restored to brackish marsh within 7 years. Maintenance of freshwater brackish marsh on the WSU would be reduced from Alternative A's 50 acres to 23 acres under Alternative B. Water management would be improved through the construction of interior levees on the SCU. All proposed work is designed for and is expected to benefit wildlife species in the long-term. These two habitat types help sustain a variety of waterfowl, shorebirds, passerines, and wading birds, as well as the raptors that prey upon them and other animals. In addition, otters, weasels, frogs, salamanders, and invertebrates use freshwater marsh habitat. Sloughs lined by brackish marsh are used by threatened salmonids and endangered tidewater gobies. A complete list of species that use these habitats is included in Appendix K.

As described above in the Plant Communities section (under Alternative B), allowing cattle grazing on the central portion of the Hookton Slough Unit is expected to promote short grass pasture favored by Aleutian cackling geese and associated species. In conjunction with the existing hazing program, providing more short grass pasture on the refuge is expected to increase the intensity of Aleutian cackling goose use on the refuge and reduce the intensity of goose use on adjacent private pastureland. The expected increase of goose use on the refuge is anticipated to be a beneficial effect for the geese and the region, with no anticipated adverse effects to fish and other species of wildlife on the refuge.

Riparian Swamp Habitat

Under Alternative B, the refuge staff would manage 35 acres of existing riparian swamp habitat and continue to plant native riparian/swamp vegetation in portions of agricultural wetlands. The refuge would also remove 20 acres of non-native tree within 5 years instead of 15 years. This diverse vegetative community provides valuable travel corridors for wildlife and habitat supporting biological integrity and environmental health on the refuge. Riparian forests provide rich habitat for a wide variety of plant species, mammals, reptiles, amphibians, and particularly migrating and nesting songbirds; and improve conditions for fish by contributing nutrients, shade, and cover to streams. By eliminating non-native trees and planting native vegetation, native species would have more available food and cover, which would result in a beneficial effect to native species. See Appendix K for a list of these species.

Dune Habitats (including dune mat/foredune grassland, dune swale, dune riparian/swamp, and coniferous dune forest)

Under Alternative B, the refuge would conduct the same management actions for dunemat/foredune grassland habitat as that described under Alternative A, except the actions would involve restoration in addition to maintenance. For dune swale habitat, over a 15 year period, the refuge would not only maintain, but also restore 67 acres of dune swale. For dune riparian/swamp habitat, within 10 years, the refuge would restore 33 total acres of dune riparian/swamp. The refuge would conduct the same management actions for coniferous dune forest habitat as that described under Alternative A. In addition, within 10 years the refuge would restore Ma-le'l Dunes Unit forest margins dominated by European beach grass to native coniferous forest communities.

As explained in more detail in the section describing the alternatives, Alternative B includes various research on the dune mat; an inventory of wildlife in the dune mat/foredune grassland and dune riparian/swamp; and research by partners on neo-tropical birds and coniferous dune forest ecology. Wildlife

inventories and research data would allow the refuge to gain a more comprehensive understanding of animal species that utilize riparian swamp, dune mat/foredune grassland, and dune swale habitats on the Ma-le'l and Lanphere Dunes Units. Currently there are no adequate surveys of wildlife species (besides birds) that are resident or migratory inhabitants of dune riparian/swamp habitats on the dune units. While riparian swamps are known to be rich habitats for wildlife, the lack of adequate information on wildlife use of dune riparian/swamp habitat makes it more challenging for the refuge staff to determine the effects of restoration. With the data and information from the aforementioned research and inventories, the Service expects that it would better inform decision-making for all habitat management activities; improving all aspects of habitat management. Increased research is expected to benefit all native species that use the refuge.

Dune swales provide valuable habitat for several species of reptiles and amphibians including the northern red-legged frog, a SSC. Several bird SSC also use dune swale habitat including black-capped chickadee, yellow warbler, and Cooper's hawk. Many mammal species also use this habitat for foraging and cover, as well as for breeding by small mammals. Dune riparian forest/swamp habitat provides valuable habitat for several species of reptiles and amphibians. Many species of migratory birds use dune riparian/swamp habitat; as well as several SSC bird species including: Vaux's swift, willow flycatcher, yellow-breasted chat, and a CESA listed threatened bird, the bank swallow. The SSC yellow warbler is a bird that nests in this habitat type. Many mammals also make use of dune riparian/swamp habitat for foraging, cover, and breeding. Maintaining and restoring this habitat will contribute to the biological integrity, diversity, and environmental health of these rare dune habitat types. Given the rarity of dune swale habitat and its value to wildlife, removal of invasive plant species and restoration of native plant species is necessary for the maintenance of the biological integrity, diversity, and environmental health of the dune ecosystem as well as to protect many California Species of Special Concern. Species that would benefit from increasing the dune habitats are listed in Appendices J and K.

Some wildlife will be temporarily displaced while restoration work is being done, but return after work is complete and humans leave the area. However, some individuals, particularly plants and invertebrates may be harmed during restoration activities. With the use of conservation measures (Appendix 1), overall, populations of species that use dune habitats would benefit from the restoration included in Alternative B. The Service anticipates that the eliminating the European beach grass will benefit native species that use these habitats. Based on the above analysis, the Service has concluded that although there will be some short term displacement and harm to fish and wildlife individuals, long term beneficial effects to fish and wildlife populations are anticipated with Alternative B.

Alternative C: Preferred Alternative

Alternative C would provide the greatest benefit to fish and wildlife due to the increased restoration and improvement goals over Alternative B. Alternative C would provide the greatest benefit especially to listed fish and wildlife species (as discussed in the Special Status Species section, below). An active pasture management program on this refuge focuses on providing short-grass habitat preferred by Aleutian cackling geese during their wintering period from fall through early spring. Refuge grasslands are grazed and mowed during the goose "off-season" (May-October) in order to maintain the grass species composition and vegetation in the condition that the geese respond to during their use period (November-April).

Hunting

Alternative C is similar to Alternative A and opens limited areas of the Ma-le'l Dunes Unit to waterfowl, coot, and snipe hunting and retrieval and provides 2 additional youth only hunting days on the Salmon Creek Unit. For a further discussion of the effects of hunting, please see the section on Hunting, under Common to All Alternatives, above..

Fishing

Alternative C includes adoption of the Draft Sport Fishing Plan, Humboldt Bay NWR (USFWS, 2008) (Appendix D). Fishing is not expected to change substantially or increase with the 2008 Sport Fishing Plan, Because the demand for fishing is expected to remain light, fishing areas are limited on the refuge, and multiple other fishing opportunities are available within minutes from the refuge and throughout the Humboldt Bay area, the Service has concluded that fishing on the refuge under Alternative C would have no adverse effects on fish or wildlife populations.

Salmon Creek Delta Restoration

Alternative C (as with Alternative B), includes Phase II of the Salmon Creek Restoration, which includes:

- Relocation of the reach of Salmon Creek channel within the refuge that currently flows through a linear ditch. A new channel will be constructed in the upper reach of tidal influence, and include a stable channel form, historic habitat complexity and sinuosity, and improved routing of sediment and flood waters.
- Construct off-channel estuarine wetlands and side-channels in upper reach for salmonid rearing habitat and channel maintenance.
- Screen existing high-flow water diversion to eliminate stranding.

Relocation of Salmon Creek to restore the sinuosity involves replacing a straightened channel section and creating one that is more sinuous. The excavation of the 1,500 linear foot channel would be done "in the dry"; the only work in the water involves removing the plugs to connect the new channel section to the existing creek, thus replacing the straightened channel with one that is meandering and "natural" in function and appearance.

The off-channel estuarine wetlands and side-channels would also be constructed in the dry, until connecting them up to Salmon Creek.

Earth removed from these excavations will be used to raise the Salmon Creek overflow marsh, and some areas of the White Slough Unit. Prior to raising the elevation of the marsh, plants and topsoil will be salvaged (removed and stored in a manner to ensure viability for transplanting). After the existing salt marsh vegetation is salvaged from the restoration site, approximately 12 inches of topsoil would be removed from the site. The native topsoil is saved to retain the native soil micronutrients and soil organisms. The stockpiled topsoil and salvaged plants would be stored as near as possible to the salt marsh restoration area on Humboldt Bay NWR lands. Topsoil stockpile locations would be placed at least 100 feet away from a body of water and protected from erosion to avoid loss of soil and runoff. Conservation measures would be required as part of the restoration activities to protect water quality and avoid soil compaction in areas outside of the restoration area. Once topsoil had been removed, clean, appropriate fill material would be spread on the marsh plain to raise the elevation of the plain. The Service expects that the estimated 10,000 to 12,000 cubic yards of soil excavated to create the meandering creek channel for the proposed Phase II of Salmon Creek Restoration project on the refuge would be the source of the fill soil. After the fill material is placed to raise the marsh plain, the stockpiled topsoil would be spread on top of the fill material. Finally, the salvaged native salt marsh plants and additional native plants would be used to revegetate the raised marsh plain.

Phase II of the Salmon Creek Restoration project will result in the direct adverse impact to amphibians, insect, and other small instream and riparian fauna in the immediate project area. Small mammals and other less mobile life forms, which use the area, may suffer direct mortality. Indirect adverse impacts will include a reduction of insect, amphibian, and other aquatic flora and fauna in the immediate vicinity, and downstream of, the project reach resulting from increased sediment loads caused by restoration activity. Conservation measures will be used to minimize sediment loads and other impacts.

The Salmon Creek restoration activities involve earthmoving equipment that could introduce various contaminants, such as fuel oils, grease, and other petroleum products, either directly from equipment or indirectly through surface runoff. Contaminants could temporarily adversely affect fish and wildlife if the following conditions occur: accidental spill of construction-related or hazardous materials, increased sedimentation or erosion, effects to water quality from an accidental spill of construction-related or hazardous materials, and increased sedimentation or erosion, are included in the Water Quality section. The conservation measures to avoid or minimize adverse affects to water quality will also avoid or minimize adverse affects to fish and wildlife (see Appendix 1).

Direct benefits of the Salmon Creek Restoration include restoring habitat for salmonids and other fish species to habitat which had become less diverse, with higher velocity due to unnatural causes, and is expected to reduce fish strandings during high water events. Indirect benefits include: 1) creating instream and side channel habitat complexity to provide escape cover for juvenile salmonids and other aquatic species; 2) increasing stream bank stability, leading to decreased sedimentation to the stream and lower levels of turbidity and aggradation – increasing the extent of suitable salmonid spawning areas and survival

of fry and smolts, 3) enhanced survival of riparian vegetative cover, which promotes cleaner, colder water; increasing survival of young salmonids; 4) creation of pools, backwater areas, and side channels – which provide habitat as refugia from current velocity and temperature extremes. For a discussion of effects on salmonids and the tidewater goby, please see the section on Special Status Species, below.

In addition to the effects described above, Alternative C includes excavation of approximately 500 feet of channel to connect the new channel to off-channel salmonid rearing habitat (in Cattail Creek) and securing large woody debris within Hookton Slough would increase available salmonid rearing and shaded riverine aquatic habitat, which is expected to provide beneficial effects to salmonid and tidewater goby habitat. The placement of the large woody debris will be from the bank/dike, and will not involve machinery driving in the water. These proposed actions will further improve salmonid and other fisheries habitat, as well as improve riparian and instream habitat for other species.

Salt Marsh Habitat
Under Alternative C, the salt marsh habitat would increase by 10 acres on the White Slough Unit over Alternative B due to restoration. A 37-acre increase of restored salt marsh (relative to Alternative B) would occur on the Hookton Slough Unit. One hundred acres of salt marsh habitat would be restored on the Table Bluff Unit. Though there will be minimal short term impacts to species using the salt marsh, all proposed work is designed for and is expected to benefit wildlife species in the long-term. The salt marsh provides habitat for fish, invertebrates, many shorebirds, and some waterbirds. The salt marsh provides habitat for the endangered tidewater goby; several species of threatened salmonids; and eulachon, a California SSC on the watch list because of reduced distribution. A complete list of species that use this habitat type and are expected to benefit from the restoration of salt marsh habitat is included in Appendix K.

Freshwater and Brackish Marsh
Under Alternative C, the refuge will implement a restoration plan that allows for partial tidal restoration in central area, with muted tidal influence to east and west areas, while allowing for fish passage, salmonid rearing and tidewater goby habitat on the Hookton Slough Unit. On Salmon Creek Unit, enhanced drainage in short-grass areas would create more favorable conditions for grass and Aleutian cackling geese. Interior dike removal around Headquarters unit and adjacent to Long Pond on SCU will enhance wetland values. A low contour levee near duck ponds on SCU will be created to impound water. All proposed work is designed for and is expected to benefit wildlife species in the long-term, but there will be minor short term impacts to less motile species, primarily small mammals, amphibians, and invertebrates. These two habitat types help sustain a variety of waterfowl, shorebirds, passerines, and wading birds, as well as the raptors that prey upon them and other animals. In addition, shorebirds, waterfowl, otters, weasels, frogs, salamanders, and invertebrates use freshwater marsh habitat. Sloughs lined by brackish marsh are used by threatened salmonids and endangered tidewater gobies. All species that use these habitats are expected to benefit from restoration activities in the long term. A complete list of species that use this habitat type and are expected to benefit from the restoration of freshwater and brackish marsh is included in Appendix K.

Riparian Swamp Habitat
The refuge would implement the same management actions for riparian/swamp habitat as those described under Alternative B. In addition, the refuge would revegetate an additional 14 acres of the eastern portion of the White Slough Unit with native riparian/swamp vegetation. If the railroad authority declines to open their tidegates, refuge staff would implement restoration of riparian/swamp habitat on the northern 16 acres of the White Slough Unit. This diverse vegetative community provides valuable travel corridors for wildlife and habitat supporting biological integrity and environmental health on the refuge. Riparian forests provide rich habitat for a wide variety of plant species, mammals, reptiles, amphibians, and especially migrating and nesting songbirds, and improve conditions for fish by contributing nutrients, shade, and cover to streams. See Appendix K for a complete list of species that will benefit.

Dune Habitats (including dune mat/foredune grassland, dune swale, dune riparian/swamp, and coniferous dune forest)
Dunemat/foredune grassland management actions would include all of those actions described under Alternative B. The refuge would restore and maintain dune swale plant communities, as described under Alternative B, however all restoration work would be completed within 10 years. The refuge would restore dune riparian/swamp habitat as described under Alternative B, and restoration work would be completed

over a ten year period also. The refuge would conduct the same restoration and maintenance actions for coniferous dune forest habitat as those described under Alternative B. In addition, within 5 years, the refuge would restore European beach grass-dominated dunes on Ma-le'l Dunes Unit forest margins to coniferous forest. Dune swales provide valuable habitat for several species of reptiles and amphibians including the northern red-legged frog, a California Species of Special Concern (SSC). Several bird SSC also use dune swale habitat including black-capped chickadee, yellow warbler, and Cooper's hawk. Many mammal species also use this habitat for foraging and cover, as well as for breeding by small mammals.

Dune riparian forest/swamp habitat provides valuable habitat for several species of reptiles and amphibians including the northern red-legged frog, a California SSC. Many species of migratory birds use dune riparian/swamp habitat; as well as several SSC bird species including: Vaux's swift, willow flycatcher, yellow-breasted chat, and a CESA listed threatened bird, the bank swallow. The SSC yellow warbler is a bird that nests in this habitat type. Many mammals also make use of dune riparian/swamp habitat for foraging, cover, and breeding. Maintaining and restoring this habitat will contribute to the biological integrity, diversity, and environmental health of these rare dune habitat types.

Currently there are no adequate surveys of plants and wildlife species, including invertebrates, that are resident or migratory inhabitants of riparian/swamp habitats on the dune units. While riparian swamps are known to be rich habitats for wildlife, the lack of adequate information on wildlife use of dune riparian and swamp habitat makes it difficult to assess the impacts of restoration on wildlife in the area. See Appendix K for a list of species that will benefit.

Some wildlife will be temporarily displaced while restoration work is being done, but return after work is complete and humans leave the area. However, some individuals, particularly plants and invertebrates may be harmed during restoration activities. With the use of conservation measures (Appendix 1), overall, populations of species that use salt marsh would benefit from the restoration of salt marsh habitat included in Alternative B is included in Appendix K. Based on the above analysis, the Service has concluded that although there will be some short term displacement and harm to fish and wildlife individuals, long term beneficial effects to fish and wildlife populations are anticipated with Alternative C.

Cumulative Effects

The Service has concluded that the effects of any of the alternatives on the regional cumulative impact on fish and wildlife in general would be cumulatively positive, but less than cumulatively considerable.

Special Status Species

The northern California Evolutionarily Significant Unit (ESU) of the Coho salmon (*Oncorhynchus kisutch*), the California coastal ESU of the Chinook salmon (*O. tshawytscha*), the northern California ESU of the steelhead (*O. mykiss*), and the Southern Distinct Population Segment (DPS) of the North American green sturgeon (*Acipenser medirostris*) are listed as threatened under the Federal Endangered Species Act, as amended. The refuge's Salmon Creek is considered habitat for and is used by the migratory salmon and steelhead. The green sturgeon is present in Humboldt Bay. The Hookton Slough area is habitat for the Federally listed as endangered tidewater goby (*Eucyclogobius newberryi*). And, the tidewater goby uses areas of Salmon Creek on the refuge. The Federally listed as endangered Humboldt Bay wallflower (*Erysimum menziesii ssp. Eurekense*) and beach layia (*Layia carnosa*) grow at Lanphere Dunes and Ma-le'l Dunes Units of the refuge. Other Federally listed species that are known to use the Humboldt Bay NWR are: the Federally listed as threatened Brown Pelican (*Pelecanus occidentalis*), the coastal population of the Western Snowy Plover (Pacific Coastal Population) (*Charadrius alexandrinus nivosus*), and marbled murrelet (*Brachyramphus marmoratus*). Although the Northern Spotted Owl (*Strix occidentalis caurina*) is included in the Humboldt County list of Federally listed as threatened species, there is no habitat for this bird on the refuge and it does not occur on the refuge. Several listed arthropods appear on the Humboldt County list of Federally protected species, but they do not use the refuge.

Endangered Species Act, section 7 consultation was conducted with the Arcata Fish and Wildlife Office and NOAA Fisheries Service. The results of the consultation are included in Appendix I of the CCP/EA.

Common to All Alternatives

After refuge staff removes (uproots) the dense-flowered cordgrass from the salt marsh, the uprooted or dead plant material (biomass) is raked into piles and burned. Dense-flowered cordgrass removal is done on about 100 acres at a time. These management actions can cause short-term turbidity in localized areas. These actions and any associated turbidity would not occur near habitat for listed fish. Effects to water and air quality are discussed in those sections, above.

The refuge plans to introduce Humboldt Bay Wallflower and beach layia to 35 acres of unoccupied habitat at Lanphere Dunes Unit and to restored habitat at Ma-le'l Dunes and Table Bluff Units. The restoration work is done by hand in currently unoccupied habitat so the Service anticipates that there will be no adverse effects to either vegetation or wildlife. Dune restoration is expected to benefit the western snowy plover as well. A complete list of species, including special status species, that use the habitats listed below is included in Appendix K. A list of locally occurring special status species is provided in Appendix L.

Alternative A: No Action

Salmon Creek Delta Restoration

Increasing natural estuarine functions to the lower end of Salmon Creek should help to restore habitat important to listed (and other) fish species. Truly functional estuarine habitat around Humboldt Bay is rare. Ongoing work on Phase I of the Salmon Creek restoration project has and will continue to improve fish passage, water quality, and sediment and flood flow transport.

Salt Marsh Habitat

Chinook salmon, tidewater goby, eulachon, longfin smelt, Coho salmon, steelhead trout, and coastal cutthroat trout would all benefit from increasing salt marsh habitat. Some species use these habitats temporarily before migrating to the estuary, and all benefit from the food base the salt marsh provides. Alternative A will maintain 313 acres of salt marsh habitat, which would continue to benefit these species.

Freshwater and Brackish Marsh

Chinook salmon, tidewater goby, eulachon, longfin smelt, Coho salmon, steelhead trout, and coastal cutthroat trout would all benefit from increasing freshwater brackish marsh habitat also, as long as there is a hydrologic connection of these habitats with the estuary. Some species use these habitats temporarily before migrating to the estuary, and all benefit from the food base the marsh provides. Alternative A will maintain 630 acres of seasonal freshwater brackish marsh habitat, 50 acres at the Hookton Slough Unit, and 50 acres at the White Slough unit, which would continue to benefit these species.

Dune Habitats (including dune mat/foredune grassland, dune swale, dune riparian/swamp, and coniferous dune forest)

Alternative A includes on-going recovery, introduction, re-introduction, and assistance actions for the protection of Humboldt Bay wallflower and beach layia, which help to ensure the continued existence of these species.

Based on the above analysis, the Service has concluded that short term impact will be overshadowed by the long term beneficial effects to special status species anticipated with Alternative A.

Alternative B

Salmon Creek Delta Restoration

The Federally protected salmonids and the tidewater goby use areas of Salmon Creek. Upon completion of consultation with AFWO and NOAA Fisheries Service, all restoration activities will be in compliance with the Federal ESA (ESA). Phase II of the Salmon Creek Restoration project would restore about 1,500 linear feet of former creek channel; and increase estuarine and off-channel rearing habitat for salmonids and tidewater gobies. A fish screen or other measures may be needed to allow seasonal flooding to be directed to other refuge wetlands without impacts to anadromous or resident fish species, since Federally-protected salmonids and the tidewater goby may use Salmon Creek. In compliance with the ESA, construction activities similar to those in Alternative B have been allowable in or near habitat for ESA-listed species when the listed species are expected not to be present or present only in very low numbers. Terms and

conditions to protect listed species will be determined during ESA consultation. The refuge would use the material excavated to create the realigned Salmon Creek to raise the elevation of the Salmon Creek overflow marsh plane to create additional salt marsh and to restore the tidal prism. See the discussion under Salt Marsh Habitat, below.

Salt Marsh Habitat
As described above, the refuge would use the excavated material from the Salmon Creek Restoration project to raise the elevation of the Salmon Creek overflow marsh plane to create additional salt marsh and to restore the tidal prism. This is expected to provide beneficial effects (relative to Alternative A) by improving water quality and increasing juvenile salmonid and tidewater goby habitat. Alternative B adds the restoration of 125 acres of salt marsh habitat which would directly or indirectly benefit Chinook salmon, tidewater goby, eulachon, longfin smelt, Coho salmon, steelhead trout, and coastal cutthroat trout. Creating more marsh habitat (fresh to salt) will create more rearing area, better water quality, increased forage, and ease the transition from fresh to saltwater for the anadromous species. The refuge would also place local fill material to raise the tidal elevation of 60 acres of mudflat on Salmon Creek overflow.

Freshwater and Brackish Marsh
In addition to what is depicted in Alternative A, Alternative B states that approximately 100 acres would be improved on the Salmon Creek Unit and Hookton Slough Unit, 13 acres would be restored to brackish marsh on TBU, but maintenance of fresh water brackish marsh would be reduced on the White Slough Unit from 50 acres maintained to 23 acres maintained. For freshwater marsh, this means modifying existing ponds and providing a larger overflow drainage ditch to seasonal wetlands. For brackish marsh, this would entail excavating portions of the marsh to mimic the pre disturbance appearance of old aerial photographs of the area. As standard operating procedures, conservation measures would be employed, as would a biological survey of the area before excavation occurs.

These two habitat types help sustain a variety of waterfowl, shorebirds, passerines, and wading birds, as well as the raptors that prey upon them and other animals. In addition, otters, weasels, frogs, salamanders, and invertebrates use freshwater marsh habitat. Sloughs lined by brackish marsh are used by threatened salmonids and endangered tidewater gobies. A complete list of species, including special status species that use these habitats is included in Appendix K. This would still be beneficial in the long term for fishes that use this habitat, for reasons listed above in the salt marsh habitat section.

Dune Habitats (including dune mat/foredune grassland, dune swale, dune riparian/swamp, and coniferous dune forest)
The refuge would continue to support recovery efforts for the Humboldt Bay wallflower (wallflower) and beach layia (layia), on Humboldt Bay NWR, through restoration of 14 acres of Ma-le'l Dunes habitat and restoration of 22 acres of Table Bluff habitat. Within 5 years, the refuge would reintroduce the wallflower and the layia to 35 acres of unoccupied habitat at Lanphere Dunes and restored habitat at Ma-le'l and Lanphere dunes. The refuge staff would also work with partners to protect wallflower and layia populations on the South Spit, Elk River Spit, the airport, and the Manila Dunes. The refuge would also work with the Service's Ecological Services Program to implement the Coastal Plants Recovery Plan (USFWS 1998).

Refuge staff will maintain and restore ~180 acres of coniferous dune forest habitat on the MDU and LDU restoring coniferous dune forest margins to native coniferous forest communities which will enhance habitat for many special status species.

Dune swales provide valuable habitat for several species of reptiles and amphibians including the northern red-legged frog, a California Species of Special Concern (SSC). Several bird SSC also use dune swale habitat including black-capped chickadee, yellow warbler, and Cooper's hawk. Many mammal species also use this habitat for foraging and cover, as well as for breeding by small mammals.

Dune riparian forest/swamp habitat provides valuable habitat for several species of reptiles and amphibians including the northern red-legged frog, a California Species of Special Concern (SSC). Many species of migratory birds use dune riparian/swamp habitat; as well as several SSC bird species including: Vaux's swift, willow flycatcher, yellow-breasted chat, and a CESA listed threatened bird, the bank swallow. The SSC yellow warbler is a bird that nests in this habitat type. Maintaining and restoring this habitat will

contribute to the biological integrity, diversity, and environmental health of these rare dune habitat types. Based on the above analysis, the Service has concluded that, although there may be some short term impacts, in the long term, beneficial effects to special status species are anticipated with Alternative B.

Alternative C: Preferred Alternative

Salmon Creek Delta Restoration

Alternative C would provide the greatest benefit to fish and wildlife, especially listed species, due to the increased restoration and improvement goals over Alternative B. Listed salmonids, tidewater goby, and other estuarine dependent species would likely benefit from the modifications proposed for lower Salmon Creek and the Hookton and White Slough Units. Use of these areas by species that are freshwater marsh dependent will decline.

Under Alternative C, the refuge would implement all of the Salmon Creek and salt marsh restoration strategies described under Alternative B, and the effects previously described for Alternative B would be expected. In addition, as part of Alternative C, excavation of approximately 500 feet of channel to connect the new channel to off-channel salmonid rearing habitat (in Cattail Creek) and securing large woody debris within Hookton Slough would increase available salmonid rearing and shaded riverine aquatic habitat, which is expected to provide addition beneficial effects to salmonids. Also with Alternative C, the refuge would coordinate with the North Coast Railroad Authority to open tide gates on the north end of the White Slough Unit. As a result, the Service anticipates increased tidal flow and flushing, which is expected to provide additional beneficial effects (relative to Alternative B) to estuarine dependent species such as tidewater goby.

Salt Marsh Habitat

Within 15 years, the refuge would manage 313 acres of existing salt marsh and restore 235 acres to native salt marsh communities. Areas that would be restored to salt marsh include: 100 acres on the Table Bluff Unit, 45 acres on the White Slough Unit, and 90 acres on the Hookton Slough Unit. The refuge would implement all of the salt marsh habitat management strategies described under Alternative B. These additions will provide the greatest direct and indirect benefits to Chinook salmon, tidewater goby, eulachon, longfin smelt, Coho salmon, steelhead trout, and coastal cutthroat trout. Creating more marsh habitat (fresh to salt) will create more rearing area, better water quality, increased forage, and ease the transition from fresh to saltwater for the anadromous species. The complete list of species, including special status species, typically found in this habitat is in Appendix K.

Freshwater and Brackish Marsh

At Hookton Slough Unit, 270 acres will be enhanced and restored creating of a continuum of saltwater to freshwater habitats within 10 years. This restoration will provide the greatest direct and indirect benefits to Chinook salmon, tidewater goby, eulachon, longfin smelt, Coho salmon, steelhead trout, and coastal cutthroat trout. Benefits to other species such as shorebirds and waterfowl will also be realized. Creating more marsh habitat (fresh to salt) will create more rearing area, better water quality, increased forage, and ease the transition from fresh to saltwater for the anadromous species. The complete list of species, including special status species, typically found in this habitat is found in Appendix K.

Dune Habitats (including dune mat/foredune grassland, dune swale, dune riparian/swamp, and coniferous dune forest)

The refuge would implement the same special status species management actions as described under Alternative B, both on and off refuge lands. In addition to Alternative B actions, the Service would pursue protection of an additional 22 acres of land currently populated with Humboldt Bay wallflower (wallflower) and beach layia. The Service would also pursue protection of 30 acres, which could be restored to wallflower and layia habitat.

The coniferous dune forest habitat and dune riparian swamp habitat would have the same restoration goal as Alternative B, but the timeline would be reduced from 10 years to 5. Dune riparian forest/swamp habitat provides valuable habitat for several species of reptiles and amphibians including the northern red-legged frog, a California Species of Special Concern (SSC). Many species of migratory birds use dune riparian/swamp habitat; as well as several SSC bird species including: Vaux's swift, willow flycatcher, yellow-breasted chat, and a CESA listed threatened bird, the bank swallow. The SSC yellow warbler is a bird that nests in this habitat type.

Dune swales provide valuable habitat for several species of reptiles and amphibians including the northern red-legged frog, a SSC. Several bird SSC also use dune swale habitat including black-capped chickadee, yellow warbler, and Cooper's hawk. Many mammal species also use this habitat for foraging and cover, as well as for breeding by small mammals.

Maintaining and restoring this habitat will contribute to the biological integrity, diversity, and environmental health of these rare dune habitat types.

Based on the above analysis, the Service has concluded that short term impacts will be overshadowed by the long term beneficial effects to special status species anticipated with Alternative C.

Cumulative Effects

The incremental contribution of any of the alternatives to the regional cumulative impact on special status species would be less than cumulatively considerable except for cumulatively beneficial effects on the Coho salmon, Chinook salmon, northern California steelhead, tidewater goby, Humboldt Bay wallflower, and beach layia.

Invasive Species

Common to all Alternatives

The effects of controlling and/or reducing invasive species on soils, water quality, plant communities, fish and wildlife, and special status species resources are analyzed in those sections above.

Refuge maintenance activities to control or reduce invasive species include the use of Service-approved pesticides in all alternatives. Pesticide Use Proposals (PUPs) are required for pesticide use on lands owned or managed by the Service. Based on the information on PUPs and the analysis of effects of pesticide use discussed earlier in this chapter under the Soils and Plant Communities sections, the Service has concluded that the use of these PUP-regulated herbicides would result in decreasing the extent (vegetative cover area) of invasive species, which is expected to increase the quality of the habitat on and off the refuge and, therefore, benefit wildlife and all plant communities on and off of the refuge for each of the alternatives.

Management of invasive species is expected to improve the quality of all habitat types on and off of the refuge. Therefore, these management actions are expected to be beneficial to plant communities, fish and wildlife both locally and regionally. More detail about the benefits of improved habitat quality is provided in the sections on Plant Communities and the section on Fish and Wildlife, above.

Alternative A: No Action

Ongoing monitoring and removal of invasive plant species; large-scale eradication experiments on dune swale invasive species; finalizing the Salmon Creek Unit invasive plant management plan; and participating in the local weed management area's coordination group are expected to improve the quality of all habitat types on and off of the refuge. As a result of invasive species management actions, the Service has concluded that beneficial effects to fish, wildlife and their habitat are anticipated with Alternative A.

Alternative B

In addition to all of the activities in Alternative A, Alternative B includes expansion of the existing program to monitor and remove high priority target invasive species; controlling these high priority target invasive species to a maintenance level of control; and pursuing grant funding for partners program for invasive plant control. As compared to Alterative A, all of the aforementioned activities are expected to provide additional habitat quality improvement on and off of the refuge. As a result of these additional invasive species management actions, the Service has concluded that Alternative B would provide additional beneficial effects to fish, wildlife and their habitats (as compared to Alternative A).

Alternative C: Preferred Alternative

In addition to all of the measures in Alternatives A and B, Alternative C includes a significant focus on assisting with the eradication of *Spartina densiflora* in the greater Humboldt Bay area; development of a Hazard Analysis and Critical Control Point Plan to prevent establishment of new invasive species; an

additional contract for invasive plant control; creation and implementation of an IPM step-down plan for the refuge; and grant funding for yet another contract for invasive plant removal. As a result of these additional invasive species management actions, the Service has concluded that Alternative C would provide the greatest beneficial effects to fish, wildlife and their habitats (as compared to both Alternatives A and B).

Cumulative Effects

The incremental contribution of any of the alternatives to the regional cumulative impact of invasive species is expected to be less than cumulatively considerable due to the vast extent of invasive species on the north coast, but beneficial overall to native plant communities, fish, and wildlife locally.

Visitor Services

The refuge would be open to wildlife-dependent recreation (hunting, wildlife observation and photography, environmental education and interpretation). Areas of exclusive use for non-hunting wildlife-dependent recreation users would be provided under each alternative.

Visitor Services – Wildlife-Dependent Observation and Photography, Environmental Education and Interpretation

Alternative A: No Action

Under Alternative A, current management, the Service would maintain current refuge visitor services and facilities. Wildlife dependent recreation opportunities would continue at current levels, including hunting, wildlife observation, photography, environmental education, interpretation, and volunteer activities. Alternative A provides opportunities for up to 20,000 visits annually. While the opportunities are provided, that does not determine the number of actual visitors that would use the refuge. The Service expects that visitor use at the refuge would stay approximately the same as it is now under Alternative A, the No Action Alternative.

Alternative B

Alternative B provides opportunities for up to 30,000 visits annually (up to 10,000 more visits annually than Alternative A). Alternative B would also include construction of an environmental education building large enough for up to 30 people or conversion of the Salmon Creek Unit barn into an environmental/cultural resources education building and provide more accessible trails on the refuge. Whether the refuge chooses to construct a new facility or convert the old barn into an environmental education facility and more accessible trails, these would increase visitor *opportunities* at the refuge. Although more visitor opportunities are provided to the public, it is difficult to estimate how many more visitor trips will actually result from more opportunities being available. A new or remodeled environmental education structure and/or more accessible trails may result in an increase in the number of visitors at the refuge. These additional facilities may result in visitors choosing the refuge as their destination rather than another location offering similar opportunities in the Humboldt Bay area. The Service expects that a net increase in visitor use at the refuge may occur under Alternative B, as compared to the No Action Alternative A.

Alternative C: Preferred Alternative

Alternative C provides opportunities for up to 35,000 visits annually (up to 15,000 more visits annually than Alternative A and up to 5,000 more than Alternative B). Alternative C would also include construction of an environmental education building large enough for up to 30 people or conversion of the Salmon Creek Unit barn into an environmental/cultural resources education building and provide more accessible trails on the refuge. As described in Alternative B, above, a new or remodeled environmental education structure and/or more accessible trails may result in an increase in the number of visitors at the refuge. These additional facilities may result in visitors choosing the refuge as their destination rather than another location offering similar opportunities in the Humboldt Bay area. The Service expects an net increase in visitor use at the refuge may occur under Alternative C, as compared to the No Action Alternative A.

Visitor Services – Hunting

The refuge would be open to wildlife-dependent recreation (hunting, wildlife observation and photography, environmental education and interpretation). Areas of exclusive use for hunting and non-hunting wildlife-dependent recreation users would be provided under each alternative.

Common to All Alternatives

Although timing of wildlife observation and photography, environmental education and interpretation activities overlap with hunting activities, they occur in geographically distinct areas on the refuge. Additionally, hunting and non-hunting recreation are further separated by time of day and seasons. For example, hunting is not allowed during certain hours of the day on hunt days and some days of the week are non-hunt days. See Alternative C and the 2008 Waterfowl Hunt Plan (Appendix C to the CCP) for details about physical distance and time buffers.

Alternative A: No Action

The existing waterfowl, coot and snipe hunting program to accommodate 1,200 hunter day use opportunities per year on Salmon Creek Unit is expected to have no adverse effect on refuge resources, as discussed in the Fish and Wildlife section, above. The modification of the pit blinds to prevent stranding of wildlife is expected to be transparent to hunters and have no effect on hunters or their hunting experience. The increase in law enforcement on the Humboldt Bay NWR through contract or through support from other Service law enforcement staff is expected to improve the organization and implementation of hunt activities and reduce violations, resulting in an improved hunting experience for visitors. The posting of additional boundary signs on the Elkhorn Slough Unit, Jacoby Creek Unit, Table Bluff Unit, Egret Island, Teal Island and Hookton Slough Unit is expected to reduce confusion and access violations, improving the hunting experience for visitors.

Alternative B

Alternative B is the same as Alternative A except that it provides additional undisturbed area for wildlife and reduced potential for hunter/non-hunter conflicts by closing Teal Island and Hookton Slough areas to overwater hunting. Alternative B has a small net decrease in hunting area as compared to the No Action Alternative A.

Alternative C: Preferred Alternative

Alternative C is the same as Alternative A except that it implements the 2008 Waterfowl Hunt Plan (Appendix C to the CCP), which opens limited areas of the Ma-le'l Dunes Unit to waterfowl, coot, and snipe hunting and retrieval and increases the youth-only hunt days by 2 days per year on the Salmon Creek Unit. Alternative C has a small net increase in hunting area as compared to the No Action Alternative A.

Cultural Resources

Preserving the culture and history of the nation's past are the goals of regulations that include the National Historic Preservation Act (NHPA), Antiquities Act of 1906, Archeological Resource Protection Act of 1979, and Historic Sites Act of 1935. The NHPA regulations (Title 36 Code of Federal Regulations Section 800 [36 CFR 800]) require that Federal agencies seek information, as appropriate, from the State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation (ACHP), Indian tribes, and other individuals and organizations likely to have knowledge of, or concerns with, historic properties in the potentially affected area. These organizations and individuals are integral in identifying issues related to the proposed project's potential effects on historic properties. Similar State regulations protect archeological, paleontological, and historical sites and specifically provide for identification. Cultural resources defined within the framework of these regulations include archeological sites, historic sites, and traditional cultural properties associated with the values of Native Americans and other cultural groups.

Actions that physically disturb a site, alter its setting, or introduce elements out of character with the site may constitute an adverse affect. If a site is eligible for inclusion in the National Register of Historic Places (National Register), any type of physical damage results in a permanent loss of information that reduces the understanding of the site's contribution to the past.

Current records identify 44 cultural resource sites on and immediately adjacent to Humboldt Bay NWR. The sites have been documented at various levels of detail by a number of archaeologists and historians over the decades. None of the sites have been specifically relocated or inventoried for the CCP. Site boundaries and land status haven not been confirmed. Nevertheless the existing records indicate that cultural resources occur on the uplands and at high tide shoreline locations on the refuge. The sites include prehistoric and historic Native American villages, fishing sites, and other resource collection and processing locations. The recorded sites also include historic American logging, ranching, fishing, and related industrial residential and recreational locations.

Only 10 percent of the Humboldt Bay NWR has been systematically surveyed for the presence of cultural resources. Most of the known and recorded cultural resource sites owe their documentation to a specific field investigation designed to find cultural resources. It is reasonable to assume that future surveys for cultural resources will locate and document previously undocumented prehistoric and historic cultural sites.

Common to all Alternatives

The refuge will comply with all applicable regulations and statutes regarding cultural resources. In consultation with the SHPO and the Tribal Historic Preservation Officer (if applicable), the Service will evaluate the eligibility of cultural resources, traditional cultural properties and unique archeological resources on the refuge.

The process of identifying and mitigating potential adverse effects to cultural resources listed or eligible to be listed on the National Register of Historic Places is found in 36CFR800. As individual projects generated by the CCP come forward, the Service will exercise Section 106 of the National Historic Preservation Act (NHPA) including consultation with the State Historic Preservation Office (SHPO) and the pertinent Tribes, in accordance with the programmatic agreement with the SHPO and the Service.

Alternative A: No Action

Alternative A includes continuing to manage and conserve Humboldt Bay NWR cultural resources on a project-by-project basis in coordination with the Service's Regional 1 Archaeologist. There would be no change in effects on cultural resources. Under the No Action alternative, the Service would continue to exercise Section 106 of the NHPA to eliminate or minimize adverse effects to cultural resources as it presently does.

Alternative B

Alternative B includes implementing a cultural resources management capability at Humboldt Bay NWR to respond to basic compliance requirements by greater use of contractors or an increase in refuge staff capability. Alternative B proposed the construction of a covered outdoor structure large enough for up to 30 people (up to 1,000 square feet in area) for environmental and cultural resources education or conversion of the existing Salmon Creek Unit barn to accommodate this use. Construction of a new building or modification or demolition of existing old structures on the Salmon Creek and Lanphere Dunes Unit would be a Federal undertaking that requires compliance with Section 106 of the NHPA. Potential adverse effects to cultural resources will be fully determined when specific and detailed project construction plans are available. The Service will exercise Section 106 of the National Historic Preservation Act including consultation with the State Historic Preservation Office and the pertinent Tribes to determine if the undertaking will have an affect on historic properties eligible for inclusion in the National Register of Historic Places. If so, the Service will take measures to avoid, eliminate, or minimize adverse effects.

Alternative C: Preferred Alternative

The effects of Alternative C on cultural resources are the same as those described for Alternative B.

Cumulative Effects

The overall cumulative effect of Alternative B or Alternative C is to increase protection, enhancement, and interpretation of cultural resources on the Humboldt Bay NWR.

Effects on the Social and Economic Environment

This section discusses the direct and indirect economic effects on the regional economy of implementing the various alternatives presented for the Humboldt Bay NWR. Economic or social changes resulting from an action are considered to produce significant effects if the changes result in a substantial adverse physical change in the environment.

Common to All Alternatives

Aleutian cackling goose (ACG) use in Humboldt County has increased to the point where local ranchers are suffering losses of forage consumed by geese and therefore unavailable to livestock (Nelson pers. comm.) (Mini, 2005). The exact amount of financial loss by local ranchers has not been well quantified, but a current (2008) study is seeking to do so (Nelson pers. comm.).

The action Alternatives B and C both provide increased opportunities for visits to the refuge annually and may increase visits to the refuge. If an increase in visits to the refuge occurs or if there is a net increase in visitors to the area, this could benefit the local economy and local employment if visitors utilize local businesses such as gas stations, markets, and restaurants. Additionally, the increased visitation provides an opportunity for public education, which can foster value for these native habitats. None of the alternatives would result in any direct or indirect adverse physical change in the environment.

Cumulative Effects

Under Alternatives B and C, less than 2 percent of the refuge's fee title lands that are currently goose habitat are proposed to be restored to other habitat types. This reduction is relatively small as compared to the entire acreage of goose habitat in the area. Improved management of existing pastures should offset this small reduction in ACG habitat. The incremental contribution of any of the alternatives to the cumulative regional impact on the social and economic environment is expected to be less than cumulatively considerable.

Irreversible and Irretrievable Commitment of Resources

NEPA Section 102(C)(v) (CEQ Regulations Part 1502.16) requires Federal agencies to consider any irreversible and irretrievable commitments of resources with would be involved in the proposed action should it be implemented.

Alternative B includes the proposed construction of an environmental education structure near the Headquarters. Alternatives B and C includes a program-level feature that would involve realignment of the Salmon Creek channel. These construction activities would involve the consumption of nonrenewable natural resource such as soil, cement, and petroleum for fuel. The resources used in facilities construction and site preparation, transportation of construction materials, excavation, and disposal of excess excavated materials (unsuitable for fill), would be permanently committed to the project.

Relationship Between Short-term Uses of the Environment and Maintenance and Enhancement of Long-term Productivity

NEPA Section 102(C)(iv) (CEQ Regulations Part 1502.16) requires Federal agencies to disclose the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. The Service expects that the proposed alternatives would lead to long-term productivity through the life of the CCP (15 years). This discussion focuses on the tradeoffs between short-term environmental costs and long-term environmental benefits.

Any adverse effects on or near the refuge due to construction are expected to be temporary, short-term (during construction), and localized. The National Wildlife Refuge (NWR) System is the only network of Federal lands dedicated specifically to wildlife conservation. Refuges support more than 700 types of birds, 220 different mammals, 250 reptiles, and more than 200 kinds of fish. The Humboldt Bay NWR Complex was created and authorized by Congress for use as sanctuary for migratory birds; as waterfowl production areas; for the development, advancement, management, and resources, for (1) incidental fish and wildlife-

oriented recreation, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species under FESA. For more information on refuge purposes, please refer to that section in Chapter 1 of the CCP. The mission of the Refuge System is "…to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (1997 Improvement Act). The long-term environmental benefits of the action alternatives to the NWR System are expected to outweigh the short-term environmental costs at the refuge.

Indian Trusts Assets

Indian trust assets (ITAs) are legal interests in assets that are held in trust by the United States Government for Federally recognized Indian tribes or individuals. The trust relationship usually stems from a treaty, Executive Order, or act of Congress. The Secretary of the Interior is the trustee for the United States on behalf of federally recognized Indian tribes. "Assets" are anything owned that holds monetary value. "Legal interests" means there is a property interest for which there is a legal remedy, such a compensation or injunction, if there is improper interference. Assets can be real property, physical assets, or intangible property rights, such as a lease, or right to use something. ITAs can not be sold, leased or otherwise alienated without the United States' approval. Trust assets may include lands, minerals, and natural resources, as well as hunting, fishing, and water rights. Indian reservations, Rancherias, and public domain allotments are examples of lands that are often considered trust assets. In some cases, ITAs assets may be located off trust land.

The Service shares the Indian trust responsibility with all other agencies of the Executive Branch to protect and maintain ITAs reserved by or granted to Indian tribes, or Indian individuals by treaty, statute, or Executive Order.

There are no tribes possessing legal property interests held in trust by the United States in the lands or natural resources related to the alternatives.

The Table Bluff Rancheria is approximately 0.5 mile to the west of the Hookton Slough Unit of the refuge. The refuge is at a lower elevation than the Table Bluff Rancheria. The Rohnerville Rancheria is approximately 1.25 miles to the east of the Hookton Slough Unit of the refuge. Both Rancherias are higher in elevation than the refuge lands. The Rancherias are separated from the refuge by rolling, hilly terrain; refuge lands do not drain onto the Rancherias. Because the Service will continue to comply with the Native American Policy, the Service has concluded that none of the alternatives would adversely affect the Table Bluff Rancheria or the Rohnerville Rancheria, and anticipates no adverse effects to ITAs with any of the alternatives.

Environmental Justice

Research was conducted by California's Environmental Protection Agency, Department of Pesticide Regulation to quantify dissipation and off-site movement of forestry herbicides on resident plants. The results of the research was intended to help determine if California Indians gathering and processing plant materials from outside herbicide treatment areas are at risk from pesticide exposure. The concern is that the use of herbicides may result in disproportionate exposure to Native people due to their potentially higher rate of consumption of edible native fish and wildlife species and potentially higher rate of exposure to native plant species for cultural. The results indicated that large variation exists between the number of weeks to reach the non-detectable level for each of the 4 plants tested, ranging from 4 to 130 weeks. The results also showed a general decline trend in concentration over time purposes (CEPA et al. 2003). The research also documented some off-site movement of the herbicide applications monitored; glyphosate and liquid hexazinone were detected at 24-30 meters form the edge of the herbicide treatment area. Although the conclusions from this study are not specified in the results, the Service is aware of the potential human health risks of overexposure to pesticides and the potential for contamination of plants and water by off-site movement of herbicides. The Service follows all applicable state and Service pesticide laws and regulations to ensure that unintentional and potentially adverse effects from pesticide applications are avoided to protect California Indian gatherers, other refuge visitors, refuge staff, and refuge resources.

Appendix F includes the Compatibility Determination for Plant Gathering for Humboldt Bay NWR. Tribal representatives are required to obtain a special use permit issued by the Refuge Manager for plant gathering and access. Access is regulated to ensure protection of habitat during critical periods of use by various species. Stipulations necessary to ensure compatibility of plant gathering with refuge purposes include a review of plant gathering activities as part of an annual coordination with tribal representatives. For more information, see the aforementioned Compatibility Determination in Appendix F.

Based on the highly regulated and judicious use of pesticides on the refuge combined with the strategies 6.1 3, 6.1.13, 6.3.2, 6.3.3; and the conservation measures in Appendix 1 to this EA, the Service has concluded that no minority and low-income populations or communities would be disproportionately affected with any of the alternatives. Further, the Service has concluded that no disproportionately high and no adverse human health effects would result from any of the alternatives.

Growth-Inducing Impacts

None of the alternatives would affect human settlement or development. Therefore, the Service has concluded that no growth-inducing impacts are expected to result from any of the alternatives.

Related Projects, Programs, Environmental Assessments

A related project, mentioned in the body of this EA, is the 1992 Humboldt Bay National Wildlife Refuge, Final Environmental Assessment for Habitat Restoration and Enhancement, June 1992. This document was prepared by the Service to address Phase I of the Salmon Creek Restoration plan. In addition, the Service continues to consult with the NOAA's National Marine Fisheries Service (NOAA Fisheries Service) on the proposed Phase II of the Salmon Creek Restoration plan under Section 7 of the Federal ESA, as amended.

Consultation and Coordination

The Humboldt Bay NWR has conducted informal consultation with the Arcata Fish and Wildlife Office (AFWO) of the Service and NOAA Fisheries under section 7 of the Federal ESA, as amended, as well as the CDFG. In compliance with section 7 of the Federal ESA, as amended, the Service has requested concurrence from both the AFWO and NOAA Fisheries Service with our determination that the actions in Alternative C may affect, but are not likely to adversely affect listed species under their jurisdiction. See also the Special Status Species section of this EA, Appendix I (Compliance with Section 7 of the Federal Endangered Species Act), and Appendix L (Locally Occurring Special Status Species).

CASTLE ROCK NATIONAL WILDLIFE REFUGE

Castle Rock NWR Plant Communities and Wildlife

Common to All Alternatives

Refuge staff would continue to collaborate with partners such as the National Oceanic and Atmospheric Administration, Humboldt State University, and the Arcata Fish and Wildlife Office to continue photographic surveys of birds and marine mammals utilizing Castle Rock NWR habitat. Surveys would continue to be conducted both aerially and by remote camera to create population estimates of wildlife using Castle Rock NWR habitat.

Under all alternatives, Castle Rock NWR would remain closed to the public. Due to the sensitivity of wildlife and their habitat on Castle Rock NWR, disturbance is required to be kept to a minimum for any action performed by refuge staff on Castle Rock NWR. However, visitation to the island for any purpose is highly likely to cause at least minimal disturbance to some wildlife or their habitat. This disturbance can be greatly mitigated by method and timing (date and time of day) of access, and it is the requirement for any refuge (approved) actions to factor these considerations in to any planned work. Both aerial and boat survey work can also cause disturbance, but again also be mitigated by appropriate survey distances.

Alternative A: No Action

Additional surveys for terrestrial plants and wildlife at Castle Rock NWR, beyond birds and marine mammals would be conducted every 5 years outside any seabird and pinniped breeding seasons. Surveys will likely be conducted remotely. All personnel that access the island will be well trained wildlife biologists briefed on the impacts they could make if they deviate from the survey protocol. Based on using primarily remote monitoring and infrequent and mitigated site visits by trained biologists, the Service has concluded that although minimal disturbance may occur, no adverse effect to plants and wildlife would occur due to refuge management actions.

Alternative B

Under Alternative B, habitat management at Castle Rock NWR would be the same as Alternative A. Based on using primarily remote monitoring and infrequent and mitigated site visits by trained biologists, the Service has concluded that although minimal disturbance may occur, no adverse effects to plants and wildlife populations would occur due to refuge management actions.

Alternative C: Preferred Alternative

The Castle Rock NWR would be recommended for wilderness designation. This designation should not change the way the island is managed, as human access to the island is already and would continue to be strictly limited and mitigated as described above under Common to All Alternatives. If a wilderness designation were approved for Castle Rock NWR, the Service would not expect the designation to afford the refuge greater protections initially because the refuge is already closed to the public. However, designation could be used as a filter to screen proposed projects. No adverse affects to plant communities or wildlife are expected as a result of wilderness designation. Based on using primarily remote monitoring and infrequent and mitigated site visits by trained biologists, the Service has concluded that although minimal disturbance may occur, no adverse effects to plants and wildlife would occur due to refuge management actions. These precautions would remain with wilderness designation.

There is no commercial or sport fishing on Castle Rock, and wilderness designation will not alter that. Currently, there is no conflict with the Crescent City airport, and although there can be restrictions of airspace over some wilderness areas, they are not common and often voluntary. At this time, the Service does not expect that the proposed Crescent City airport plans would be in conflict with a recommendation for wilderness designation, as the birds are accustomed to existing airport traffic and are expected to continue to be present. The Service expects that potentially adverse effects to plant communities and wildlife are and would continue to remain minimal, however, the Wilderness Act requires that an EIS be prepared to analyze the effects of a recommendation for wilderness designation. The EIS would be prepared within the life of the CCP, within 15 years of CCP approval.

Castle Rock NWR Special Status Species

Common to All Alternatives

The following special status species are found at Castle Rock NWR: rhinoceros auklet, tufted puffin, double-crested cormorant, fork-tailed storm-petrel, brown pelican, and Steller (northern) sea-lion.

Due to the remoteness and the conservative approach of refuge management in all the alternatives, special status species using Castle Rock NWR would be protected from disturbance. Any attempt to land on Castle Rock NWR by refuge staff would be timed to reduce adverse effects to special status species and seabirds. Work performed by refuge staff is designed to benefit the species that inhabit the island. All personnel accessing the island are trained in methods to reduce and minimize disturbance to the habitat and wildlife. See also Appendix I (Compliance with Section 7 of the Federal Endangered Species Act), and Appendix L (Locally Occurring Special Status Species).

Castle Rock NWR Environmental Justice

Common to All Alternatives

Like many other seabird islands within the Refuge System, Castle Rock is so rich with sensitive wildlife species and fragile habitat it cannot accommodate direct public access and still fulfill the purposes for

which it was established. Due to the sensitivity of wildlife and their habitat on Castle Rock NWR, this rocky, 14-acre island is closed to the public. Because the refuge would remain closed to the public under all alternatives, the Service has concluded that no minority and low-income populations or communities would be disproportionately affected with any of the alternatives. The Service has concluded that no disproportionately high and no adverse human health or environmental effects would result from any of the alternatives.

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Environmental Assessment Appendices

APPENDIX 1: Conservation Measures

Conservation measures or Best Management Practices (BMPs) are designed to reduce adverse impacts to fish, wildlife, and plant species and their critical habitats. Appropriate BMPs must be executed by all project coordinators. BMPs are listed by main project categories, but in practice overlaps do exist among the categories. Individual BMPs are subject to becoming more stringent or additional BMPs instituted if restoration activities are changed.

General BMPs for all Project Categories:

1. Follow all terms and conditions in regulatory permits and other official project authorizations to eliminate or reduce adverse impacts to any endangered, threatened, or sensitive species or their critical habitats.

2. Complete restoration activities at individual project sites in a timely manner. This will reduce disturbance and/or displacement of fish and wildlife species in the immediate project area.

3. Significant modifications to an approved work plan must be reviewed and approved by appropriate agency personnel and the landowner(s) before the work can be carried out or continued.

4. Unobstructed fish passage must be provided at all times during any restoration activity.

5. Use existing roadways or travel paths for access to project sites.

6. Avoid the use of heavy equipment and techniques that will result in excessive soil disturbances or compaction of soils, especially on steep or unstable slopes.

7. Vehicles and machinery must cross streams at right angles to the main channel whenever possible.

8. Excavation or transport equipment/machinery should be limited in capacity, but sufficiently sized to complete required restoration activities. Equipment and machinery coming in contact with water shall be inspected daily and cleaned of grease, oil, petroleum products or other contaminants.

9. Streams, riparian zones, and wetlands must not be used as staging or refueling areas. Equipment must be stored, serviced, and fueled away from aquatic habitats or other sensitive areas.

10. Native vegetation must be planted on disturbed sites. Native vegetation should be salvaged from areas where ground disturbances will be occurring on projects. Salvaged vegetation should then be replanted after the completion of project activities. The use of nonnative vegetation will be strictly limited. Vegetative planting techniques must not cause major disturbances to soils and slopes. Hand planting is the preferred technique for all plantings. Plantings must occur during the optimal seasonal growth period for the respective plant species involved. Vegetation growth should also be enhanced by bank sloping/grading, seedbed and site preparations, mulching, or fertilizing.

11. Boulder and rock materials used for restoration projects must come from non-streambed and non-wetland sources. Conifer and hardwood timber stands must not be specifically harvested to supply woody materials for any restoration activity, unless the harvest is part of an approved silvicultural operation. Boulder, rock, and woody materials must be collected during appropriate seasonal periods to reduce soil and slope disturbances.

12. A written contingency plan must be developed for all project sites where hazardous materials (e.g., pesticides, herbicides, petroleum products) will be used or stored. Appropriate materials/supplies (e.g., shovel, disposal containers, absorbent materials, first aid supplies, clean water) must be available on site to cleanup any small scale accidental hazardous spill; this action will protect the environment,

project workers, and the public from direct contact with hazardous materials. Hazardous spills must be reported. Emergency response, removal, transport, and disposal of hazardous materials must be done in accordance with the U.S. Environmental Protection Agency. Hazardous materials and petroleum products shall be stored in approved containers or chemical sheds, and be located at least 100 feet from surface water in an area protected from runoff.

13. The evaluation of herbicide, pesticide, and fertilizer use must include the accuracy of applications, effects on target and non-target species, and the potential impacts to aquatic and terrestrial ecosystems. Treatments for the control or removal of invasive plants in riparian/wetland areas must be limited to hand or wick applications by qualified personnel. Apply chemicals during calm, dry weather and maintain unsprayed buffer areas near aquatic habitats and other sensitive areas. Chemical applications must be avoided where seasonal precipitation or excess irrigation water is likely to wash residual toxic substances into waterways. Consider persistence, soil/water mobility, toxicity, and plant uptake when selecting appropriate chemicals. All chemicals should be handled in strict accordance to label specifications. Proper personal protection (e.g., gloves, masks, clothing) must be used by all applicators. Obtain a copy of the material safety data sheet (MSDS) from the chemical manufacturer for detailed information on each chemical to be used. Refer to appropriate federal and state regulations concerning the use of chemicals. Chemicals must only be considered when other treatments would be ineffective or cannot be applied.

14. Sedimentation and erosion controls must be implemented on all project sites where the implementation of restoration activities will result in soil and/or slope disturbances. Soil and slope stabilization control structures/techniques must be bio-engineered to the extent possible. Structures/techniques must be placed and/or anchored appropriately to prevent adverse impacts to down slope habitats. Revegetate disturbed areas with native vegetation as soon as possible. Control structures/techniques may include, but are not limited to, silt fences, hay bale structures, seeding by hand and hydro-seeding, jute mats, and coconut logs. Contact the local state forester, state extension service agent, or Soil and Water Conservation District for information or assistance on control structures/techniques. *NOTE: This requirement refers to all sediment and erosion control measures addressed in the following project categories.*

15. Staging and stockpile areas must be located on or immediately beside the project area whenever possible. Sediment and erosion controls must be implemented around all stockpiled material and disturbed project sites to prevent the introduction of pollutants into water sources. This will reduce the disturbance and displacement potentials to fish and wildlife species in the surrounding areas.

16. Excess excavated materials removed during the completion of a restoration activity must be disposed of properly and/or stabilized to eliminate future environmental problems. Salvage of boulders, rock, and fill material is encouraged for use on nearby roads or other projects. Vegetation not salvaged will be removed to a county approved disposal site or chipped and composted off site to prevent spread of noxious weeds. If specific uses are not available for project spoils, they will be placed in upland areas, and contoured, with the assistance of an environmental engineer, to blend into the surrounding landscape. Under no circumstances will disposal sites be located in riparian, wetland, or floodplain areas unless used for dike construction. Dike construction would take place only to 1) restore historic hydrology when modifications on adjacent ownerships prevent re-contouring or use of other methods to restore the historic physical condition, or 2) prevent flooding of adjacent landowners' properties not involved in the project. Sedimentation and erosion controls must be implemented to prevent adverse impacts to down slope habitats. Disposal sites should be revegetated with native vegetation as soon as possible.

17. Project coordinators must ensure that all waste resulting from the completion of a project is removed and disposed of properly before work crews vacate the project site.

18. Structures containing concrete or wood preservatives must be cured or dried before they are placed in streams, riparian zones, or wetlands. Wet concrete or runoff from cleaning tools that have wet concrete slurry or lye dust must never enter aquatic habitats. Runoff control measures must be employed, such as hay bales and silt fences, until the risk of aquatic contamination has ended.

19. Monitoring is required during project implementation and for at least one year following project completion to ensure that restoration activities implemented at individual project sites are functioning as intended and do not create unintended consequences to fish, wildlife, and plant species and their critical habitats or adversely impact human health and safety. Corrective actions, as appropriate, must be taken for potential or actual problems.

20. Brightly-colored construction fencing shall be installed around isolated special status plants to avoid disturbance.

21. An environmental education program shall be presented to all construction personnel to brief them on the status of the special status species and the penalty for not complying with these requirements.

Instream Habitat Restoration BMPs:

1. Instream restoration activities must occur during appropriate times as determined by the California Department of Fish and Game and comply with National Marine Fisheries Service (NMFS) guidelines for placement of large wood in streams, stream-road crossings, fish passage improvements. .

2. Large woody debris and boulders used for instream structures need to be appropriately sized, anchored, and/or placed to eliminate or reduce the movement of these materials during high flow events. Size standards must be determined by hydrologists, biologists, or other qualified professionals and should be based on individual stream reaches and their associated seasonal discharge rates. Durable wood and rock materials should be used for instream structures.

3. Installed instream or streambank structures altering hydrologic flow regimes must not impact adjacent or down stream properties or manmade structures.

4. Temporary coffer dams built as a part of a project must use materials from non-streambed and non-wetland sources that are free of fines. Upon project completion, coffer dams must be feathered out in the streambed.

5. Adequate fish screening or other measures shall be installed and maintained to eliminate or reduce fish emigration into water distribution systems as required by the NMFS. All off-channel livestock watering systems must adhere to this requirement.

6. Heavy equipment must have limited access to the streambeds and streambanks. Instream construction activities must be minimized to reduce sedimentation rates, channel instability, and aquatic habitat impacts.

7. Soil and/or slope disturbances along stream channels should be eliminated or reduced wherever possible. Undisturbed vegetated buffer zones must be retained along stream channels to reduce sedimentation rates, channel instability, and aquatic habitat impacts.

Riparian/Wetland and Upland/Forest Restoration BMPs:

1. Bank stabilizing vegetation removed or altered because of restoration activities must be replanted with native vegetation and protected from further disturbance until new growth is well established. Native shrubs and trees should also be included in the reclamation of disturbed sites. Waste organic materials (e.g., discarded lumber, woody vegetation) must not be used to stabilize soils and slopes in disturbed areas. Metal refuse or debris (e.g., petroleum containers, car bodies) must not be used for streambank protection; this violates both state and federal regulations. Also, broken asphalt and tires must not be used due to potential seepage of petroleum and other toxic chemicals. Concrete is not recommended for bank stabilization projects. Do not use instream materials (e.g., stream debris and gravels) to replace or restore eroded streambanks.

Stabilization projects should employ bioengineering methods to the greatest extent possible.

2. Sedimentation and erosion controls must be implemented on site at all times during wetland restoration or creation activities to maintain the water quality of adjacent water sources.

3. Restoration activities that require prescribed burning of slash material or invasive vegetation must be planned and managed to maximize the benefits and reduce the detrimental effects of burns. Slash control and disposal must also be completed in a way that reduces the occurrence of debris from entering stream channels. Reduce the potential for very hot burns to conserve litter layers and eliminate or reduce the development of hydrophobic soil conditions. Develop plans for rapid site revegetation. Always consider nonburning alternatives whenever possible. Fire suppression equipment must always be located at the immediate project site during prescribed burnings.

4. Slash materials should be gathered by hand or with light machinery to reduce soil disturbances and compaction of soils. Avoid accumulating or spreading slash in upland draws, depressions, intermittent streams, and springs. Slash control and disposal activities should be conducted in a way that reduces the occurrence of debris in streams. These practices will eliminate or reduce debris torrents, avalanches, flows, and slides.

5. Use the appropriate timber yarding system during silvicultural operations to eliminate or reduce soil disturbances and compaction of soils.

6. Retain or develop snags on project sites for cavity dependent wildlife species whenever possible.

7. Abandoned and decommissioned roadways must be revegetated. Compacted road surfaces will be tilled to promote vegetation establishment and growth. Ensure that drainage patterns on these roadways will not result in increased sedimentation rates or erosion to down slope habitats. Drainage improvements should be constructed and stabilized before the rainy season. Install water energy dissipators (e.g., water bars and rolling dips) along roadways and on all cross drain outfalls. Do not sidecast excavated road materials, and avoid accumulating or spreading these materials in upland draws, depressions, intermittent streams, and springs. Road entrances closed by tanking or ditching must have the excavated/disturbed areas stabilized as soon as possible.

8. Purchase seedlings from reputable suppliers or growers. Hardwood and conifer seedlings should be stored, handled, and planted properly. Seeds used to grow seedlings should have been collected in an area where the environmental conditions (e.g., elevation and range) closely match those on project sites; refer to a tree seed zone map and ensure that every purchased box or bag of seedlings are clearly marked with the seed zone and elevation. Reduce seedling competition by clearing grasses, forbs, and woody shrubs from around each seedling for a minimum distance of three feet. Employ the proper methods to protect seedlings from animal, insect, and environmental damages. Periodically examine planted seedlings for damages and diseases. Contact your local state forester or extension service agent for additional information or assistance.

9. Retain the appropriate amount of down and decaying woody debris to provide for wildlife habitats and nutrient recycling. Project coordinators should be aware of potential wildfire hazards in project areas because of retained woody debris.

10. Fall trees away from streams, riparian zones, and wetlands whenever possible. Tree falling on steep slopes should not be done or done in an appropriate manner to avoid damage to surrounding vegetation and soils. Employ the proper yarding technique on project sites to eliminate or reduce soil disturbances and compaction of soils.

11. Fence designs (e.g., wire type and wire spacing) and installations should not restrict the movement of any wildlife species; limit the use of woven wire fences whenever possible. The quality and durability of fencing materials must meet or exceed the intended management objectives. Fences must not be constructed in areas where natural barriers restrict livestock movements. Refer to the Bureau of Land Management fencing handbook (BLM 1989) for additional information.

12. Livestock crossings and off-channel livestock watering facilities must not be located in areas where compaction and/or damage may occur to sensitive soils, slopes, or vegetation due to congregating livestock. Livestock fords across streams must be appropriately rocked to stabilize soils/slopes and prevent erosion. Do not use crushed rock to stabilize fords. Fords should be placed on bedrock or stable substrates whenever possible.

13. Silvicultural activities (e.g., herbicide treatment, thinning, and harvesting) should be limited or restricted on steep slopes and highly erodible soils to prevent accelerated soil erosion and increased sedimentation rates.

14. Fill material used on project sites must be from nonstreambed and nonwetland sources that are free of fines. Deposition of materials must not violate state or federal regulations, standards, or guidelines as set forth by local Soil and Water Conservation Districts, U.S. Army Corps of Engineers, or other regulatory agencies.

Fish Passage Improvement BMPs:

1. The dimensions, slopes, jump heights, water depths, and seasonal flows in fishways must be adequate to pass the intended fish species and life stages at critical migration periods. Provide fish resting areas, as necessary, within the fishways, and maintain appropriate entrance flows to attract fish. Restrict fish access to inappropriate areas to prevent fish morbidity and mortality.

2. Culverts and bridges, whether for livestock or vehicle access, must be sized to pass at least a normal seasonal high flow and designed to provide unobstructed fish passage at all times. Bridge abutments must be designed and installed in a way that does not alter stream flows or channel stability. Do not backfill culverts or bridge abutments with vegetation, debris, or mud. Abutments should be properly protected (e.g., rock armored) to prevent future scouring actions and erosion hazards. All culvert passage projects must be consistent with the NMFS "Culvert Passage Guidelines" Bridge designs and installations must conform to all federal and state standards.

3. Installed culverts should be aligned to stream flows and positioned at or below stream grades. Culvert inlets and outfalls should be properly protected (e.g., rock armored) to prevent future scouring actions and erosion hazards. Use appropriate culvert lengths and install culverts at proper slopes (less than 1% slope gradient) to aid fish passage. Install baffles inside culverts, as a last resort necessity, to reduce flow velocities. Open-bottom and arch culverts are the preferred culvert types to be used if existing culverts are to be replaced. A single large culvert is preferred over using several smaller culverts at individual stream crossings.

4. Develop maintenance schedules for culvert and bridge installations to ensure they remain in proper functioning condition. Install trash/debris racks, as necessary, to prevent blockage or damage to these structures. These racks must be installed and maintained in such as manner that fish are easily able to pass through them at any time.

5. Appropriate sediment and erosion controls must be implemented as they apply to specific fish passage structures. Revegetate bare soils with native vegetation as soon as possible to prevent sedimentation and erosion hazards.

6. All fish screening projects must be consistent with the NMFS "Juvenile Fish Screen Criteria," and all intake screening projects must be consistent with NMFS "Pump Intake Screen Guidelines."

7. Fish passage structural designs (i.e., culverts and fishways) must be submitted to the NMFS, through the U.S. Fish and Wildlife Service, to obtain design approvals prior to the installation of the structures.

Air Quality BMPs:

1. All disturbed areas shall be effectively stabilized of dust emissions using water, approved chemical stabilizer/suppressant, tarp or other suitable cover or vegetative ground cover.

2. All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities shall be effectively controlled of fugitive dust emissions by applying water or by pre-soaking.

3. Following the addition of materials to, or the removal of materials from the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions using sufficient water or approved chemical stabilizer/suppressant.

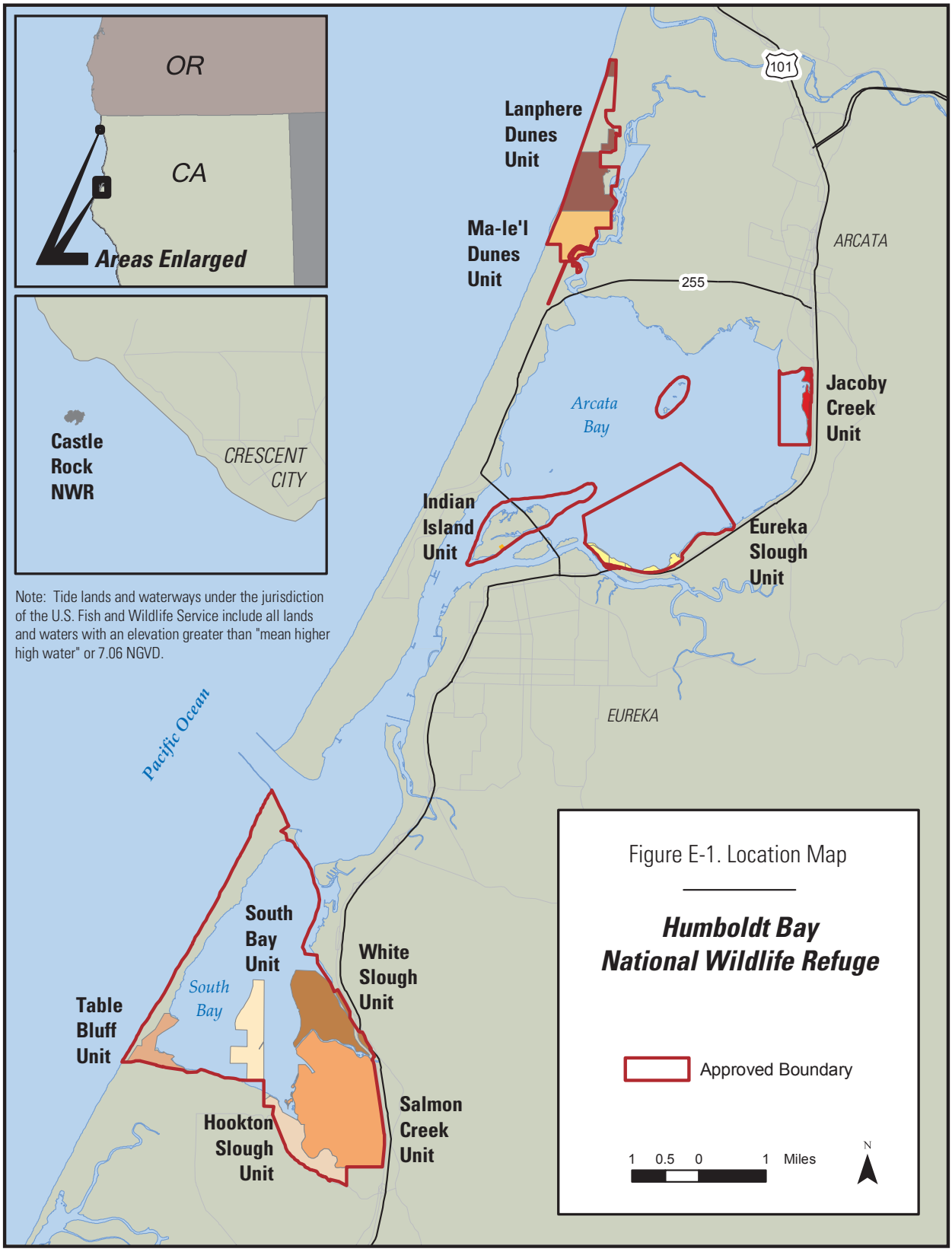

Figure E-1: Location Map.

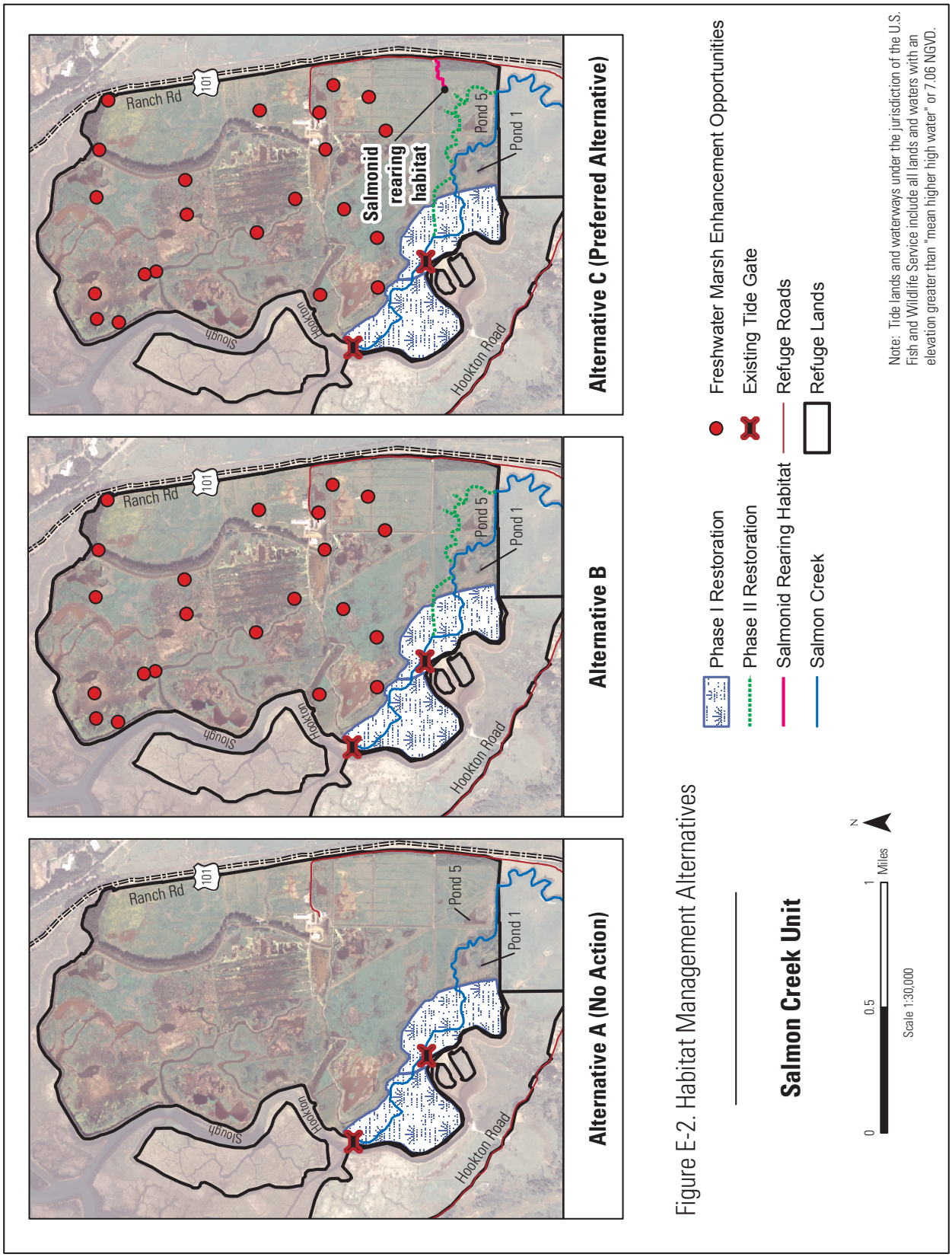

Figure E-2: Habitat Management Alternatives, Salmon Creek Unit.

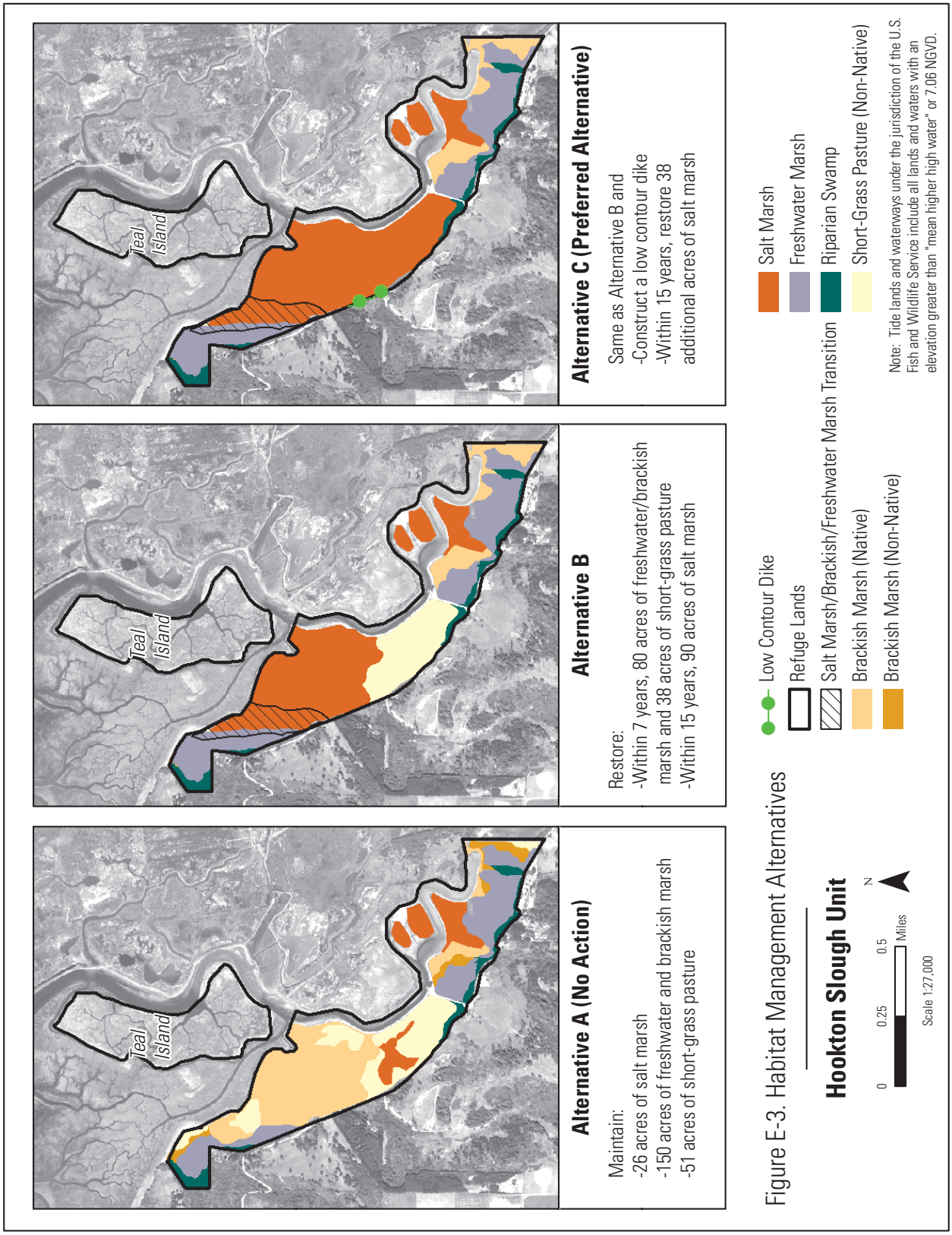

Figure E-3: Habitat Management Alternatives, Hookton Slough Unit.

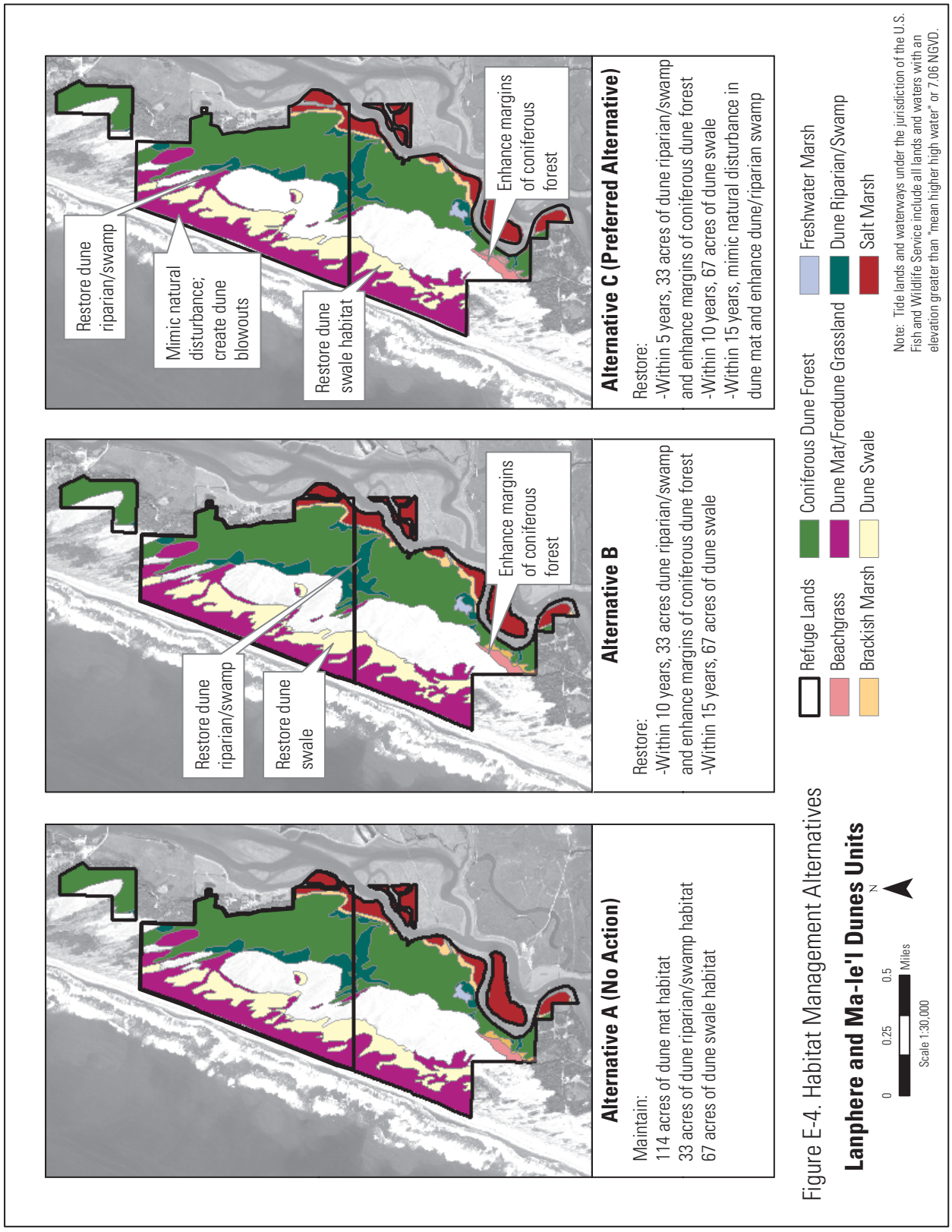

Figure E-4: Habitat Management Alternatives, Lanphere and Ma-le'l Dunes Units.

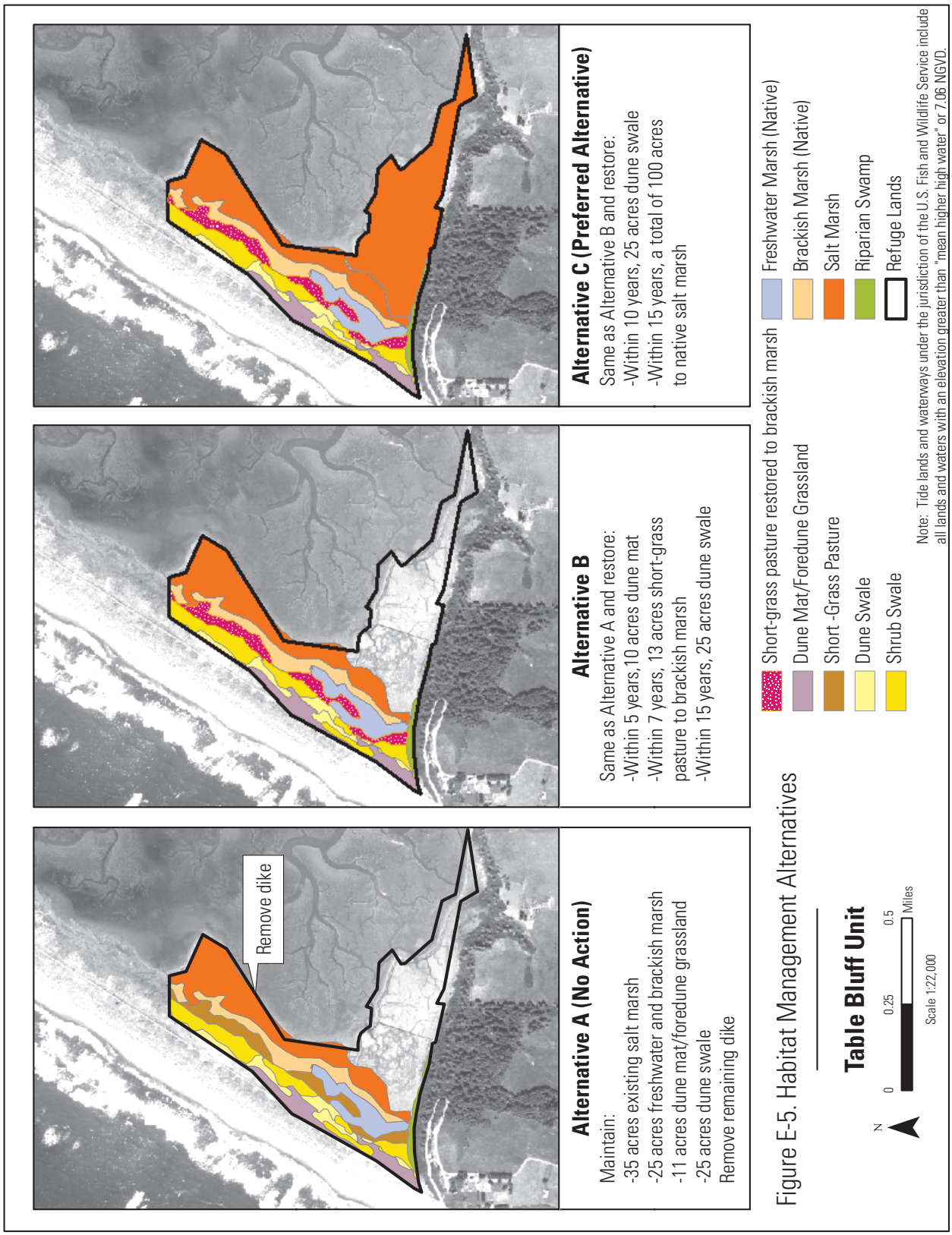

Figure E-5: Habitat Management Alternatives, Table Bluff Unit.

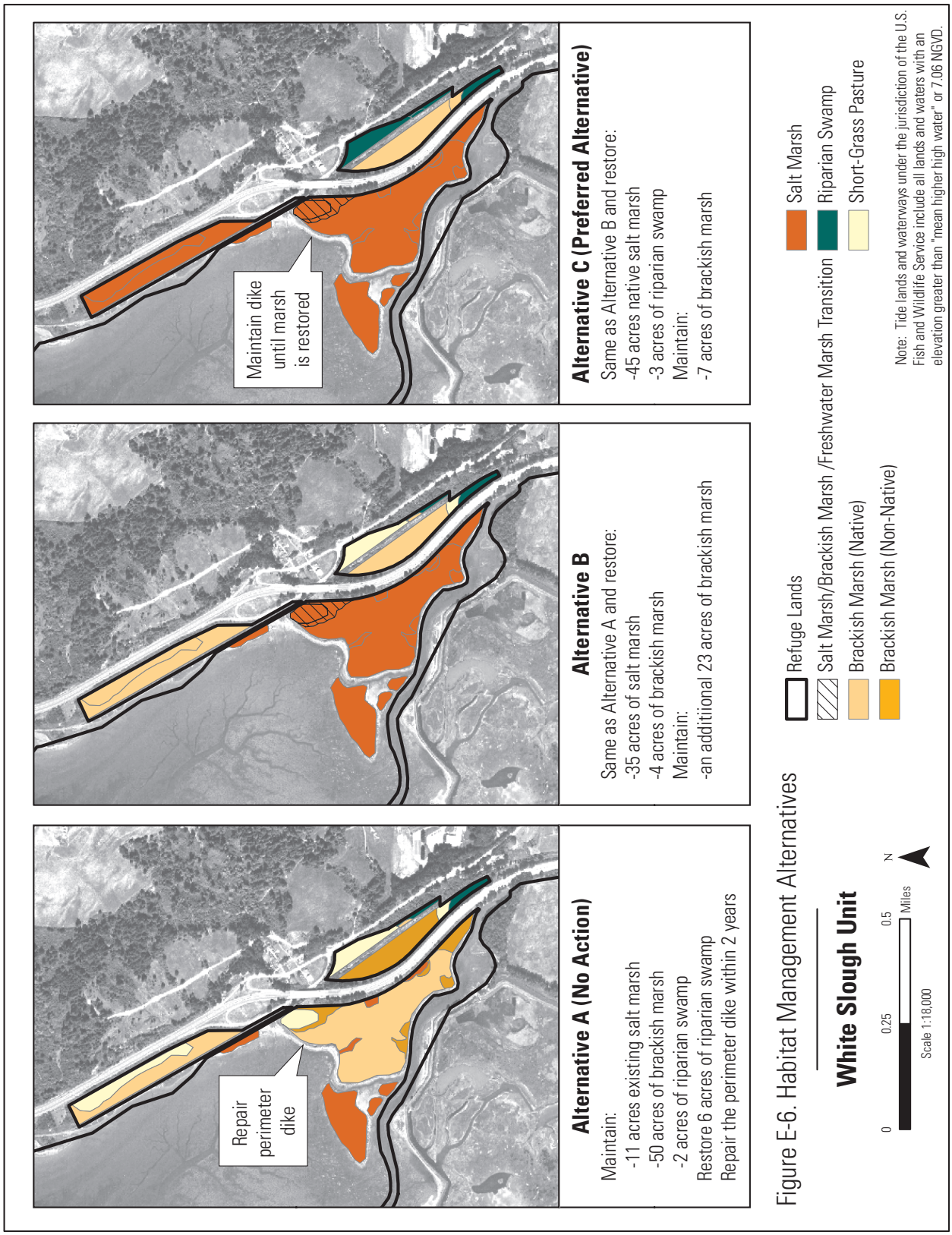

Figure E-6: Habitat Management Alternatives, White Slough Unit.

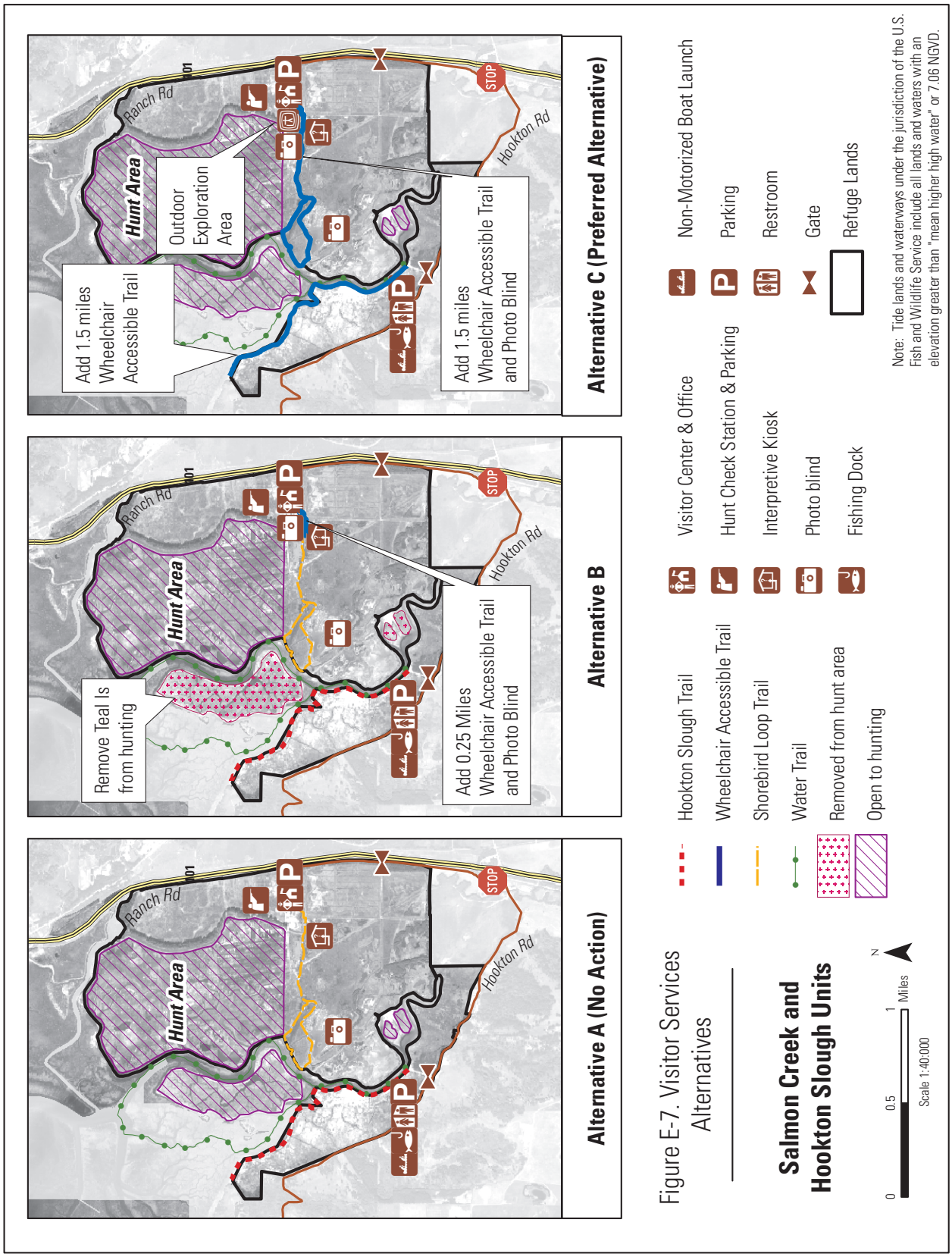

Figure E-7: Visitor Services Alternatives, Salmon Creek and Hookton Slough Units.

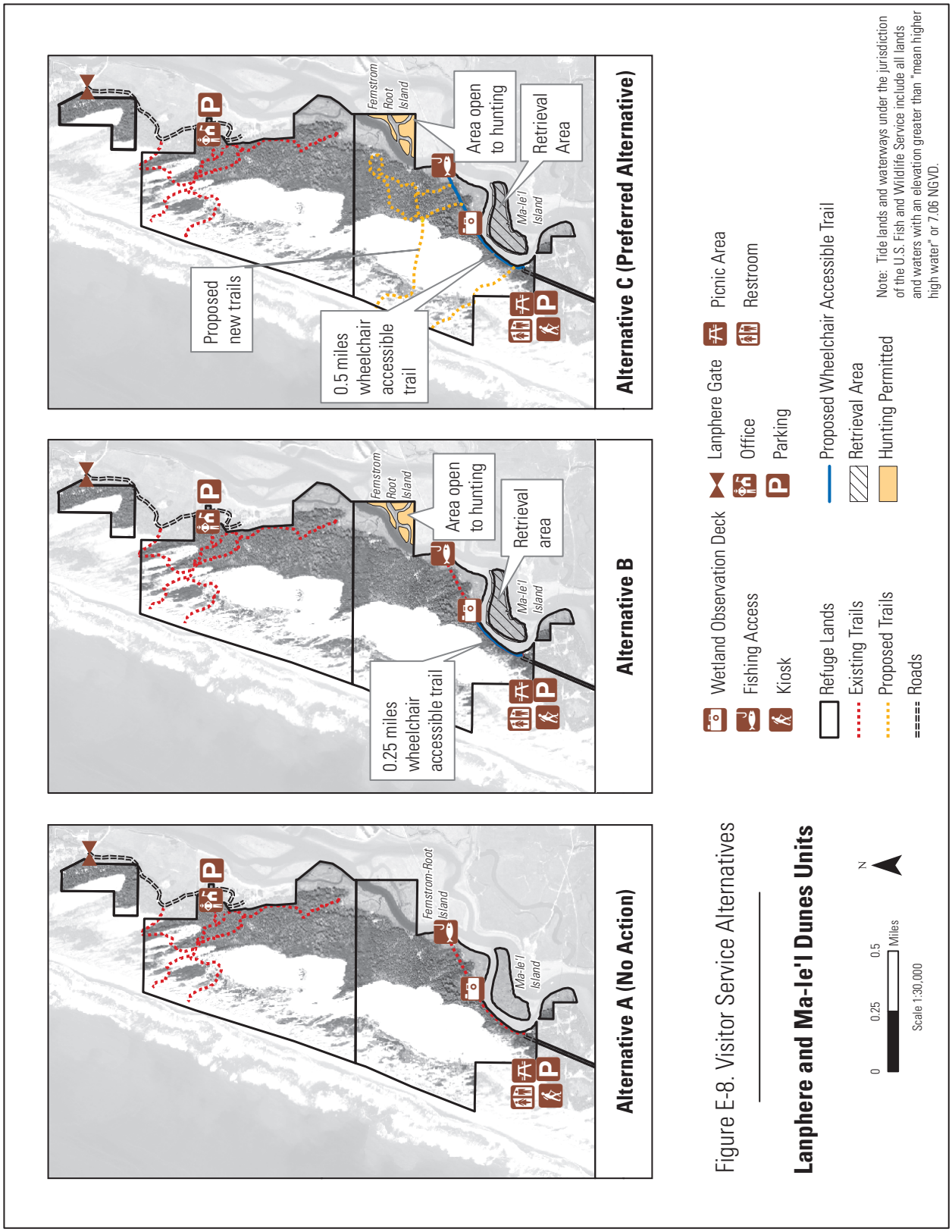

Figure E-8. Visitor Service Alternatives

Lanphere and Ma-le'l Dunes Units

Figure E-8: Visitor Services Alternatives, Lanphere and Ma-le'l Dunes Units.

Appendix F: Compatibility Determinations

Compatibility Determination for Environmental Education and Interpretation for Humboldt Bay NWR

Use: Environmental Education and Interpretation

Refuge Name: Humboldt Bay National Wildlife Refuge, Humboldt Bay National Wildlife Refuge Complex

County and State: Humboldt County, California

Establishing and Acquisition Authority(ies):

Humboldt Bay NWR was established under the authority of The Migratory Bird Conservation Act of 1929, The Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and The Endangered Species Act of 1973.

Refuge Purpose(s):

According to these authorities, Humboldt Bay NWR's purposes are:

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... as Waterfowl Production Areas subject to... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. §§ 460k-1 and "... the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ....or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:

"The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."(National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C.668dd-ee]).

Description of Use(s):

Environmental education and interpretation are those activities which seek to increase the public's knowledge and understanding of wildlife and its associated ecology and contribute to the conservation of such wildlife. The Humboldt Bay NWR (refuge) proposes to enhance existing environmental education by strengthening existing partnerships with area schools, universities, conservation groups and the refuge support groups (Friends of Humboldt Bay National Wildlife Refuge and Friends of the Dunes).

The refuge currently offers traditional environmental education activities (teacher-led or staff-led on-site field trips), annual interpretive events, guided natural history walks, etc. The refuge currently provides wildlife-dependent educational opportunities for four school or community groups per month and 20,000 annual visitor opportunities for interpretive experiences on refuge property to foster public awareness and appreciation of wildlife and their habitats around Humboldt Bay. Within 15 years, the refuge expects to provide wildlife-dependent educational opportunities for at least 8 school or community groups per month and 35,000 annual visitor opportunities for interpretive experiences on and off refuge to foster public awareness and appreciation of the natural heritage of the north coast. The current program includes 3 walks monthly at Salmon Creek Unit and 2 walks monthly at Lanphere Dunes Unit. Ma-le'l Dunes Unit is yet to open, but should add at least 1 walk. With the addition over then next 15 years of a 1/2 time FTE, 3.7 miles of accessible trails, the Historic Hunt Cabin and the Children's Outdoor Exploration area, 8 school or community groups receiving wildlife-dependent educational opportunities is reasonable goal.

The refuge Visitor's Center has interpretive panels that provide information on wildlife and their respective habitats. There is also a children's area called the "Fledgling Fort" in the Visitor Center that contains nature-centered activities and a seasonal "Children's Outdoor Exploration Area" for children to explore nature in an unstructured way. Several educational and conservation organizations utilize the refuge for educational purposes. Some of these include the Audubon Society, groups from College of the Redwoods, Humboldt State University, and local elementary and high schools.

A self-guiding interpretive pamphlet is available at the refuge visitor's center that provides historic and natural history information corresponding to numbered locations along the Shorebird Loop Trail on the Salmon Creek Unit.

Availability of Resources:

Presently, there is adequate funding and staff to meet the current needs for the environmental education and interpretation program at the existing visitation rate. The refuge staff has seen increased demand for environmental education and interpretation experiences. Area schools are requesting hands-on nature activities that emphasize particular topics concerning the environment to provide students with a well rounded refuge experience. In anticipation of increased use in this area, a part-time permanent Visitor's Service Assistant was funded in 2008. The refuge will continue to pursue various areas of matching funding for this position in order to make it full-time.

Facilities

Material/Facility Proposed	Explanation of Need	Cost [1] annual cost [2] one time cost
Education materials and supplies	Various materials are required annually to implement existing environmental education programs	$3K[1]
Acquire additional and maintain existing interpretive panels	Acquire additional and Update existing interpretive panels and signs to facilitate education and interpretive programs.	$50K[2]
Complete the "Historic Hunt Cabin"	Will interpret the recent history of the Salmon Creek Ranch, refuge development, and the role waterfowling at the ranch, refuge, and bay played in local conservation efforts.	$100K[2]
Establish outdoor environmental education structure for lab activities	Will allow students/visitors to explore the ecology of the refuge in a lab setting and in inclement weather	$50K[2]
Establish 'Discovery Area' on refuge in accordance w/ Children in Nature Initiative	Allows for a place on the refuge where children can use all their senses to explore nature.	$10K[2]
3.7 miles of accessible trails	Increase accessibility for 6 priority uses under Americans with Disabilities Act	$50 K[2]
Total Construction Cost for Facilities **Annual Cost**		**$260K** **$3K**

Staffing

Position	Involvement	FTE	Annual Cost
Project Leader	General oversight of programs & budget	0.1	$12K
Assistant Refuge Manager	Periodic on-site oversight, occasional monitoring of program activities	0.2	$20K
Maintenance Worker	Facilities maintenance	0.1	$10K
Visitor Services Assistant	Coordinate and provide oversight of environmental education programs and assist in interpretive plan design.	0.5	$20K
Total FTEs and Costs for Staffing		**.8**	**$62K**

Anticipated Impacts of the Use(s):

The use of on-site, hands-on action-oriented activities by groups of up to 50 students and teachers (the maximum group size the refuge can accommodate to ensure a quality environmental education experience for all students) to accomplish environmental education objectives may impose a short-term, low level impact on the sites used for these activities. These low level impacts may include trampling of vegetation and temporary disturbance to wildlife species in the immediate vicinity. It is not anticipated that such impacts would be permanent or long-lasting because these activities take place on established trails or areas close to the Visitor's Center where wildlife is already somewhat habituated to human activities.

The presence of humans will disturb wildlife causing temporary displacement without long-term effects on individuals or populations. Some species will avoid the areas people frequent, while others will seemingly be unaffected by the presence of humans.

Activities related to environmental education and photography can have negative impacts to wildlife by altering wildlife behavior, reproduction, and distribution. The response of wildlife to human activities includes: site departure (Owen 1973, Burger 1981, Henson and Grant 1991, Klein 1993), use of suboptimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Morton et al. 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). McNeil et al. (1992) found that many waterfowl species avoid disturbance by feeding at night instead of during the day. The location of recreational activities impacts species in different ways. Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller et al. 1998).

For songbirds, Gutzwiller et al. (1997) found that singing behavior of some species was altered with low levels of human intrusion. Pedestrian travel can impact normal behavioral activities, including feeding, reproductive, and social behavior. Studies have shown that ducks and shorebirds are sensitive to pedestrian activity (Burger 1981, 1986). Resident waterbirds tend to be less sensitive to human disturbance than migrants, and migrant ducks are particularly sensitive when they first arrive (Klein 1993). In areas where human activity is common, birds tolerated closer approaches than in areas receiving less activity.

Environmental education activities can affect wildlife resources positively and negatively. A positive effect of public involvement in these priority public uses will be a better appreciation and more complete understanding of the refuge wildlife and habitats. Pedestrian travel has the potential of impacting shorebird, waterfowl, and other migratory bird populations feeding and resting near the trails and on beaches during certain times of the year. Human disturbance to migratory birds has been documented in many studies. However, the overall effects to wildlife should not be significant, because public use is allowed on only a small portion of the refuge lands.

Public Review and Comment:

Environmental education and interpretation were discussed at two public meetings held in conjunction with the Comprehensive Conservation Plan process. To initiate the CCP process, a Notice of Intent was published in the Federal Register on January 29, 2007. Written comments were solicited from the public about the refuge's operations including public use programs such as environmental education and interpretation. Five CCP planning updates and one planning workbook were prepared to summarize the progress of the CCP and to discuss issues related to the planning process. This compatibility determination was submitted for public review and comment as an appendix to the Draft Comprehensive Conservation Plan and Environmental Assessment for the Humboldt Bay National Wildlife Refuge Complex. No comments were received on this compatibility determination.

Determination (check one below):

___ Use is Not Compatible

__X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Activities are held on existing trails, pull-off areas and gardens where human presence is frequent and wildlife are minimally affected by the presence of humans. Periodic opportunistic evaluation of sites, programs and general public use are held to assess if objectives are being met and the resource is not being degraded. If evidence of unacceptable adverse impacts begin to appear, it may be necessary to temporarily close a trail or site.

As the need increases, the refuge will recruit volunteers or interns to assist with providing environmental education and interpretation tours. Prospective groups interested in guided wildlife-dependent environmental education at the refuge are currently required to submit a field trip application, available in the refuge visitor center, by fax, and on the refuge website. Applications are reviewed and trips developed based on conversation between Visitor Services staff and applicants to provide a detailed trip plan to maximize the effectiveness and enjoyment of each trip for user groups. Staff discusses trail etiquette, including ways to reduce wildlife disturbance, with teachers during the pre-trip planning conversations and with students upon their arrival at the refuge during their welcome session.

Sign replacement and installation along public trails and access points will be prioritized to prevent visitors from entering sensitive areas.

Justification:

The National Wildlife Improvement Act of 1997 (Pub. L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Where these uses have been determined compatible, they are to receive enhanced consideration over other uses in planning and management.

These uses have been determined compatible because environmental education and interpretation will not materially interfere with or detract from unit purposes. The continuation of these programs will support the refuge goal of fostering a broader understanding of the value of wildlife conservation. The level of use for environmental education and interpretation is moderate. The associated disturbance to wildlife is temporary and minor. Under those conditions, the staff does not expect them to materially interfere with or detract from the mission of the System or diminish the purposes for which the refuge was established; nor do we expect them to cause significant adverse effects on refuge resources or cause undue administrative burden.

Mandatory Re-Evaluation Date: (provide month and year for "allowed" uses only)

_____X_____Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

_ X__Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36.

Burger, J. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation. 21:231-241.

Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. Environmental Conservation. 13:123-130.

Erwin, R. M. 1980. Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance. Biological Conservation. 18:39-51.

Gutzwiller, K.J., R.T. Wiedenmann, and K.L. Clements. 1997. Does human intrusion alter the Seasonal timing of avian song during breeding periods? Auk. 114:55-65.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin. 20:290-298.

Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. Wildlife Society Bulletin. 19:248-257.

Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. Wildlife Society Bulletin. 21:31-39.

McNeil, R., P. Drapeau, J.D. Goss-Custard. 1992. The occurrence and adaptive significance of nocturnal habitats in waterfowl. Biological Review. 67:381-419.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications. 8(1) 162-169.

Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management. 53:401-410.

Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl. 24:123-130.

Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management. Wildfowl. 31:151-157.

Refuge Determination for Environmental Education and Interpretation for Humboldt Bay NWR:

Prepared by:	P.M. Clifford, previously with Humboldt Bay NWR (Signature)	(Date)
Refuge Manager/ Project Leader Approval:	Eric Rel (Signature)	10/18/09 (Date)
Concurrence:		
Refuge Supervisor:	Dan Walsworth (Signature)	10/23/09 (Date)
Assistant Regional Director - Refuges:	Margaret D. Kalar (Signature)	11/9/09 (Date)

Compatibility Determination for Wildlife Observation and Photography for Humboldt Bay NWR

Use: Wildlife Observation and Photography

Refuge Name: Humboldt Bay National Wildlife Refuge, Humboldt Bay National Wildlife Refuge Complex

County and State: Humboldt County, California.

Establishing and Acquisition Authority(ies):

Humboldt Bay NWR was established under the authority of The Migratory Bird Conservation Act of 1929, The Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and The Endangered Species Act of 1973.

Refuge Purpose(s):

According to these authorities, Humboldt Bay NWR's purposes are:

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... as Waterfowl Production Areas subject to... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. §§ 460k-1 and "... the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ....or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:

"The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C.668dd-ee]).

Description of Use(s):

The Humboldt Bay National Wildlife Refuge (refuge) would continue to provide opportunities for wildlife observation and photography, two of the six priority uses of the National Wildlife Refuge System. If found

compatible, priority uses are to receive enhanced consideration over other general public uses. (16 U.S. C. 668dd-668ee, as amended by Pub.L. 105-57; 111 Stat 1252).

Wildlife observation and photography would be limited to the established trail systems of the Humboldt Bay NWR, and the Visitor Center, photo blind, the Children's Outdoor Exploration Area at the Salmon Creek Unit, and the Lanphere Dunes and Ma-le'l Dunes .

The refuge is located along the Pacific Flyway, providing valuable habitat to migratory birds. The Salmon Creek and Hookton Slough Units currently have 3.0 miles of trails traversing through a diversity of wildlife habitat. Tidal flats, salt marsh and freshwater marshes are all components of these units. Birds from waterfowl, shorebirds, hawks, sparrows and warblers to deer, otters, and harbor seals are just a sample of the wildlife that uses these habitats. Within 15 years, the refuge expects to provide 35,000 annual wildlife observation and photography visitor opportunities by land and water trails and to provide 3.0 miles of wheelchair accessible trail (the entire Shorebird Loop and Hookton Slough Trails). The Hookton Slough Unit is open daily sunrise to sunset and the Salmon Creek Unit is open every day from 8:00 A.M. to 5:00 PM.

There are ~4.0 miles of trails in the North Bay units, Lanphere Dunes and Ma-le'l Dunes. These units contain globally rare vegetation types, coastal coniferous forest, sand dune, and beach habitats and offer the public a unique opportunity for nature recreation. Within 15 years, the refuge expects to provide a total of 0.5 miles of accessible trail at the Ma-le'l Dunes Unit and implement all phases of the Ma-le'l Dunes Cooperative Management Area Access Plan which includes: an expanded trail system, interpretive panels, a viewing deck, a volunteer caretaker, and restrooms at the Ma-le'l Dunes Unit. The majority of these improvements will be acquired through a grant from the California Coastal Conservancy. The Lanphere Dunes Unit is open by permit only. The Ma-le'l Dunes Unit will be opened to the public as soon as the Ma-le'l Dunes Cooperative Management Agreement is approved.

The two priority uses would be conducted much as they are at this time. They would be allowed only on designated trails and at the photo blind and proposed Children's Outdoor Exploration Area. Permitted uses are only allowed on designated trails or other public use locations. Walking off-trail can harm sensitive vegetation and/or disturb wildlife. "Closed Area" signs mark areas closed to public entry. Entry on all or portions of specific areas may be temporarily suspended by posting upon occasions of unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety.

Providing access for wildlife observation and photography will allow public access and enjoyment of scenic views and an array of wildlife including waterfowl, other migratory birds, wetland and salt marsh plants and resident wildlife and dune and coastal ecosystem plants and wildlife. These areas provide opportunities for wildlife enjoyment not usually available on adjacent private land. Refuge visitors will better understand the challenges facing our wildlife and wild lands resources, what effects the public can have on wildlife resources, and learn more about the Service's role in conservation. People will better understand the biological facts underlying our management programs, and why wildlife and wild lands are important. These two priority uses will provide opportunities for the public to observe wildlife habitats firsthand and learn about wildlife and wild lands at their own pace in an unstructured environment. Photographers will gain opportunities to photograph wildlife and natural habitats. Those opportunities can result in increased publicity and advocacy for Service programs.

Availability of Resources:

To continue accommodating public use at the current level would not require a significant increase in maintenance or visitor service staff expenditures. Using a combination of automatic trail counters, hand counting at the Salmon Creek Unit Visitor Center, and indirect methods, monitoring indicates that current public use is no more than 50 visitors at any one time on the refuge, except for during special events. Staff time associated with administration of these uses is related to maintaining trails, kiosks, gates, signs, providing information to the public about the use, conducting visitor surveys, analyzing visitor use patterns, and monitoring the effects of the use on refuge resources. Staff and or volunteers would administer the program and would monitor the effects of public access. Through a cooperative agreement, Rangers with the Bureau of Land Management will conduct law enforcement activities to provide for visitor safety and resource protection. New funding provided in 2008 allows for a part time permanent staff position dedicated to Visitor Services and Outreach, which will significantly assist refuge efforts in providing these

priority public uses. In addition, there are funds in an existing contract to provide additional improvements in signage, interpretation, and existing facilities to help accommodate these uses.

Maintenance of trails and facilities are costs related to accommodating these uses. The major portion of the funds needed to support the two priority uses are salaries for staff to maintain the trails and to provide protection and monitoring; additional funds are needed for maintenance materials and other supplies. At the Salmon Creek and Hookton Slough Units there are restrooms that are maintained and open year-round for public users of the trail system. Additionally, there are kiosks, interpretive panels, displays, and brochures at the Salmon Creek and Hookton Slough Units that provide important information on refuge resources, management and rules to help the users have an enjoyable, safe experience while at the refuge. The kiosks receive regular maintenance and brochure replenishment. It is estimated that approximately one day per week is spent at each location conducting routine maintenance, trail clearing, and general upkeep and one day per week is spent on general public assistance for these activities. The CCP prescribes additional visitor facilities and activities, some of which are covered under other compatibility determinations. The estimated cost of constructing and maintaining these structures is detailed below. However, the development of many of the strategies in the CCP is dependent upon receiving adequate funding and staffing. The refuge will continue to manage these activities at current levels until this funding is made available.

Facilities

Material/Facility Proposed	Explanation of Need	Cost annual cost [1] one time cost [2]
Special equipment, facilities, or improvements & maintenance	Scopes, binoculars, brochures, handouts, special events	$500[1]
Trails, panels, kiosks, Visitor Center & photo blinds	Maintenance (mowing, gravel, etc)	$2,000[1]
Construction of photo blind for mobility-impaired individuals		$5,000[2]
Total Annual Cost for Facilities		**$2,500[1]**

Staffing

Position	Involvement	FTE	Annual Cost
Project Leader	General oversight of programs & budget	0.2	$16,000
Assistant Refuge Manager	Periodic on-site oversight and monitoring of program activities	0.2	$10,000
Maintenance Worker	Facilities maintenance	0.1	$10,000
Visitor Services Assistant	Coordinate and provide oversight of Wildlife observation and photography programs	0.2	$10,000
Total FTEs and Costs for Staffing		**0.7**	**$46,000**

Anticipated Impacts of the Use(s):

Wildlife observation and photography can affect wildlife resources positively and negatively. A positive effect of public involvement in these priority public uses will be a better appreciation and more complete understanding of the refuge wildlife and habitats. Pedestrian travel has the potential of impacting shorebird, waterfowl, and other migratory bird populations feeding and resting near the trails and on beaches during certain times of the year. Human disturbance to migratory birds has been documented in many studies. However, the overall effects to wildlife should not be significant, because most of the refuge lands will experience minimal public use.

The presence of humans will disturb wildlife causing temporary displacement without long-term effects on individuals or populations. Some species will avoid the areas people frequent, while others will seemingly be unaffected by the presence of humans.

Activities related to wildlife observation and photography can have negative impacts to wildlife by altering wildlife behavior, reproduction, and distribution. The response of wildlife to human activities includes: site departure (Owen 1973, Burger 1981, Henson and Grant 1991, Klein 1993), use of suboptimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Morton et al. 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). McNeil et al. (1992) found that many waterfowl species avoid disturbance by feeding at night instead of during the day. The location of recreational activities impacts species in different ways. Studies have shown that ducks and shorebirds are sensitive to pedestrian activity (Burger 1981, 1986). Resident waterbirds tend to be less sensitive to human disturbance than migrants, and migrant ducks are particularly sensitive when they first arrive (Klein 1993). Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller et al.1998).

For songbirds, Gutzwiller et al. (1997) found that singing behavior of some species was altered by low levels of human intrusion. Pedestrian travel can impact normal behavioral activities, including feeding, reproductive, and social behavior. In areas where human activity is common, birds tolerated closer approaches than in areas receiving less activity.

People can be vectors for invasive plants by moving seeds or other propagules from one area to another. Once established, invasive plants can out-compete native plants, thereby altering habitats and indirectly impacting wildlife. The threat of invasive plant establishment will always be an issue requiring annual monitoring and treatment when necessary. Our staff will work at eradicating invasive plants and educating the visiting public.

Impacts may be considered insignificant when analyzed alone, but may be considered important when they are evaluated cumulatively. The refuge's principal concern is repeated disruptions of resting, foraging, or nesting birds. Staff knowledge and regular observations of the affected areas show no apparent evidence that these two priority wildlife-dependent uses cumulatively affect the wildlife resource adversely. However, it will be important for refuge staff to monitor these (and other) uses and if necessary respond with management actions to conserve wildlife resources.

Refuge staff, in collaboration with volunteers and researchers, will monitor and evaluate the effects of these priority uses to discern and respond to any adverse effects to wildlife or habitats. Monitoring costs are associated with and included in biological strategies rather than herein for wildlife observation and photography. Based on the best knowledge of managers, no additional adverse effects are expected from providing these two priority uses.

Public Review and Comment:

Wildlife observation and photography were discussed at two public meetings held in conjunction with the Comprehensive Conservation Plan process. To initiate the CCP process, a Notice of Intent was published in the Federal Register on January 29, 2007. Written comments were solicited from the public about the refuge's operations including public use programs such as wildlife observations and photography. Three CCP planning updates and one planning workbook were prepared to summarize the progress of the CCP and to discuss issues related to the planning process. This compatibility determination was submitted for public review and comment as an appendix to the Draft Comprehensive Conservation Plan/Environmental Assessment for the Humboldt Bay National Wildlife Refuge Complex. No comments were received on this compatibility determination.

Determination (check one below):

_ Use is Not Compatible

__X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Access is limited to walking on designated trails, beach, public roads, and parking lots between sunrise and sunset daily.
2. Camping, overnight use, and fires are prohibited.
3. Harassment of wildlife or excessive damage to vegetation is prohibited.
4. Information on the impacts of disturbance to wildlife and habitat will be made available to the public on a consistent and ongoing basis. Regulations and wildlife friendly behavior (e.g. requirements to stay on designated trails, no dogs, etc.) will be described in brochures and posted at the Visitor's Station.
5. Biological inventories will be conducted to provide baseline information for measuring change. If monitoring and evaluation of the area indicate that there is significant impact or reduction in wildlife use, appropriate action can be taken to restore compatibility, including modifying or discontinuing the use.
6. Signs will be posted at areas closed to the public. Adequate areas would be designated as wildlife sanctuary with no or limited public use activities to provide high quality habitat for feeding, resting, and nesting.

Justification:

The National Wildlife Improvement Act of 1997 (Pub. L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Where these uses have been determined compatible, they are to receive enhanced consideration over other uses in planning and management.

These uses have been determined compatible because wildlife viewing and photography will not materially interfere with or detract from unit purposes. The continuation of these programs will support the refuge goal of fostering a broader understanding of the value of wildlife conservation. The level of use for wildlife observation and photography is moderate compared with many other refuges in California. The associated disturbance to wildlife is temporary and minor. Under those conditions, the staff does not expect them to materially interfere with or detract from the mission of the System or diminish the purposes for which the refuge was established; nor do we expect them to cause significant adverse effects on refuge resources or cause undue administrative burden.

Mandatory Re-Evaluation Date: (provide month and year for "allowed" uses only)

_____X_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

_ X__Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36.

Burger, J. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation. 21:231-241.

Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. Environmental Conservation. 13:123-130.

Erwin, R. M. 1980. Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance. Biological Conservation. 18:39-51.

Gutzwiller, K.J., R.T. Wiedenmann, and K.L. Clements. 1997. Does human intrusion alter the Seasonal timing of avian song during breeding periods? Auk. 114:55-65.

Havera, S.P., L.R. Boens, M.M. Georgi, and R.T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. Wildlife Society Bulletin. 20:290-298.

Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. Wildlife Society Bulletin. 19:248-257.

Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. Wildlife Society Bulletin. 21:31-39.

McNeil, R., P. Drapeau, and J.D. Goss-Custard. 1992. The occurrence and adaptive significance of nocturnal habitats in waterfowl. Biological Review. 67:381-419.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications. 8(1) 162-169.

Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. Journal of Wildlife Management. 53:401-410.

Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl. 24:123-130.

Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management. Wildfowl. 31:151-157.

Refuge Determination for Wildlife Observation and Photography for Humboldt Bay NWR:

Prepared by:	P.M. Clifford, previously with Humboldt Bay NWR (Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	10/18/09 (Date)
Concurrence:		
Refuge Supervisor:	Dan Wadsworth (Signature)	10/23/09 (Date)
Assistant Regional Director - Refuges:	Margaret J. Kolar (Signature)	11/12/09 (Date)

Compatibility Determination for Recreational Boating for Humboldt Bay NWR

Use: Recreational Boating

Refuge Name: Humboldt Bay National Wildlife Refuge, Humboldt Bay National Wildlife Refuge Complex

County and State: Humboldt County, California.

Establishing and Acquisition Authority(ies):

Humboldt Bay NWR was established under the authority of The Migratory Bird Conservation Act of 1929, The Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and The Endangered Species Act of 1973.

Refuge Purpose(s):

According to these authorities, Humboldt Bay NWR's purposes are:

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... as Waterfowl Production Areas subject to... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. §§ 460k-1 and "... the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ....or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:

"The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966)

Description of Use(s):

The Humboldt Bay NWR (refuge) proposes to continue to allow motorized and non-motorized recreational boating in all bay waters including Hookton Slough, White Slough, Mad River Slough and Humboldt

Bay. Recreational boating use addressed in this compatibility determination is for motorized and non-motorized boats, including kayaks and canoes. Although boating is not a wildlife-dependent public use, it does facilitate other wildlife-dependent uses such as hunting, fishing, wildlife observation, photography and environmental education.

The Hookton Slough Unit non-motorized boat launch is currently open to public use daily from sunrise to sunset. Permits are not required from the refuge for this public use. There are several staff guided canoe/kayak trips each year. There are also boat launches off the refuge on Lanphere Road and Samoa Highway where the roads cross Mad River Slough that are continuously open. Boat accessibility to the sloughs and Humboldt Bay is often determined by the tides.

Canoeing and kayaking use of the bay and sloughs have increased significantly in this area and recreational boating allows the public to observe wildlife and habitats from a unique vantage point. The refuge has an Americans with Disabilities Act (ADA) compliant non-motorized boat launch at the Hookton Slough Unit which provides access to natural areas of Humboldt Bay to the mobility impaired public.

Availability of Resources:

The following funding/annual cost would be required to administer and manage boating activities as described above:

Facilities

Material/Facility Proposed	**Explanation of Need**	**Cost** (approximate)
Maintenance of non-motorized boat launch at Hookton Slough Unit	Necessary to provide safe and functional facility	$500 annually
Signage/Outreach	Inform public on appropriate use, safety, and habitat protection, brochures, interpretive displays	$250 annually
Total:		**$750 annually**

Anticipated Impacts of the Use(s):

Humboldt Bay NWR provides crucial foraging and resting habitat for wintering migratory birds, including waterfowl, shorebirds, seabirds, and other waterbirds. Recreational boating affects their use of refuge and other bay waters. Boating activity, both motorized and non-motorized, can alter distribution, reduce use of particular habitats or entire areas by waterfowl and other birds, alter feeding behavior and nutritional status, and cause premature departure from areas (Knight and Cole 1995). More sensitive species may find it difficult to secure adequate food or loafing sites as their preferred habitat becomes fragmented and recreation-related disturbances increase (Skagen et al. 1991, Pfister et al. 1992). During migration and wintering Pacific brant can be considered obligate feeders on eelgrass. Because of this and the fact that there are relatively few locations along the Pacific coastline which sustain large eelgrass beds, Humboldt Bay is one of the three most important locations on the U.S. west coast for brant. Approximately 60% of the Pacific flyway brant population spends some period of time each year at Humboldt Bay. Because the majority of brant use occurs between January and mid-April when the weather is fairly severe, it is expected that disturbance will be minimal because few recreational boaters are on the bay at that time.

Another species with the potential to be impacted by boaters are the double-crested cormorants that nest in a colony along the remaining dike on the northeast side of Teal Island. However, aerial survey data collected on this colony in recent years does not indicate any decline in nests or total numbers of cormorants.

A third species that could be impacted is the harbor seal. Harbor seals haulout and bear their pups on bay tideflats, often adjacent to large channels. Harbor seals are afforded protection under the Marine Mammal Protection Act of 1972.

Canoes and kayaks can cause significant disturbance effects based on their ability to penetrate into shallower areas of a marsh or estuary (Speight 1973, Knight and Cole 1995). Canoes or slow-moving boats have been observed to disturb great blue herons (Vos et al. 1985). Huffman (1999) found that non-motorized boats within 30 meters of the shoreline in south San Diego Bay caused all wintering waterfowl to flush between the craft and shore. However, compared to motorboats, canoes and kayaks appear to have less disturbance effects on most wildlife species (Huffman 1999, DeLong 2002). The overall effects to wildlife should not be significant, because we expect most of the refuge lands will experience relatively light public use. However, monitoring should be done to: 1) establish a baseline of non-motorized boat use on different areas of the bay which either do or are expected to receive the highest use, and 2) compare with previous data collected on brant and harbor seal use of South Bay.

Public Review and Comment:

To initiate the CCP process, a Notice of Intent was published in the Federal Register on January 29, 2007. Written comments were solicited from the public about the refuge's operations including public use programs such as wildlife observations and photography. The shellfish growers, Humboldt Bay Harbor Recreation and Conservation District (HBHRCD), and California Department of Public Health expressed concerns over water quality during the public scoping for the CCP/EA. Five CCP planning updates and one planning workbook were prepared to summarize the progress of the CCP and to discuss issues related to the planning process. This compatibility determination was submitted for public review and comment as an appendix to the Draft CCP/EA for the Humboldt Bay National Wildlife Refuge Complex. The shellfish growers, HBHRCD, the California Coastal Commission, Humboldt County Department of Environmental Health (DPH), and the Environmental Protection Agency are included on the CCP/EA mailing list and received notification of availability of the Draft CCP/EA for review and comment. Two shellfish growers submitted comments about potential impacts (increased potential for contamination) to water quality by potentially increased numbers and/or concentrations of boaters, particularly in the lower Mad River Slough area where their operations are concentrated. The California Department of Public Health also submitted comments on the Draft CCP/EA regarding water quality and non-motorized boating. The comments are addressed in Appendix S. Due to the aforementioned water quality concerns and elevation at mid and lower tides, the Mad River Slough site was not a priority location for a boat ramp. A boat ramp at Ma-le'l Dunes is not proposed as a part of the CCP or the Ma-le'l Dunes Cooperative Management Area and Public Access Plan.

Determination (check one below):

___ Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Monitoring of boating activities and associated effects on waterfowl (especially brant), waterbirds, other migratory birds, and harbor seals will be conducted to compare against previous use data for brant and harbor seals. Monitoring data will be used by the refuge to evaluate impacts.

2. Coordination with other agencies such as the CA Dept. of Fish and Game, CA Dept. of Public Health, Humboldt Bay Harbor, Recreation and Conservation District and shellfish growers as well as boating groups such as Explore North Coast and other interested businesses and individuals regarding issues such as water quality and disturbance.

3. Environmental interpretive displays/brochures will be developed to educate the public about the potential effects of boating on sensitive habitats, wildlife and water quality.

5. Boaters must abide by the State boating regulations.

Justification:

Boating itself is not considered wildlife-dependent recreation, but many wildlife-dependent recreational activities (fishing, waterfowl hunting, environmental education, interpretation, and wildlife observation/

photography) are associated with boating. Providing opportunities for wildlife-dependent priority public uses would contribute toward fulfilling provisions under the National Wildlife Refuge System Administration Act as amended in 1997. Although boating has a potential to impact wetlands and wildlife, implementing the prescribed measures listed in the Stipulations section will minimize these impacts. It is anticipated that an adequate amount of estuary habitat would be available to the majority of waterfowl and other wetland birds because some high wildlife use areas will be closed to boating, and boating regulations would be maintained and enforced. Thus, it is anticipated that birds will find sufficient food resources and resting places such that their abundance and use of the refuge will not be measurably lessened, the physiological condition and production of waterfowl and other waterbirds will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall status will not be impaired. The refuge will also implement a monitoring program to help assess disturbance effects on wildlife and habitat. Improved outreach and educational information for refuge visitors involved in activities associated with boating would also help to reduce the impacts associated with boating activities.

Mandatory Re-Evaluation Date:

_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____X___ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

_ X__Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

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Refuge Determination for Recreational Boating for Humboldt Bay NWR:

Prepared by:	P.M. Clifford, previously with Humboldt Bay NWR (Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	10/18/09 (Date)
Concurrence:		
Refuge Supervisor:	(Signature)	11/4/09 (Date)
Assistant Regional Director - Refuges	(Signature)	11/9/09 (Date)

Compatibility Determination for Waterfowl Hunting for Humboldt Bay NWR

Use: Waterfowl hunting

Refuge Name: Humboldt Bay National Wildlife Refuge, Humboldt Bay National Wildlife Refuge Complex

County and State: Humboldt County, California.

Establishing and Acquisition Authority(ies):

Humboldt Bay NWR was established under the authority of The Migratory Bird Conservation Act of 1929, The Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and The Endangered Species Act of 1973.

Refuge Purpose(s):

According to these authorities, Humboldt Bay NWR's purposes are:

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... as Waterfowl Production Areas subject to... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. §§ 460k-1 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"...the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ....or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:

"The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."(National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-ee]).

Description of Use(s):

The Humboldt Bay NWR proposes to continue to provide opportunities for waterfowl hunting, one of the six priority uses of the National Wildlife Refuge System under the National Wildlife Refuge System Improvement Act of 1966 (16 U.S. C. 668dd-668ee) as amended by The National Wildlife Refuge System Improvement Act of 1997 (Pub.L. 105-57; 111 Stat 1252). The Refuge System Administration Act identifies hunting as one of the six wildlife-dependent recreational uses to be facilitated in the Refuge System, and the Act encourages the Service to provide opportunities for the public to enjoy them. Hunting has been a traditional form of recreation around Humboldt Bay for generations. The hunt program at Humboldt Bay NWR is small compared to many other federal wildlife refuges in California such as Sacramento NWRC or Tule Lake NWR. However, Humboldt Bay NWR provides a unique public land hunting opportunity for the citizens of Humboldt County in general and specifically for the cities of Eureka, Arcata and Fortuna. The high quality hunting resulting from a lottery draw for designated blinds offered at the Salmon Creek Unit of HBNWR is different than the other public lands open to hunting in the area, which are managed as free-roam hunt areas. During the public scoping period for the CCP (January 29 – March 15, 2007) the majority of the comments received about the hunt program supported stable or increased hunting opportunities at the refuge.

Hunting on the refuge has occurred traditionally in White Slough, Eureka Slough, Jacoby Creek, Teal Island and Table Bluff Units, and the controlled hunt area of the Salmon Creek Unit. Concurrent with implementation of the Ma-le'l Dunes Cooperative Management Agreement, on the Ma-le'l Dunes Unit hunting will be allowed on 10 acres of the Fernstrom-Root Island and retrieval will be allowed on the areas of Ma-le'l Island within the Service's jurisdiction.

The waterfowl hunt program at HBNWR takes place during the normal State waterfowl hunting season, typically lasting 100 to 107 days, usually from the third weekend in October to the last weekend in January as set by the State Commission in accordance with Federal guidelines. Hunting would continue to follow the State waterfowl season. The hunting program would be conducted at the following areas:

Salmon Creek Unit
Hunting at the Salmon Creek Unit occurs two days per week, Tuesday and Saturday from ½ hour before sunrise until 3:00 PM during the entire regular hunting season. During check in hunters will receive a daily hunting permit for their blind. Hunting blinds are selected using a lottery draw occurring 1 and 1/2 hours before legal shooting time on the morning of each hunting day. The hunting permit must be in possession of the hunter while in the field, and hunters must return their permits and report hunting results at the check station by 4:30 PM.

Teal Island
Teal Island is open to hunting Wednesdays, Saturdays, Sundays, holidays and the opening and closing days during the prescribed open season as per Section 3681 of the California Fish and Game code. Teal Island is designated as boat in access only. Hunting is permitted from the levees or from a boat blind. Teal Island may not be accessed for hunting from the Hookton Slough non-motorized boat dock; Fields Landing is the nearest public boat launch.

Jacoby Creek Unit
Jacoby Creek is open to free roam hunting 7 days a week, but the property is designated as boat in access only. No parking is allowed on FWS property. No trespass onto the banks of Jacoby Creek is permitted. Parking along Highway 101 is not recommended and the FWS assumes no responsibility or liability for hunters that choose to park along Highway 101. The Arcata Marsh has the closest public boat launching point.

Eureka Slough Unit
The Eureka Slough Unit is open to free roam hunting 7 days a week, but the property is boat in access only. Woodley Island Marina or the launch behind Target department store are the nearest public boat launches.

Table Bluff Unit
Table Bluff Unit is open to free roam hunting 7 days a week. Hunters may access the area either by boat or by walking in.

White Slough/Egret Island Unit
This area is open to hunting Wednesdays, Saturdays, Sundays, holidays and the opening and closing days during the prescribed open season as per Section 3681 of the California Fish and Game code. White Slough and Egret Island are designated as boat in access only; Fields Landing is the nearest public boat launch. Hunting and retrieval are allowed on all of the salt marsh islands but access and hunting is not allowed on any of the dikes and lands inside the dikes. Retrieval is not allowed in the Salmon Creek Unit. Shooting is not allowed within 150 yards of Highway 101 or Tompkins Hill Road.

Hookton Slough Unit
Hookton Slough is open to hunting Wednesdays, Saturdays, Sundays, holidays and the opening and closing days during the prescribed open season as per Section 3681 of the California Fish and Game code. Hookton Slough is designated as boat in access only. Boat access for hunting is not allowed from the Hookton Slough non-motorized boat dock; Fields Landing is the nearest public entry point. No shooting is allowed within 150 yards of the Hookton Slough non-motorized boat dock. All other areas of Hookton Slough Unit are closed to hunting.

Fernstrom-Root Island (Ma-le'l Dunes Unit)
Concurrent with the implementation of the Ma-le'l Dunes Cooperative Management Agreement, Fernstrom-Root Island will be open to hunting 7 days a week. Hunting but no blind construction is allowed on the portion of the Fernstrom-Root Island owned by the Service. Areas of Ma-le'l Island within the Service's jurisdiction are designated as retrieval only areas. Hunters can access Mad River Slough from the boat ramp on Lanphere Road and from Samoa Boulevard to reach Fernstrom-Root Island.

Hunting would be permitted in accordance with State and Federal regulations and seasons. The specific hunter registration and selection process is as follows:

Hunter Application and Registration Procedures at Salmon Creek Unit
A permit is required to hunt at the Salmon Creek Unit. The refuge check station opens 2 hours before Eureka legal shoot time. A random drawing for available permits takes place at the check station 1 ½ hours prior to shoot time before each daily hunt. Hunters must be present to be eligible for the draw. The refuge's controlled waterfowl hunt is operated under the Recreation Fee Program. Junior hunters (age 17 and under) must be accompanied by an adult who will assume legal responsibility of the junior hunter.

Description of Hunter Selection Process at Salmon Creek Unit

Sign in procedure:
Waterfowl hunters or groups of hunters are required to sign in at the check station in order to participate in that day's hunt. Hunters must be present to participate in the lottery draw.

When the lottery draw is complete and the numbers are posted, the check station attendant will begin filling blinds and checking in hunters in the order of the lottery draw. These numbers are also used to prioritize re-filling blinds. Hunters must present a completed permit card and their hunting license to the check station attendant. The permit must have the assigned blind number written on the permit to be valid. Hunters must have an affixed State duck stamp, an affixed HIP program stamp and be in possession of a Federal duck stamp signed by the hunter in order to hunt.

Joining up:
The first fourteen (14) lottery numbers drawn may join with any other of the first fourteen (14) draws as long as there are no more than four (4) hunters per blind. Waterfowl hunters or groups of hunters chosen after the first fourteen (14) must wait until their number is called in order to pair with other hunters. The check station attendant will continue to call numbers until all blinds are occupied. Once all blinds are occupied, no more numbers will be called.

Re-filling:
The check station attendant will assign priority numbers for re-filling available blinds based on the morning random draw and those present. Hunters must be present in order to maintain their position from the morning draw. If a hunter was not present at the morning draw they would sign in according to the "sign in procedures". Hunters would then be given a re-fill number after all other priority hunters have either taken a blind or declined to accept a blind.

When a blind has been vacated by all hunters and those hunters have checked out with the check station attendant, the blind is available to be re-filled. Re-fill one has the option of taking the blind or not taking the blind without losing position in line. If re-fill one does not take an available blind, the choice goes to priority two with the same options, so on and so forth.

Use of hunting dogs for retrieval of birds is allowed and strongly encouraged, however dogs must be under control of their owners at all times. Failure to follow any State, Federal or refuge-specific regulations may result in eviction from the refuge or a citation.

A mobility-impaired ("disabled") blind is available for mobility-impaired hunters. A "mobility-impaired hunter" is defined as: Any person who has been issued a "DMV Disabled license plate, or a permanent parking placard identification card," or a valid "Mobility Impaired Disabled Persons Motor Vehicle Hunting License" (FG form 1460). The blue plastic "Disabled Parking Placard" may not be substituted for the required "Identification card" which bears the name of the mobility-impaired person. Disabled hunters must provide the registration certificate for DMV issued disabled license plates.

Hunting is permitted from designated blind zones. Free roam hunting is not allowed. Hunters are required to remain within designated blind zones, except for retrieving downed birds. Hunter may take their firearms while retrieving downed birds, but no active hunting is allowed when outside of the designated blind zone. Firearms must be unloaded while being transported between parking areas and hunting sites. A firearm is deemed loaded when there is a live cartridge or shell in, or attached in any manner to, the firearm, including, but not limited to, the firing chamber, magazine, or clip thereof attached to the firearm. (Penal Code & 12031(g)).

Hunter Procedures at Other Refuge Units
Procedures at other units are free roam hunting in accordance with State regulations and unit specific refuge regulations as described above and in the Humboldt Bay NWR Sport Hunting Plan (Appendix C of the CCP).

Availability of Resources:

The estimated annual cost to administer the hunt program is $25,500. Within the annual refuge budget the necessary funds are available for this work. The refuge also participates in the Recreational Fee Program, which offsets some costs of the hunting program.
To regulate the hunting activities on the refuge the following staffing and equipment would be required:

Equipment

Type of Equipment	Explanation of Need	Cost
Pit blind modification	Prevent strandings of wildlife	$500
Modify harvest record card	Improve hunt program record keeping	$500
Sign posting/improvement	Educate public	$1,000
Maps/brochures	Improve interpretation and outreach	$1,000
Total Cost for Equipment (one-time cost)		**$3,000**

Staffing

Position	Involvement	FTE	Cost
Project Leader	General oversight & budget	0.05	$2.5K
Assistant Refuge Manager	Periodic on-site oversight	0.05	$2.5K
Heavy Equipment Operator	Hunt Area management/maintenance	0.05	$2.5K
Visitor's Service Assistant	Planning and implementation of Hunt Program	.2	$5K
Law Enforcement Officer		0.05	$2.5K
Temporary hire	Staff hunt check station	0.2	$7.5K
Total FTEs and Costs for Staffing		**.6**	**$25.5K**

Based on the refuge's current staffing level, adequate staff to patrol and monitor waterfowl hunting activity on the refuge is available to support the proposed use.

Anticipated Impacts of the Use(s):

The hunting of geese, ducks, coots, common moorhens, and snipe would be allowed under the refuge's Hunt Program. Direct effects of hunting include mortality, wounding, and disturbance (DeLong 2002). Hunting can alter behavior (i.e. foraging time), population structure, and distribution patterns of wildlife (Owens 1977, Raveling 1979, White-Robinson 1982, Thomas 1983, Bartelt 1987, Madsen 1985, and Cole and Knight 1990). There also appears to be an inverse relationship between the numbers of birds using an area and hunting intensity (DeLong 2002). In Connecticut, lesser scaup were observed to forage less in areas that were heavily hunted (Cronan 1957). In California, the numbers of northern pintails on Sacramento Refuge non-hunt areas increased after the first week of hunting and remained high until the season was over in early January (Heitmeyer and Raveling 1988). Following the close of hunting season, ducks generally increased their use of the hunt area; however, use was lower than before the hunting season began. Human disturbance associated with hunting includes loud noises and rapid movements, such as those produced by shotguns and boats powered by outboard motors. This disturbance, especially when repeated over a period of time, compels waterfowl to change food habits, feed only at night, lose weight, or desert feeding areas (Madsen 1995, Wolder 1993).

These impacts can be reduced by the presence of adjacent sanctuary areas including adjacent wetlands and pastures, the White Slough, Hookton Slough and Salmon Creek Unit Closed Zones, and the Ma-le'l Dunes Unit closed zones where hunting does not occur and birds can feed and rest relatively undisturbed. Sanctuaries or non-hunt areas have been identified as the most common solution to disturbance problems caused from hunting (Havera et. al 1992). Prolonged and extensive disturbances may cause large numbers of waterfowl to leave disturbed areas and migrate elsewhere (Madsen 1995, Paulus 1984). In Denmark, hunting disturbance effects were experimentally tested by establishing two sanctuaries (Madsen 1995). Over a 5-year period, these sanctuaries became two of the most important staging areas for coastal waterfowl. Numbers of dabbling ducks and geese increased 4 to 20 fold within the sanctuary (Madsen 1995). Thus, sanctuary and non-hunt areas are very important to minimize disturbance to waterfowl populations to ensure their continued use of the refuges.

Intermittent hunting can also be a means of minimizing disturbance, especially if rest periods in between hunting events are weeks rather than days (Fox and Madsen 1997). It is common for refuges to manage hunt programs with non-hunt days. At Sacramento Refuge, 3-16 percent of pintails were located on hunted units during non-hunt days, but were almost entirely absent in those same units on hunt days (Wolder 1993). In addition, northern pintails, American wigeon, and northern shovelers decreased time spent feeding on days when hunting occurred on public shooting areas, as compared to non-hunt days (Heitmeyer and Raveling 1988). The intermittent hunting per week at Sacramento Refuge results in lower pintail densities on hunt areas during non-hunt days than non-hunt areas (Wolder 1993). However, intermittent hunting may not always greatly reduce hunting impacts.

Hunting is a highly regulated activity, and generally takes place at specific times and seasons (fall and winter) when the game animals are less vulnerable. Managed and regulated hunting will not reduce species populations to levels where other wildlife-dependent uses will be affected.

Hunting is an appropriate wildlife management tool that can be used to manage wildlife populations. Some wildlife disturbance will occur during the hunting seasons. Proper zoning, regulations, and restrictions of days hunted per week at some units from the State regulations will be designated to minimize any negative impacts to wildlife populations using the refuges. Harvesting permitted species would not result in a substantial decrease in biological diversity on the refuge.

Through a quality hunting program, the public can gain a deeper appreciation of wildlife and an enhanced understanding of the importance of conserving habitat, which ultimately contributes to the Refuge System mission. A priority for the refuge is to offer a safe and enjoyable hunting program and to minimize any potential adverse impacts.

Hunting will have a number of short-term impacts on refuge resources. Three impacts we expect are minor damage to vegetation, increased amounts of litter, and some minor disturbance to wildlife by dogs used for retrieval purposes. Other wildlife may be present and hunting will disturb some of them. The impacts will be minor given the percentage of refuge lands open to hunting is only approximately 20 percent; hunters are spaced apart and restricted in their movements at the Salmon Creek Unit, which receives the most impact; and the limiting of hunting days to two per week at the Salmon Creek Unit and three per week at the Hookton Slough and White Slough Units.

Recreational hunting will remove individual animals, but does not typically have a significant negative effect on wildlife populations. To ensure that populations are sustainable, the Service, state wildlife agencies, and federal and provincial governments in Canada have long-term cooperative programs that monitor breeding-population status, harvest levels, production, migration, and other parameters utilized for regulating waterfowl harvests, managing the populations at the flyway level (rather than refuge by refuge). The process of regulating harvests involves a lengthy sequence of public involvement and decision making and participation by the Service, state wildlife agencies, and the Canadian and Mexican governments. It culminates in regulations being set at the flyway level (season lengths, daily bag limits, and outside dates for the earliest opening and latest closing dates for a hunting season) and special regulations at the state level (e.g., split seasons, harvest zones, special seasons, area closures).

The Service does not expect waterfowl hunting to have an adverse effect on the long-term sustainability of migratory bird populations that are hunted. All of the specific regulatory decisions on hunting migratory birds are revisited annually and the regulations are adjusted based on the observed status and trends of the species/population at issue. Thus, changes in species status due to hunting and factors other than hunting (e.g., climate change, disease, catastrophic weather events) would be taken into account and addressed in the subsequent year's hunting regulations. Therefore, the Service has concluded that waterfowl hunting on NWRs does not constitute a significant cumulative effect on waterfowl populations.

Based on the above, the anticipated waterfowl harvest from the refuge hunting program will have negligible cumulative effects on overall populations of waterfowl and other non-target species. An adequate amount of non-hunting areas will be maintained to support current refuge waterfowl populations and to withstand the cumulative effects of off-refuge hunting programs.

The proposed hunt program is intended to minimize conflicts with other wetland-dependent species (e.g. special status species) through education, monitoring and limiting hunt days and times. Potential biological conflicts include flushing other migratory and resident birds from areas being hunted or the take of non-target species either by mistake or willfully. Minor adverse impacts to wildlife or habitats are anticipated from dogs used for retrieval since they will be under the control of their owners at almost all times.

Because Humboldt Bay is a shared waterway, conflicts may arise among hunters and recreational boaters or anglers. However conflicts among those users should be minimal. Hunting, including the sound of gunfire, does disturb some of our residential neighbors and other refuge users, but we attempt to mitigate that by outreach and by restricting the days and times when we permit hunting. We work with other local, state, and federal law enforcement organizations to provide an increased presence during the hunting season.

Public Review and Comment:

Waterfowl hunting was discussed at two public meetings held in conjunction with the Comprehensive Conservation Plan Process. To initiate the CCP process, a Notice of Intent was published in the Federal Register on January 29, 2007. Written comments were solicited from the public about the refuge's operations including public use programs such as wildlife observations and photography. Five CCP planning updates and one planning workbook were prepared to summarize the progress of the CCP and to discuss issues related to the planning process. This compatibility determination was submitted for public review and comment as an appendix to the Draft Comprehensive Conservation Plan and Environmental Assessment for the Humboldt Bay National Wildlife Refuge Complex. No comments were received on this compatibility determination. Hunting-related comments on other parts of the Draft CCP/EA and appendices are addressed in Appendix S.

Determination (check one below):

___ Use is Not Compatible

_X_ Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Waterfowl hunting programs have been conducted for many years and the special regulations, restrictions, and general operations have been structured to ensure compatibility. If the monitoring described under Availability of Resources indicates that this use materially interferes with or detracts from fulfillment of the National Wildlife Refuge System mission or the purposes of the refuge, we would curtail or eliminate the use. The hunting of geese, ducks, coots, common moorhens and snipe during the waterfowl season as determined by the State on designated areas of the refuge is subject to the following conditions:

1. Hunters must possess a valid hunting license, an affixed State duck stamp, a signed Federal duck stamp and an affixed Harvest Information Program (HIP) stamp.

2. Hunting hours will coincide with California State Regulations.

3. Non-Toxic shot is required on all refuge units. Shot size is restricted to no larger than "T" for steel shot and "BB" for all other non-toxic shot.

4. Only firearms meeting California State regulations and Department of Fish and Game Regulations relating to waterfowl hunting (DF&G Code Section 507 (a)) are permitted.

5. No person may build or maintain fires.

6. When not hunting, dogs must be in vehicles or on a leash and kept under control at all times. Dogs are not allowed to enter closed areas for any reason.

7. Hunters may use only portable blinds or temporary blinds constructed of natural materials. Hunters must dismantle or remove all blinds from the refuge after each days hunt. No cutting or removal of vegetation for blind construction or for making trails is permitted.

8. Vehicle parking is permitted only in designated areas.

9. Hunters must remove all decoys, shotshell casings and other personal equipment from the refuge following each day's hunt. Littering is unlawful.

10. Possession or use of alcohol is prohibited on National Wildlife Refuges.

11. The refuge will annually review all hunting activities and operations to ensure compliance with all applicable laws, regulations, and policies.

12. Refuge specific hunting information will be available via brochures and the refuge website.

13. The refuge staff will monitor hunting activity in the field to assure that it does not interfere with other wildlife-dependent uses.

14. Commercialized guiding is not allowed.

15. Access is by foot or boat only. Bicycles or other conveyances are not allowed. Mobility impaired hunters should consult with the Refuge Manager for allowed conveyances.

Justification:

The National Wildlife Refuge System Improvement Act of 1997 (Pub. L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Where these uses have been determined compatible, they are to receive enhanced consideration over other uses in planning and management.

Migratory waterfowl hunting will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

The Migratory Bird Conservation Act of 1929, which established inviolate sanctuaries, was amended by the National Wildlife Refuge System Administration Act of 1966. This amendment authorized up to 40 percent of an area acquire for a migratory bird sanctuary to be opened to migratory bird hunting.

Mandatory Re-Evaluation Date: (provide month and year for "allowed" uses only)

_____X_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

__X__Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

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Refuge Determination for Waterfowl Hunting for Humboldt Bay NWR:

Prepared by:	P.M. Clifford, previously with Humboldt Bay NWR (Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	10/18/09 (Date)
Concurrence:		
Refuge Supervisor:	(Signature)	11/4/09 (Date)
Assistant Regional Director - Refuges:	Margaret J. Kolar (Signature)	11/12/09 (Date)

Compatibility Determination for Fishing for Humboldt Bay NWR

Use: Fishing

Refuge Name: Humboldt Bay National Wildlife Refuge, Humboldt Bay National Wildlife Refuge Complex

County and State: Humboldt County, California.

Establishing and Acquisition Authority(ies):

Humboldt Bay NWR was established under the authority of The Migratory Bird Conservation Act of 1929, The Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and The Endangered Species Act of 1973.

Refuge Purpose(s):

According to these authorities, Humboldt Bay NWR's purposes are:

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... as Waterfowl Production Areas subject to... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. §§ 460k-1 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"...the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ....or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:

"The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge Administration Act of 1966, as amended [16 U.S.C.668dd-ee])

Description of Use(s):

Sport fishing (hereafter refered to as "fishing") is currently allowed on the Humboldt Bay NWR (refuge). The Service proposes to continue to allow fishing, which is one of the six priority uses of the National Wildlife Refuge System under the National Wildlife Refuge System Improvement Act of 1966 (16 U.S. C. 668dd-668ee) as amended by The National Wildlife Refuge System Improvement Act of 1997 (Pub.L. 105-57; 111 Stat 1252). The Refuge System Administration Act identifies fishing as one of the six wildlife-dependent recreational uses to be facilitated in the Refuge System, and the Act encourages the Service to provide opportunities for the public to enjoy them.

Public fishing will continue to be permitted on navigable waters of Humboldt Bay that fall within the existing refuge boundary. Most fishing in Humboldt Bay will occur from boats on the navigable waters. Fishing will also be permitted from the outer levee of the Hookton Slough Unit, west of the designated parking lot. This area is known as the "Hookton Slough Shoreline Fishing Trail.

Under the Preferred Alternative (Alternative C), in the CCP, we would increase fishing opportunities for visitors by providing fishing access at the Ma-le'l Dunes Unit. Fishing would be opened to the public at the Ma-le'l Dunes Unit at the end of the railroad berm trail, for pedestrian access only. Boaters can also access Mad River Slough from the existing boat launch points on Lanphere Road or from Samoa Blvd. These points are not on refuge property.

Fishing will follow the California Department of Fish and Game's Ocean Sport Fishing Regulations. Fishing will be allowed at the Hookton Slough Unit along the Hookton Slough Shoreline Fishing Trail during daylight hours. Fishing at the Ma-le'l Dunes Unit will be allowed during daylight hours.

Fishing would be conducted in accordance with refuge regulations that apply to all visitors: e.g., no littering, no pets, no feeding or disturbing wildlife or venturing into closed areas. Game fish species to be allowed for legal take will include all native and introduced species listed in the California Ocean Sport Fishing Regulations. Fishing will be permitted in accordance with State and Federal regulations to ensure it will not interfere with conservation of fish and wildlife and their habitats.

1. Fishing is permitted on designated areas of Humboldt Bay NWR subject to the following conditions:
2. Fishing from the designated Hookton Slough Shoreline Fishing Trail and Hookton Slough non-motorized boat dock is permitted during daylight hours only.
3. Only the use of pole and line or rod and reel is permitted while fishing on the refuge.
4. Fishing at Ma-le'l Dunes is pedestrian access only, during daylight hours.
5. Use or possession of alcohol is prohibited on refuge property, as is littering.

Availability of Resources:

The costs of managing the fishing program are minimal, and consist primarily of posting and maintaining "Public Fishing Area" signs and including fishing information in the refuge brochure and website. Necessary funds are available for this work within the annual budget of the refuge. There will be no facilities developed or managed specifically for the use of anglers.

Anticipated Impacts of the Use(s):

Fishing as a solitary and stationary activity tends to be less disturbing to wildlife than hunting or boating (Tuite et al. 1983). Fishing may result in increased problems with vandalism and litter such as discarded monofilament line and tackle. Other potential impacts of fishing from motorized boats are the spills of gasoline and motor oil, the release of toxic fumes into the water, and litter that may injure wildlife species.

Sport fish also provide food for many wildlife species, including terns, gulls, wading birds, osprey, and waterfowl. The amount of angling that occurs on refuge waters is not likely to reduce the prey base for those species significantly. The removal of adult fish that prey on forage fish similar to those eaten by bird species may reduce competition for prey, but the removal of adult fish of breeding age may reduce the amount of forage fish (i.e., fewer sport fish fry and juveniles available for fish-eating birds).

Public Review and Comment:

Fishing was discussed at two public meetings held in conjunction with the Comprehensive Conservation Plan process. To initiate the CCP process, a Notice of Intent was published in the Federal Register on January 29, 2007. Written comments were solicited from the public about the refuge's operations including public use programs such as wildlife observations and photography. Five CCP planning updates and one planning workbook were prepared to summarize the progress of the CCP and to discuss issues related the planning process. This compatibility determination was submitted for public review and comment as an appendix to the Draft Comprehensive Conservation Plan and Environmental Assessment for the Humboldt Bay National Wildlife Refuge Complex. No comments were received on this compatibility determination.

Determination (check one below)**:**

___ Use is Not Compatible

_X_ Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Fishing will be permitted at Humboldt Bay NWR with the following stipulations:

- Littering regulations will be strictly enforced;
- Use or possession of alcohol while fishing will be prohibited;
- Parking areas, roads, and related access facilities will be maintained as necessary to ensure public safety and to prevent erosion or habitat damage;
- No building or maintaining of fires will be permitted on the refuge;
- Anglers using boats on the refuge (motorized boats launched from access points around the bay other than the Hookton Slough non-motorized boat dock and non-motorized boats) must abide by the boating stipulations described in the State and Coast Guard regulations on boating;
- Fishing will be allowed during daytime hours only;
- Opportunistic monitoring of fishing program and enforcement by Bureau of Land Management Rangers will encourage compliance with regulations.

The Refuge Manager will have the authority to close certain areas during critical wildlife use periods and cancel any activities deemed necessary to fulfill refuge purposes or ensure visitors' safety. Sensitive nesting areas will be protected from disturbance by visitors with signs and barriers. Visitors will be directed away from areas where major habitat restoration or management projects are under way.

Justification:

Fishing is a priority wildlife-dependent visitor use provided for in the National Wildlife Refuge System Improvement Act of 1997. By facilitating this use on the refuge, we hope to increase the visitors' knowledge and appreciation of fish and wildlife, which may lead to increased public stewardship of wildlife and their habitats on the refuge. Increased public stewardship will support and complement the Service's actions in achieving the refuge's purposes and the mission of the National Wildlife Refuge System. This program as described is determined to be compatible and will not conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge.

Mandatory Re-Evaluation Date:

_____X_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

_ X__Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

Tuite, C.H., M. Ownen, and D. Paynther. 1983. Interaction between wildfowl and recreation at Llangorse Lake and Talybont Resevoir, South Wales. Wildfowl 34:48-63

Refuge Determination for Fishing for Humboldt Bay NWR:

Prepared by:	P.M. Clifford, previously with Humboldt Bay NWR (Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	10/18/09 (Date)
Concurrence:		
Refuge Supervisor:	Dan Walsworth (Signature)	11/4/09 (Date)
Assistant Regional Director - Refuges	Margaret J. Nolan (Signature)	11/12/09 (Date)

Compatibility Determination for Grazing and Haying for Humboldt Bay NWR

Use: Grazing and Haying

Refuge Name: Humboldt Bay National Wildlife Refuge, Humboldt Bay National Wildlife Refuge Complex

County and State: Humboldt County, California.

Establishing and Acquisition Authority(ies):

Humboldt Bay National Wildlife Refuge (NWR) was established under the authority of The Migratory Bird Conservation Act of 1929, The Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and The Endangered Species Act of 1973.

Refuge Purpose(s):

According to these authorities, Humboldt Bay NWR's purposes are:

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... as Waterfowl Production Areas subject to... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. §§ 460k-1 and "... the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ....or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:

"The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."(National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-ee]).

Description of Use(s):

The use is grazing and haying. It is not a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee) as amended by the National Wildlife Refuge System Improvement Act of 1997. Although not a priority use, managing a

certain amount of vegetation at the Humboldt National Wildlife Refuge (refuge) through grazing and haying provides habitat in the form of water, food, cover, breeding areas, rearing areas, and sanctuary for a variety of wildlife including migratory birds, waterfowl and shorebirds. Diked areas of the Salmon Creek Unit were primarily used for cattle production from about the turn of the century until 1988. Grazing of the short-grass pasture areas provides habitat primarily for the recently increasing population of Aleutian cackling geese, as well as American wigeon, tundra swans, and many species of shorebirds.

The Service proposes to continue to use grazing and/or haying as a tool for vegetation and wildlife habitat management in the short-grass pasture areas of the Salmon Creek Unit. Grazing and/or haying may be conducted periodically (seasonally) each year. The specified time is determined by the refuge and the cooperator to meet target habitat conditions. Currently the refuge has an agreement with two cooperators to operate on the Salmon Creek Unit.

Grazing (by cattle) and haying would be conducted annually for a specified period (i.e., seasonally) to manage vegetation for native plant and wildlife habitat. The timing is somewhat dictated by growing conditions and other factors but is generally from late April/early May through October.

Grazing and haying are administered with cooperator(s) under a U.S. Fish and Wildlife Service Cooperative Land Management Agreement (CLMA). The CLMA serves as an annual grazing/haying plan and states provisions for habitat objectives, expected wildlife benefits, and operating rules, regulations, and reporting requirements. The CLMA prescribes expected habitat conditions (vegetation height), livestock turn-in/turn-out dates and Animal Unit Months (AUM). The grazing plan has built-in flexibility due to the uncertainties of annual and seasonal precipitation and climate, flooding, and the consequent effect on vegetation growth. This is to insure that expected conditions are met and that refuge vegetation is neither over-grazed nor under-grazed, both conditions result in degraded habitat. Because conditions change during the course of a season, regular monitoring by refuge staff is required.

Availability of Resources:

The grazing and haying program is administered by refuge staff who identify the desired objectives of the program, prepare the CLMA, and provide coordination for cooperators as well as compliance monitoring. The cooperator is generally responsible for the cost of installation and/or maintenance of all range improvements associated with program activities. Refuge operational funds are currently available through the Service budget process to administer this program.

Anticipated Impacts of Use:

Grazing by native wildlife species has long occurred in the California landscape where it has shaped its botanical and zoological resources (Edwards 1992; Edwards 1996). Currently, livestock grazing is an important method of vegetation management (Barry 2003; Griggs 2000). The grazing/haying program results in both long and short term impacts, both negative and positive. Negative impacts to wildlife resources can result from: trampling or mowing of desirable vegetation and/or wildlife, disturbances to ground nesting species, fencing that may restrict the movement of large animals, the introduction of non-native or invasive plan species seeds or propagules, and soil compaction especially during wet periods. Adverse impacts can be mitigated by moving equipment slowly, so most wildlife moves away from oncoming equipment, and using single wire fencing, which wildlife can easily go under or over.

Conversely, short and long term positive impacts to refuge habitat and wildlife can result from a well managed grazing/haying program. Primary benefits associated with the grazing/haying program include: an overall reduction of undesirable, non-native vegetation, the creation and maintenance of short-cropped foraging habitat for wintering and migratory birds, especially Aleutian cackling geese, swans and shorebirds.

Overall, seasonal grazing/haying would improve plant species composition and structure so that short-term impacts to wildlife and habitat would be mitigated by long-term benefits to refuge vegetation and overall wildlife habitat quality. Therefore, there would be a net long-term benefit to habitat for migratory birds and resident deer herds.

Public Review and Comment:

To initiate the CCP process, a Notice of Intent was published in the Federal Register on January 29, 2007. In February 2007, three scoping meetings were held, one in Crescent City, one in Eureka, and one in Bayside to receive input from the public on issues related to the management of the Humboldt Bay National Wildlife Refuge. Five CCP planning updates and one planning workbook were prepared to summarize the progress of the CCP and to discuss issues related to the planning process. This compatibility determination was submitted for public review and comment as an appendix to the Draft Comprehensive Conservation Plan and Environmental Assessment for the Humboldt Bay National Wildlife Refuge Complex.No comments were received on this compatibility determination. No comments were received on this compatibility determination.

Determination (check one below)**:**

_____Use is Not Compatible

___X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. The Cooperator will operate under the terms and conditions of a Cooperative Land Management Agreement. This document provides the necessary information and assistance from the refuge to determine periods of use and stocking rates.

2. Refuge staff will set the value of grazing/haying so as to reflect current fair market values, monitor Cooperator compliance, and maintain complete files on all grazing/haying activities.

3. Grazing/haying would not be allowed in sensitive natural or cultural areas.

4. All cooperators shall secure a signed special use permit for refuge cooperators assisting Humboldt Bay NWR in habitat and land management.

5. The annual agreement between the cooperating parties shall include a description of how the special use meets the management objectives of the refuge.

6. Grazing is conducted in accordance with the special use permits, which include special conditions that specify timing of grazing, location(s) of grazing, stocking densities, types of livestock permitted, access locations, predator management restrictions, and personnel and equipment allowed. The specific conditions may vary annually due to differences in objectives, habitat conditions, and weather.

7. Cooperators are required to arrive with clean equipment free of exotic plant or animal matter that may introduce invasive species to the refuge. Refuge staff may inspect livestock home pasture sites for the presence of weed species and may require a 48-hour quarantine with certified weed-free feed prior to livestock arrival at the refuge.

Justification:

This program as described is determined to be compatible. Based upon impacts described in the Draft Comprehensive Conservation Plan and Environmental Assessment (USFWS 2009), it is determined that grazing and haying within the Humboldt Bay National Wildlife Refuge, as described herein, will not materially interfere with or detract from the purposes for which the refuge was established and the mission of the Refuge System. Refuge livestock grazing and haying by cooperators will directly support refuge goals, objectives and management plans and activities. Fish, wildlife, plants and their habitat will improve through vegetation management which will result in short-term and long-term reductions of non-native invasive species, increases in biomass and improved foraging conditions for migratory birds and local deer herds. Consequently, the livestock grazing and haying program would maintain biological integrity, diversity and environmental health. The wildlife-dependent, priority public uses (wildlife viewing and photography, environmental education and interpretation, fishing and hunting) would also benefit as a result of improved habitat conditions for wildlife associated with the grazing program. In our opinion grazing and

haying will not conflict with the national policy to maintain biological diversity, integrity, and environmental health of the refuge.

Mandatory Re-Evaluation Date:

_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____X_____Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

_ X__Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

Barry, S. 2003. Using planned grazing to manage for native grasslands. Pages 1-10, in Section 14, Grazing. Techniques and Strategies for Using Native Grass and Graminoids in Revegetation and Restoration. California Native Grass Association.

Edwards, S.W. 1992. Observations on the prehistory and ecology of grazing in California. Fremontia 20(1):3-11.

Edwards, S.W. 1996. A rancholabrean-age, latest Pleistocene bestiary for California botany. The Four Seasons 10(2):5-34.

Griggs, F.T. 2000. Vina Plains Preserve: eighteen years of adaptive management. Fremontia 27(4) & 18(1): 48-51.

U.S. Fish and Wildlife Service (USFWS). January 2009. Humboldt Bay National Wildlife Refuge Complex, Draft Comprehensive Conservation Plan and Environmental Assessment. Refuge Planning, California and Nevada Region, USFWS, Sacramento, CA and Humboldt Bay National Wildlife Refuge Complex, USFWS, Loleta, CA.

Refuge Determination for Grazing and Haying for Humboldt Bay NWR:

Prepared by:	P.M. Clifford, previously with Humboldt Bay NWR (Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	10/28/09 (Date)
Concurrence:		
Refuge Supervisor:	Dan Wahwatt (Signature)	10/23/09 (Date)
Assistant Regional Director – Refuges:	Margaret T. Nolan (Signature)	11/12/09 (Date)

Compatibility Determination for Mosquito Control for Humboldt Bay NWR

Use: Mosquito Control (Integrated Pest Management [IPM])

Refuge Name: Humboldt Bay National Wildlife Refuge, Humboldt Bay National Wildlife Refuge Complex

County and State: Humboldt County, California.

Establishing and Acquisition Authority(ies):

Humboldt Bay National Wildlife Refuge (NWR) was established under the authority of The Migratory Bird Conservation Act of 1929, The Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and The Endangered Species Act of 1973.

Refuge Purpose(s):

According to these authorities, Humboldt Bay NWR's purposes are:

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... as Waterfowl Production Areas subject to... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. §§ 460k-1 and "... the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ....or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:

"The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."(National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-ee]).

Description of Use(s):

The use is mosquito management, which includes surveillance, and if warranted, control. It is not a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System

Administration Act of 1966 (16 U.S.C. 668dd-668ee) as amended by the National Wildlife Refuge System Improvement Act of 1997.

Humboldt Bay National Wildlife Refuge will follow the National Wildlife Refuge System and Regional Mosquito Management policies and continue coordinating with Humboldt County to survey for and control mosquitoes. Humboldt County's Department of Public Health has responsibility for mosquito management but is not a mosquito abatement district. Five mosquito species are known to inhabit the Humboldt Bay National Wildlife Refuge and surrounding areas. These mosquitoes breed in and inhabit salt and freshwater marshes, riparian areas, and man-made objects (old tires, water troughs, backyard ponds etc.). Adult mosquitoes appear as early as April and persist until late summer, depending on the species. The majority of information in this compatibility determination was found in *Best Management Practices for Mosquito Control on California State Properties*, released in June 2008 by the California Department of Public Health (CDPH). Additional information can be found in the Central Valley Joint Venture Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands, June 2004, prepared by the Central Valley Joint Venture's Mosquito Working Group.

Culex tarsalis – This species transmits West Nile Virus (WNV), Western Equine Encephalitis (WEE), and St. Louis Encephalitis (SLE), but is not the most common species found in the county.
Culesita particeps – This species is not considered to be an important health concern or vector.
Aedes increptus, Aedes dorsalis, and *Aedes vexan* – There are 24 species of *Aedes* mosquitoes in California, including these three. As a group these mosquitoes are the most aggressive. They lay single eggs on intermittently flooded surfaces including all wetland types. The eggs are resistant to drying out and can remain dormant but viable for at least three years.

Mosquito management on the Humboldt Bay NWR is addressed through an integrated pest management approach in which the refuge coordinates with the county to manage the overall environmental health of adjacent communities while minimizing impacts to refuge trust resources.

The current procedures for implementing mosquito management on this refuge involve water management. From the standpoint of mosquito production there are two types of wetlands on the refuge. Most wetlands are seasonal, meaning they dry up in late spring or early summer. These wetlands rarely produce mosquitoes during this time because they typically are dry before water temperatures are warm enough to produce mosquitoes and "flood-up" occurs well after "mosquito season" is done in mid-October. Other wetlands on the refuge are estuarine or tidal in nature. The key to preventing estuarine wetlands from producing an extraordinary amount of salt marsh mosquitoes is making sure there is good hydrologic connection in these areas and that tidegates don't leak or when they do they are fixed quickly. This allows fish and other predators that come in with the tidal flow to eat mosquito larvae before they become adults. In a natural salt marsh, some mosquitoes are always produced because during extreme high tides, generally some water gets into isolated areas for a long enough period (10-14 days) for mosquito production to occur. Because almost all marsh on the refuge is behind tidegates, refuge staff has to be vigilant about monitoring refuge wetlands during summer and fall and making sure mosquito production stays at a minimal level. While there are always going to be some mosquitoes produced on the refuge, staff and adjacent landowners are well aware when an extraordinary situation arises and then refuge staff consults with the county and deals with the situation accordingly.

Public concern over human health issues related to mosquito-borne disease has intensified with the advance of West Nile Virus across the United States. To address mosquito management, a phased response strategy has been developed for implementation on refuges in the Pacific Southwest Region. This strategy encourages an integrated pest management approach that incorporates habitat and best management practices to reduce the need for and use of insecticides on refuges, while also ensuring that legitimate human, fish, and wildlife health concerns are addressed. To implement this phased response strategy, the current procedures for managing mosquitoes on this refuge will be augmented to better identify thresholds for mosquito treatment and will present specific responses to various conditions encountered in the field. If mosquito population monitoring and disease surveillance (implemented by the County) indicate that human health thresholds are exceeded, the use of larvacides and/or adulticides will be considered by the County and the Project Leader.

Human health thresholds are described in Humboldt County Health Department's 2007 West Nile Virus Monitoring and Response Plan. Threshold Level Three (out of 3 levels): Epidemic Conditions includes a

Level Three Action (out of 3 actions) with steps the County will take when considering chemical applications of chemical adulticide mosquito sprays as needed to protect human health.
According to the Division of Environmental Health, each year Humboldt County enters the threshold Level Two. Each year, due to complaints about nuisance mosquitos, the County looks to sources and agencies such as the Humboldt Bay National Wildlife Refuge to control mosquitos by maintenance of flood gates [and water management techniques]; the County's best method of control is by controlling [water levels that affect] the larval stage (Metcalfe pers. comm.).

Two larvicide compounds that could be used to manage mosquitoes on the refuge include: Bti (*Bacillus thuringienensis israelensis)* and Altosid (methoprene). Both are larvicides intended to control mosquitoes in wetlands prior to their emergence as adults. Bti is used primarily to control early stage larvae and is available in liquid and granular formulations. Altosid is used on later stage mosquito larvae and is available in liquid, briquette and pellet formulations. Both compounds are highly specific to mosquito larvae.

Availability of Resources
Refuge operational funds are currently available through the Service budget process to administer this program. Because of the relative rarity of a mosquito "outbreak" indicating health risk in Humboldt County, the county does not have a mosquito abatement district, nor does it generally spray adulticides for control.

Anticipated Impacts of Use

Anticipated positive impacts of a mosquito control program at the Humboldt Bay NWR include the following:

- The minimization of health risk to adjacent landowners and refuge visitors caused by mosquitoes.

Potential negative impacts of a mosquito control program include the following:

- Lethal effects on non-target water-borne invertebrates and potential non-lethal effects to fish and wildlife of Bti and Altosid, should they need to be used.
- Temporary disturbance to wildlife species in the area.

Positive impacts can be maximized and negative impacts can be minimized through:

- Maintenance of good hydrologic connection in estuarine wetlands
- Appropriate monitoring and immediate response

Public Review and Comment

We published this determination for review concurrently with our comprehensive conservation plan (CCP). This use was discussed at two public meetings held in conjunction with the Comprehensive Conservation Plan Process. To initiate the CCP process, a Notice of Intent was published in the Federal Register on January 29, 2007. Written comments were solicited from the public about the refuge's operations including public use programs. Five CCP planning updates and one planning workbook were prepared to summarize the progress of the CCP and to discuss issues related to the planning process. The public review and comment period of the draft plan and associated environmental assessment offered additional opportunities for comments. This compatibility determination was submitted for public review and comment as an appendix to the Draft Comprehensive Conservation Plan and Environmental Assessment for the Humboldt Bay National Wildlife Refuge Complex. A comment was received regarding the description of the human health threshold for use of pesticides. In response, references were added to page F-40-41.

Determination (check one below):

___Use is Not Compatible

_X_Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Special Use Permit conditions will stipulate that all control work will be carried out in conformance with pre-approved USFWS Pesticide Use Proposals, and existing and future USFWS policies on mosquito management.

2. All applications of pesticides/biological agents must be coordinated and approved by the Refuge Manager to avoid conflicts with fish and wildlife species, Refuge management activities, and public use.

3. Refuge staff will be present during any applications of pesticides/biological agents for mosquito abatement.

4. Larva monitoring sites will be limited to open water areas on the edges of ponds or other water bodies to minimize potentially adverse effects to the tidewater goby. Adult mosquito monitoring will occur on adjacent upland sites along existing service roads.

5. Prior to any application of pesticides/biological agents, the Humboldt County Health Department or other agency proposing the application shall provide a map and dip net counts to and obtain verbal approval from the Project Leader or Deputy Project Leader.

6. At the end of the permitting period, the Humboldt County Health Department or other agency responsible for the pesticide application shall provide the Project Leader with a written list of all pesticides/biological agents used (if any), and the location(s), date(s) and quantities of each that were applied.

Justification:

Mosquito management would be implemented on this refuge in accordance with the guidance provided for the Pacific Southwest Region by the Regional Office in March 2003 and consideration of Best Management Practices for Mosquito Control on California State Properties, released by the California Department of Public Health in June 2008 (http://cdph.ca.gov or http://westnile.ca.gov). This guidance for mosquito management incorporates a phased-response strategy developed to manage mosquitoes in a manner that is compatible with refuge purposes and uses the best available science while minimizing impacts to fish and wildlife, which is consistent with the mission of the National Wildlife Refuge System. Mosquito management proposed for this refuge would also address legitimate human, fish, and wildlife health concerns. Implementing mosquito control in accordance with the stipulations presented above would therefore not materially interfere with the ability to achieve the wildlife management goals established for this refuge.

Mandatory Re-Evaluation Date:

_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____X_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

_ X__Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

Metcalfe, K. Humboldt County Division of Environmental Health. Personal Communication to Sandy Osborn, USFWS, April 21, 2009.

Refuge Determination for Mosquito Control for Humboldt Bay NWR:

Prepared by:	P.M. Clifford, previously with Humboldt Bay NWR (Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	10/18/09 (Date)
Concurrence:		
Refuge Supervisor:	Dan Walsworth (Signature)	10/23/09 (Date)
Assistant Regional: Director - Refuges	Margaret J. Kolar (Signature)	11/12/09 (Date)

Compatibility Determination for Plant Gathering for Humboldt Bay NWR

Use: Plant Gathering

Refuge Name: Humboldt Bay National Wildlife Refuge, Humboldt Bay National Wildlife Refuge Complex

County and State: Humboldt County, California

Establishing and Acquisition Authority(ies):

Humboldt Bay NWR was established under the authority of The Migratory Bird Conservation Act of 1929, The Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and The Endangered Species Act of 1973.

Refuge Purpose(s):

According to these authorities, Humboldt Bay NWR's purposes are:

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... as Waterfowl Production Areas subject to... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) (Fish and Wildlife Act of 1956)

"... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. §§ 460k-1 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"...the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ....or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:

"The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-ee])

Description of Use(s):

The gathering of plants at Humboldt Bay National Wildlife Refuge by Native Americans would be a new use at the refuge. Gathering plants is not one of the 6 legislated uses of the National Wildlife Refuge System. However, the use of refuge lands for plant gathering is considered to be of vital importance to Native American cultural groups such as the California Indian Basketweavers Association. Native Americans have historically gathered plant materials around Humboldt Bay. Plants are gathered for a variety of uses; medicinal, ceremonial, food resources, and utilitarian or artistic purposes. Plants gathered for traditional uses may include California blackberry (*Rubus ursinus)*, Evergreen huckleberry (*Vaccinium ovatum*), Willows (*Salix* sp.) and Thimbleberry (*Rubus parviflorus*). Plants are gathered during various seasons. Special use permits will be issued by the refuge for plant gathering and access regulated to ensure protection of critical habitat during key wildlife use periods.

Availability of Resources:

No additional resources will be needed to support this use. Adequate funding and staff are available to manage this use within the existing refuge budget.

Anticipated Impacts of the Use(s):
Anticipated impacts from this use are minor damage to vegetation and disturbance to wildlife. No long-term or cumulative impacts are expected on wildlife or habitat.

Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment or change in food habits, physiological changes such as elevated heart rates due to flight, or even death (Knight and Cole 1995). The long term effects are more difficult to assess but may include altered behavior, vigor, productivity or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interaction.

According to Knight and Cole (1991), there are three categories of wildlife responses to human disturbance: 1) avoidance; 2) habituation; and 3) attraction. The magnitude of the avoidance response may depend on a number of factors inducing the type, distance, movement pattern, speed, and duration of the disturbance, as well as the time of day, time of year, weather; and the animal's access to food and cover, energy demands, and reproductive status (Knight and Cole 1991; Gabrielsen and Smith 1995). The level of disturbance to wildlife will vary depending on the season, but is considered to be low overall. The gathering of berries and other plant materials that occurs from late summer through fall will have little or no impact on migratory or nesting birds.

Plant gathering can also have adverse impacts on vegetation and soil conditions. Plant gatherers can alter habitats by trampling vegetation, compacting soil, and increasing the potential for erosion (Liddle 1975; Hendee et al. 1990). Impacts to habitat and wildlife associated with plant gathering on the refuge are minimal. The amount of plant material being harvested is small enough not to constitute any meaningful impact on habitat. Gathering of new plant growth in springtime, herbs for medicinal/ceremonial purposes and willow twigs and bark for basket weaving may coincide with the use of the refuge by migratory waterfowl. However, because gathering activities are limited by the amount of material required, adverse impacts are also expected to be limited and negligible.

Public Review and Comment:

To initiate the CCP process, a Notice of Intent was published in the Federal Register on January 29, 2007. Written comments were solicited from the public about the refuge's operations including public use programs such as environmental education and interpretation. Five CCP planning updates and one planning workbook were prepared to summarize the progress of the CCP and to discuss issues related to the planning process. This compatibility determination was submitted for public review and comment as an appendix to the Draft Comprehensive Conservation Plan and Environmental Assessment for the Humboldt Bay National Wildlife Refuge Complex. No comments were received on this compatibility determination.

Determination (check one below)**:**

___ Use is Not Compatible

_X_Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

In order to accommodate access to the refuge for plant gathering and ensure minor impact to habitats and wildlife, the following measures will be taken:

1. Plant gathering activities will be reviewed as a part of annual coordination with tribal representatives. If monitoring by the refuge reveals that impacts are negatively affecting wildlife or habitat, then permittees will be required to adjust their activities to avoid impacts. Adjustments may include reductions in harvest, changes in timing of gathering, or reductions in numbers of visitors or frequency of visitors.

2. The Refuge Manager has the authority to close areas within the refuge during sensitive wildlife use periods and cancel any collecting activities deemed necessary to fulfill refuge purposes or ensure visitor safety. Sensitive nesting areas will be protected from disturbance by visitors with signs and barriers. Visitors will be directed away from areas where major habitat restoration or management projects are in progress.

Justification:

One of the goals of the National Wildlife Refuge System (System) is providing the public an understanding and appreciation of fish and wildlife ecology, wildlife habitat and the human role in the environment. The Service strives to provide priority visitor uses when compatible with the purpose and goals of the refuge and the mission of the System. The National Wildlife Refuge System Improvement Act of 1997 identifies environmental education and interpretation as priority public uses for National Wildlife Refuges.

The Native American Policy of the U.S. Fish and Wildlife Service state that the Service will provide reasonable access to Service managed lands for exercising ceremonial, medicinal, and traditional activities recognized by the Service and by Native American governments. The Service will permit these uses if the activities are consistent with treaties, judicial mandates, or Federal and tribal law and are compatible with the purposes for which the lands are managed.

Although plant gathering is not a wildlife-dependent recreational use, it is an activity that contributes to environmental education and awareness. An understanding of plant ecology is essential to sustainable plant harvesting, thus this activity helps to educate participants about Humboldt Bay habitats while supporting their cultural practices. Accordingly, the Service has determined that the proposed plant gathering by Native Americans for cultural purposes is a compatible refuge purpose.

Mandatory Re-Evaluation Date: (provide month and year for "allowed" uses only)

_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____X_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

_ X__Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

Gabrielson, G.W., and E.N. Smith. 1995. Physiological responses of wildlife to disturbance. Pages 95-107 in R.L. Knight and K.J. Gutzwill, ed. Wildlife and Recreationists: coexistence through management and research. Island Press, Washington, D.C. 372pp.

Hendee, J.C., G.H. Stankey, and R.C. Lucas. 1990. Wilderness Management. North American Press, Golden, CO.

Knight, R.L., and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands in Transactions of the North American Wildlife and Natural Resources Conference. 56:238-247.

Knight, R.L., and D.N. Cole. 1995. Wildlife responses to recreationists. Pages 71-79 in R.L. Knight and K.J. Gutzwiller, ed. Wildlife and Recreationists: coexistence through management and research. Island Press, Washington, DC.

Liddle, M.J. 1975. A selective review of the ecological effects of human trampling on natural ecosystems. Biol. Conserv. 7:17-36.

Refuge Determination for Plant Gathering for Humboldt Bay NWR:

Prepared by:	P.M. Clifford, previously with Humboldt Bay NWR (Signature)	_____ (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	10/18/09 (Date)
Concurrence:		
Refuge Supervisor:	(Signature)	10/23/09 (Date)
Assistant Regional Director - Refuges:	(Signature)	11/12/09 (Date)

Compatibility Determination for Research for Humboldt Bay NWR

Use: Research

Refuge Name: Humboldt Bay National Wildlife Refuge, Humboldt Bay National Wildlife Refuge Complex

County and State: Humboldt County, California

Establishing and Acquisition Authority(ies):

Humboldt Bay National Wildlife Refuge (NWR) was established under the authority of The Migratory Bird Conservation Act of 1929, The Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and The Endangered Species Act of 1973.

Refuge Purpose(s):

According to these authorities, Humboldt Bay NWR's purposes are:

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... as Waterfowl Production Areas subject to... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. §§ 460k-1 and "... the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ....or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission:

"The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."(National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C.668dd-ee])

Description of Use(s):

The use is research on refuge resources. It is not a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee) as amended by the National Wildlife Refuge System Improvement Act of 1997.

The location of the research will vary by project. Usually a research project is limited to a particular habitat type, plan, or wildlife species. On occasion, research projects may encompass an assemblage of habitat types, plants or wildlife. Refuge management will limit the locations of research to those areas of the refuge necessary to conduct any specific, scientific research projects that require it.

The timing of the research will depend on the project. Refuge management may allow scientific research on the refuge throughout the year. A research project could be short-term in design, requiring one or two visits over the course of a few days. Others could be multi-year studies that require daily visits to the study site. The timing of each research project will be limited to the minimum required to complete it. If a research project overlaps a refuge hunting season, special precautions or limitations may be required to ensure the safety of researchers or staff.

The methods of a research project will depend on the project. We will evaluate the methods of each research project before allowing it on the refuge. Research, inventory and information collection activities on the Humboldt Bay National Wildlife Refuge that are directly related to the conservation of fish and wildlife resources which involve negligible animal mortality, disturbance or habitat destruction, and no introduction of either exotic organisms or contaminants will be considered, as will those research activities which seek to increase the public's knowledge and understanding of fish and wildlife resources. Research activities will typically be conducted by University or College professors, students, and other professional resource biologists.

The purposes of research are to further the understanding of the natural resources and improve the management of those resources on the refuges or in the System. Refuge management will assign priority to research applicable to wildlife, habitat, or public use management on or near the refuges of the Complex.

At the Humboldt Bay NWR (refuge), the refuge manager has issued special use permits (SUPs) for such research as:

- Studies on various species of fish, wildlife and plants
- Mapping of invasive species and rare plants
- Studies on water quality and hydrology

We will encourage and support research and management studies on refuge lands that improve and strengthen our natural resource management decisions. The refuge manager will encourage and assign priority to research that:

- Relates to approved refuge objectives, clearly improves land management, and promotes adaptive management.
- Enables better management of the Nation's biological resources. This could include research which may not relate directly to refuge-specific objectives, but would contribute to the broader enhancement, protection, use, preservation or management of populations of fish, wildlife and plants, and their natural diversity in the region or flyway.
- Is generally considered important to agencies of the Department of Interior, particularly the U.S. Fish and Wildlife Service, the Refuge System, and State Fish and Wildlife Agencies.
- Addresses important management issues or demonstrates techniques for managing species or habitats.

Research evaluation criteria will include, but not be limited to, the following:

- Research that will contribute to specific refuge management issues will be given higher priority over other research requests.
- Research that will conflict with other ongoing research, monitoring, or management programs will not be granted.
- Research projects that can be accomplished off-refuge are less likely to be approved.
- Research that causes undue disturbance or is intrusive will likely not be granted. Level and type of disturbance will be carefully evaluated when considering a request.
- Refuge evaluation will determine if any effort has been made to minimize disturbance through study design, including considering adjusting location, timing, scope, study methods, number of study sites, etc.
- If staffing or logistics make it impossible for the refuge to monitor researcher activity in a sensitive area, the research request may be denied, depending on the specific circumstances.

- The length of the project will be considered and agreed upon before approval. Projects will be reviewed annually.

Availability of Resources:

Staff time spent reviewing research proposals and administering permits will be minimal. In most cases, a research project may require one to four hours of staff time to coordinate all aspects of a project, including review of the proposal, issuing a Special use Permit, coordinating access to the refuge, and reviewing project results. Currently, refuge staff spends an average of 40 hours a year working full time on research projects. Adequate funding and staff exist to manage research projects within the current refuge budget. Researchers will be required to furnish their own materials and supplies. Supplies and staff time associated with cooperative studies involving the refuge and other agencies or universities should be covered by appropriate refuge/joint funds.

Anticipated Impacts of Use:

Disturbance to wildlife and vegetation by researchers could occur through observation, a variety of wildlife capture techniques, banding, and accessing the study area by foot or vehicle. Many studies have demonstrated adverse effects of human disturbances, including researcher activity on wildlife species. For example, Tremblay and Ellison (1979) documented that visits to black-crowned night-heron colonies just before or during laying provoked abandonment of newly constructed nests or either predation of eggs or abandonment of eggs followed by predation. In some instances, investigator disturbance cause mortality of young. Ellison and Cleary (1978) studied the double-crested cormorant to assess the influence of investigators visiting colonies during the breeding season. They discovered the frequent visits caused nest abandonment, predation by gulls, and discouraged late nesting birds from settling in disturbed experimental colonies. Human presence can affect foraging behavior such as location, duration, and time of day (Burger and Gochfield 1991). It is possible that direct or indirect mortality could result as a byproduct of research activities. The objective is always to conduct the research in a fashion such that potential adverse impacts are likely to be outweighed by the knowledge gained about the resource(s).

However, not all research activities negatively affect a species or its habitat. Fredrick and Collopy (1989) found no differences in reproductive parameters in nests of tricolored herons visited frequently (16 times) to those visited infrequently (7 times). Parsons and Burger (1982) reported no differences in black-crowned night heron chick weight between chicks which were handled every two days and those which were handled once during the study.

Studies suggest that the adverse effects of human disturbance are species specific (Gutzwiller et al. 1998). Thus different species are affected by human presence in specific factors such as timing, location and duration (Gutzwiller and Stanley 1999). Knowing what factors disrupt a species, the probability of disturbing that species during research can be decreased. For instance, Ellison (1989) and Buckley and Buckley (1976) provided management guidelines to minimize disturbance to colonial nesting waterbirds by the general public and investigators. By restricting disruptive activities and monitoring researchers, impacts are expected to be minimal.

Public Review and Comment:

We published this determination for review concurrently with our comprehensive conservation plan (CCP). This use was discussed at two public meetings held in conjunction with the Comprehensive Conservation Plan process. To initiate the CCP process, a Notice of Intent was published in the Federal Register on January 29, 2007. Written comments were solicited from the public about the refuge's operations including public use programs. Five CCP planning updates and one planning workbook were prepared to summarize the progress of the CCP and to discuss issues related to the planning process. The planning updates have been distributed to a large number of individuals and organizations representing interested members of the public, conservation organizations, hunting, fishing and boating organizations, public agencies, municipalities, special districts, Tribes, and adjoining property owners. The public review and comment period of the draft plan and associated environmental assessment offered additional opportunities for comments. No comments were received on this compatibility determination.

Determination (check one below):

___Use is Not Compatible

__X_ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. We will require all researchers to submit a detailed research proposal following Service policy in the Service Refuge Manual Chapter 4, section 6 (USFWS 1982). The refuge must receive at least 60 days to review proposals before research starts. If the collection of wildlife is involved, researchers must give the refuge 90 days to review their proposal. We will assign priority and approve proposals based on their need, benefit, compatibility, and funding required.

2. We will issue SUPs for all research. Each SUP will list the conditions the refuge manager determines necessary to ensure compatibility, and identify a schedule for progress reports and the submittal of a final report or scientific paper.

3. We may ask regional refuge biologists, other Service divisions, State agencies or non-governmental organizations and biologists to provide additional review and comment on any research proposal.

4. We will require all researchers to obtain appropriate state and federal permits.

5. Activities will be held where minimal impact will occur.

6. Refuge staff will monitor researcher activities for potential impacts to the refuge resources and for compliance with the conditions in the SUP. Researchers will be required to allow refuge staff to accompany researchers at any time to assess potential impacts and to insure adherence to the SUPs. We may terminate any research project at any time for non-compliance with the SUP conditions, or modify, redesign, relocate or terminate it, if the refuge manager determines that it is causing unanticipated adverse impacts on wildlife, wildlife habitat, approve priority public uses, or other refuge management activities.

Justification:

The program as described in the 2009 Draft CCP/EA is determined to be compatible (USFWS 2008). Scientific research will comply with the stipulations listed, and will not interfere with the primary purposes for which the refuge was established. We encourage approved research to further understanding of refuge natural resources. Research conducted will not materially interfere with or detract from the mission of the System or the purposes for which the refuge was established. Research will directly benefit and support refuge goals, objectives and management plans and activities. Fish, wildlife, plants and their habitats will improve through the application of knowledge gained from research. Biological integrity, diversity and environmental health would benefit from research conducted on natural resources at the refuge. The wildlife-dependent priority public uses would also benefit as a result of increased biodiversity from improved restoration and management plans and activities associated with monitoring and research investigation that address specific restoration and management questions.

Mandatory Re-Evaluation Date:

_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____X_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision (check one below)**:**

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

_ X__Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

References Cited:

Buckley, P., and F. Buckley. 1976. Guidelines for the protection and management of colonially nesting waterbirds. North Atlantic Regional Office. NPS. Boston, MA 54 pp.

Burger, J., and M. Gochfield. 1991. Human activity influence and diurnal and nocturnal foraging of Sanderlings. Condor. 93: 259-265.

Ellison, R.M. 1989. Responses to human intruders by birds nesting in colonies: Experimental Results and management guidelines. Col. Waterbirds 12(1):104-108.

Frederick, R.B., and M.W. Collopy. 1989 Researcher disturbance in colonies of wading birds: Effects of frequency of visit and egg-marking on reproductive parameters. Col. Waterbirds. 12(2):152-157.

Gutzwiller, K.J., and H.A. Stanley. 1999. Spatial extent of human-intrusion effects on Subalpine bird distributions. Condor: 101:378-389

Gutzwiller, K.J., H.A. Marcum, H.B. Harvey, J.D. Roth, and S.H. Anderson. 1998. Bird tolerance to human intrusion in Wyoming montane forests. Condor:100 519-527.

Parsons, K.C., and J. Burger. 1982. Human disturbance and nestling behavior in black-crowned night herons. Condor 84: 184-187.

U. S. Fish and Wildlife Service (USFWS). 1982. National Wildlife Refuge System – Refuge Manual Dept. of Interior USFWS, Washington, D. C.

U.S. Fish and Wildlife Service (USFWS). January 2009. Humboldt Bay National Wildlife Refuge Complex, Draft Comprehensive Conservation Plan and Environmental Assessment. Refuge Planning, California and Nevada Region, USFWS, Sacramento, CA and Humboldt Bay National Wildlife Refuge Complex, USFWS, Loleta, CA.

Tremblay, J., and L.N. Ellison. 1979. Effects of human disturbance on breeding of Black-crowned night herons. Auk 96:364-369.

Refuge Determination for Research for Humboldt Bay NWR:

Prepared by:	P.M. Clifford, previously with Humboldt Bay NWR (Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	10/18/09 (Date)
Concurrence:		
Refuge Supervisor:	(Signature)	10/23/09 (Date)
Assistant Regional: Director - Refuges	(Signature)	11/12/09 (Date)

Compatibility Determination for Research for Castle Rock NWR

Use: Research

Refuge Name: Castle Rock NWR, Humboldt Bay National Wildlife Refuge Complex

County and State: Del Norte, California.

Establishing and Acquisition Authority(ies):

Castle Rock National Wildlife Refuge (NWR) was established under the authority of The Migratory Bird Conservation Act of 1929, The Migratory Bird Hunting and Conservation Stamp Act of 1934, the Fish and Wildlife Act of 1956, the Refuge Recreation Act of 1962, and The Endangered Species Act of 1973.

Refuge Purpose(s):

According to these authorities, Castle Rock NWR's purposes are:

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. §§ 715d (Migratory Bird Conservation Act)

"... as Waterfowl Production Areas subject to... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. §§ 742f(a)(4) and "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. §§ 742f(b)(1) (Fish and Wildlife Act of 1956)

"...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. §§ 460k-1 and "... the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. §§ 460k-2 (Refuge Recreation Act [16 U.S.C. §§ 460k-460k-4], as amended)

"... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ....or (B) plants ..." 16 U.S.C. §§ 1534 (Endangered Species Act of 1973)

National Wildlife Refuge System Mission (System):

"The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."(National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C.668dd-ee])

Description of Use(s):

The use is research on refuge resources. Research is an ongoing use at the Castle Rock NWR (refuge), and the Service proposes to continue this use. Although it is not a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-

668ee) as amended by the National Wildlife Refuge System Improvement Act of 1997, information gained from research can improve management of the refuge and resources.

This refuge is somewhat unique in that it is an island. This necessarily precludes public access and many research options because of the potential for damaging seabird nesting habitat by breaking through the surface into burrows, disturbance to marine mammals and seabirds, as well as substantial safety issues of getting on and off the island. Over 100,000 common murres normally nest on this refuge. They start arriving on the rock as early as January/February and in most years are there until their chicks depart sometime in July/early August. From ~January through early April there are ~20,000 Aleutian geese which roost on the island at night. In addition, marine mammals, including the Federally listed threatened Stellar's Sea-lion also use the island.

The location of the research on the island will vary by project. Usually a research project is limited to a particular habitat type or wildlife species. On occasion, research projects may encompass an assemblage of habitat types, plants or wildlife. We will limit the locations of research to those areas of the refuge necessary to conduct any specific, scientific research projects that require it and do not cause an incompatible amount of disturbance.

The conditions outlined in the stipulations section will also dictate timing of any research. We may allow remote scientific research (i.e., data gathered from cameras or other remote sensing devices placed on the island or gathered from a plane or a boat, throughout the year. A research project could be short-term in design, requiring one or two visits over the course of a few days. The timing of each research project must be evaluated against potential impacts to resources and will be limited to the minimum required to complete it.

The methods of a research project will depend on the project. We will evaluate the methods of each research project before allowing it on the refuge. Research, inventory and information collection activities on the Castle Rock NWR must be directly related to the conservation of wildlife resources which involve negligible animal mortality, disturbance or habitat destruction, and not allow introduction of either exotic organisms or contaminants. Research activities will be conducted by professional resource biologists, university professors, students, or other qualified personnel as determined by the refuge manager.

The purposes of research are to further the understanding of the natural resources and improve the management of those resources on the refuges or in the System. We will assign priority to research applicable to wildlife, habitat, or public use management on or near the refuges of the Complex.

At Castle Rock NWR, the refuge manager has issued special use permits (SUPs) for such research as gathering population inventory and baseline data for seabirds and marine mammals.

We will encourage and support research and management studies on refuge lands that improve and strengthen our natural resource management decisions. The refuge manager will encourage and assign priority to research that:

- Relates to approved refuge objectives, clearly improves land management, and promotes adaptive management;
- Enables better management of the Nation's biological resources. This could include research which may not relate directly to refuge-specific objectives, but would contribute to the broader enhancement, protection, use, preservation or management of populations of fish, wildlife and plants, and their natural diversity in the region or flyway;
- Is generally considered important to agencies of the Department of Interior, particularly the U.S. Fish and Wildlife Service, the Refuge System, and State Fish and Wildlife Agencies; and
- Addresses important management issues or demonstrates techniques for managing species or habitats.

Research evaluation criteria will include, but not be limited to, the following:

- Research that will contribute to specific refuge management issues will be given higher priority over other research requests.
- Research that will conflict with other ongoing research, monitoring, or management programs will not be granted.

- Research projects that can be accomplished off-refuge are less likely to be approved.
- Research which causes undue disturbance or is intrusive will likely not be granted. Level and type of disturbance will be carefully evaluated when considering a request.
- Refuge evaluation will determine if any effort has been made to minimize disturbance through study design, including considering adjusting location, timing, scope, study methods, number of study sites, etc.
- If staffing or logistics make it impossible for the refuge to monitor researcher activity in a sensitive area, the research request may be denied, depending on the specific circumstances.
- The length of the project and review periods will be considered and agreed upon before approval.

Availability of Resources:

Adequate funding and staff exist to manage research projects within the current refuge budget. Staff time includes review of the proposal, issuing a Special use Permit, coordinating access to the refuge, and reviewing project results. Currently, the refuge Manager spends an average of 80 hours a year working full time on research projects conducted in collaboration with university researchers. Researchers will likely be required to furnish their own materials and supplies. Supplies and staff time associated with cooperative studies involving the refuge and other agencies or universities will be covered by appropriate refuge/joint funds.

Anticipated Impacts of Use:

Disturbance to wildlife, vegetation and substrate by researchers could occur through observation, a variety of wildlife capture techniques, banding, and access to and departure from the study area. Disturbance to island dependent animals can have greater impacts because they have limited area to escape to and they typically occur in higher densities. In addition, where you have thousands of birds nesting in close proximity, one bad event at a key time and/or location can cause significant abandonment, predation and/or mortality. Many studies have demonstrated adverse effects of human disturbances, including researcher activity on wildlife species. For example, Tremblay and Ellison (1979) documented that visits to black-crowned night-heron colonies just before or during laying provoked abandonment of newly constructed nests or either predation of eggs or abandonment of eggs followed by predation. In some instances, investigator disturbance cause mortality of young. Ellison and Cleary (1978) studied the double-crested cormorant to assess the influence of investigators visiting colonies during the breeding season. They discovered the frequent visits caused nest abandonment, predation by gulls, and discouraged late nesting birds from settling in disturbed experimental colonies. Human presence can affect foraging behavior such as location, duration, and time of day (Burger and Gochfield 1991). It is possible that direct or indirect mortality could result as a byproduct of research activities. The objective is always to conduct the research in a fashion such that potential adverse impacts are likely to be outweighed by the knowledge gained about the resource(s).

However, not all research activities negatively affect a species or its habitat. Fredrick and Collopy (1989) found no differences in reproductive parameters in nests of tricolored herons visited frequently (16 times) to those visited infrequently (7 times). Parsons and Burger (1982) reported no differences in black-crowned night heron chick weight between chicks which were handled every two days and those which were handled once during the study.

Studies suggest that the adverse effects of human disturbance are species specific (Gutzwiller et al. 1998). Thus different species are affected by human presence in specific factors such as timing, location and duration (Gutzwiller and Stanley 1999). Knowing what factors disrupt a species, the probability of disturbing that species during research can be decreased. For instance, Ellison (1989) and Buckley and Buckley (1976) provided management guidelines to minimize disturbance to colonial nesting waterbirds by the general public and investigators. By restricting disruptive activities and monitoring researchers, impacts are expected to be minimal.

Public Review and Comment:

We published this determination for review concurrently with our comprehensive conservation plan (CCP). This use was discussed at two public meetings held in conjunction with the Comprehensive Conservation Plan process. To initiate the CCP process, a Notice of Intent was published in the Federal Register on January 29, 2007. Written comments were solicited from the public about the refuge's operations including

public use programs. Five CCP planning updates and one planning workbook were prepared to summarize the progress of the CCP and to discuss issues related to the planning process. The planning updates have been distributed to a large number of individuals and organizations representing interested members of the public, conservation organizations, hunting, fishing and boating organizations, public agencies, municipalities, special districts, Tribes, and adjoining property owners. This compatibility determination was submitted for public review and comment as an appendix to the Draft Comprehensive Conservation Plan and Environmental Assessment for the Humboldt Bay National Wildlife Refuge Complex. No comments were received on this compatibility determination.

Determination (check one below)**:**

___Use is Not Compatible

__X_ Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility:

We will require all researchers to submit a detailed research proposal following Service policy included in the Service's Refuge Manual, Chapter 4, section 6 (USFWS 1982). The refuge must receive at least 90 days to review proposals before research starts. We will assign priority and approve proposals based on their need, benefit, compatibility, and funding required.

We will issue SUPs for all research conducted. Each SUP will list the conditions the refuge manager determines necessary to ensure compatibility, and identify a schedule for progress reports and the submittal of a final report or scientific paper.

We may ask regional refuge biologists, other Service divisions, state agencies or non-governmental organizations and biologists to provide additional review and comment on any research proposal.

We will require all researchers to obtain appropriate state and federal permits.

Activities will be held where minimal impact will occur.

Refuge staff will monitor researcher activities for potential impacts to the refuge and for compliance with the conditions in the SUP. Refuge staff will be free to accompany researchers at any time to assess potential impacts and to insure SUPs are adhered to. We may terminate any research project at any time for non-compliance with the SUP conditions, or modify, redesign, relocate or terminate it, if the refuge manager determines that it is causing unanticipated adverse impacts on wildlife, wildlife habitat, approve priority public uses, or other refuge management activities.

Justification:

The program as described in the CCP and EA is compatible. Scientific research will comply with the stipulations listed, and will not interfere with the primary purposes for which the refuges were established. We encourage approved research to further understanding of refuge natural resources. Research conducted will not materially interfere with or detract from the mission of the System or the purposes for which the refuges were established. Research will directly benefit and support refuge goals, objectives and management plans and activities. Fish, wildlife, plants and their habitats will improve through the application of knowledge gained from research. Biological integrity, diversity and environmental health would benefit from research conducted on natural resources at the refuge. The wildlife-dependent priority public uses would also benefit as a result of increased biodiversity from improved restoration and management plans and activities associated with monitoring and research investigation that address specific restoration and management questions.

Mandatory Re-Evaluation Date:

_____ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

_____X_____ Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

_____Categorical Exclusion without Environmental Action Statement

_____Categorical Exclusion and Environmental Action Statement

_ X__Environmental Assessment and Finding of No Significant Impact

_____Environmental Impact Statement and Record of Decision

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Refuge Determination for Research for Castle Rock NWR:

Prepared by:	P.M. Clifford, previously with Humboldt Bay NWR (Signature)	(Date)
Refuge Manager/ Project Leader Approval:	(Signature)	10/18/09 (Date)
Concurrence:		
Refuge Supervisor:	Dan Wahwatt (Signature)	10/23/09 (Date)
Assistant Regional: Director - Refuges	Margaret J. Palan (Signature)	11/12/09 (Date)

Appendix G: Wilderness Review for Humboldt Bay NWR and Castle Rock NWR

Wilderness Review for Humboldt Bay NWR and Castle Rock NWR

Wilderness Review Process

The purpose of a wilderness review is to identify and recommend for Congressional designation National Wildlife Refuge System (System) lands and waters that merit inclusion in the National Wilderness Preservation System (NWPS). Wilderness reviews are a required element of CCPs and are conducted in accordance with the refuge planning process outlined in 602 FW 1 and 3, including interagency and tribal coordination, public involvement and National Environmental Policy Act (NEPA) compliance.

There are three phases to a wilderness review: inventory, study, and recommendation. The wilderness inventory identifies those lands within the refuge that might have wilderness character and satisfy the definition of wilderness. Each unit must be roadless and be either greater than 5,000 acres; a roadless island of any size; or less than 5,000 acres but of sufficient size to be practicably managed as wilderness. The inventory preliminarily classifies each unit of land that meets these requirements as a wilderness study area (WSA).

The wilderness study further evaluates each WSA for values, resources, and uses to determine if each one merits recommendation from the Service to the Secretary of the Interior as wilderness. The recommendation phase consists of forwarding or reporting recommendations for wilderness designation from the Director through the Secretary and the President to Congress in a wilderness study report. This appendix summarizes the wilderness inventory for Humboldt Bay NWR and Castle Rock NWR.

Inventory Criteria

The wilderness inventory is a broad look at the planning area to identify WSAs. These are roadless areas that meet the minimum criteria for wilderness identified in Section 2(c) of the Wilderness Act.

"A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions, and which: (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological or other features of scientific, educational, scenic, or historical value."

A WSA must appear natural, provide outstanding opportunities for solitude or primitive recreation, meet the size criteria, and may provide other supplemental values. The process for identification of roadless areas and islands in the Complex and application of the wilderness criteria are described in the following sections.

Identification of Roadless Areas and Roadless Islands

Identification of roadless areas and roadless islands required gathering and evaluating land status maps, land uses, road inventory data, and aerial photographs for the Complex. "Roadless" refers to the absence of improved roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use. Only lands currently owned by the Service in fee title are discussed in this inventory.

Evaluation of the Naturalness Criteria

In addition to being roadless, a WSA must meet the naturalness criteria. Section 2(c) defines wilderness as an area that "... generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable." The area must appear natural to the average visitor rather than "pristine." The presence of historic landscape conditions is not required. An area may include some human impacts provided they are substantially unnoticeable in the unit as a whole. Significant human-caused hazards, such as the presence of unexploded ordnance from military activity, and the physical impacts of refuge management facilities and activities are also considered in evaluation of the naturalness criteria. An area may not be considered unnatural in appearance solely on the basis of the "sights and sounds" of human impacts and activities outside the boundary of the unit.

Evaluation of Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation

In addition to meeting the size and naturalness criteria, a WSA must provide outstanding opportunities for solitude or primitive recreation. The area does not have to possess outstanding opportunities for both solitude and primitive and unconfined recreation and does not need to have outstanding opportunities on every acre. Further, an area does not have to be open to public use and access to qualify under this criteria; Congress has designated a number of wilderness areas in the Refuge System that are closed to public access to protect resource values.

Opportunities for solitude refer to the ability of a visitor to be alone and secluded from other visitors in the area. Primitive and unconfined recreation means non-motorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport. These primitive recreation activities may provide opportunities to experience challenge and risk, self reliance, and adventure.

These two "opportunity elements" are not well defined by the Wilderness Act but, in most cases, can be expected to occur together. However, an outstanding opportunity for solitude may be present in an area offering only limited primitive recreation potential. Conversely, an area may be so attractive for recreation use that experiencing solitude is not an option.

Evaluation of the Size Criteria

Roadless areas or roadless islands meet the size criteria if any one of the following standards apply:

- An area with over 5,000 contiguous acres. State and private lands are not included in making this acreage determination.
- A roadless island of any size. A roadless island is defined as an area surrounded by permanent waters or that is markedly distinguished from the surrounding lands by topographical or ecological features.
- An area of less than 5,000 contiguous federal acres that is of sufficient size as to make practicable its preservation and use in an unimpaired condition and of a size suitable for wilderness management.
- An area of less than 5,000 contiguous federal acres that is contiguous with a designated wilderness, recommended wilderness, or area under wilderness review by another federal managing agency such as the Forest Service, NPS, or Bureau or Land Management.

Evaluation of Supplemental Values

Supplemental values are defined by the Wilderness Act as "...ecological, geological, or other features of scientific, educational, scenic, or historic value." These values are not required for wilderness but their presence should be documented.

Humboldt Bay National Wildlife Refuge

Humboldt Bay National Wildlife Refuge (Humboldt Bay NWR) contains a total of 3,379 discontinuous acres, owned in fee title by the Service. The largest Service-owned segment of contiguous land at Humboldt Bay NWR consists of 1,602 acres, with the next largest being 580 acres. It is bordered by Highway 101 and communities on the east, by the Humboldt Bay on the west, and is largely surrounded by agricultural lands on the south and north. Most of the surrounding agricultural lands were converted from salt marsh,

via construction of a large levee separating south Humboldt Bay lands from tidal influence by the 1910s to 1920s. Other dikes and channels were constructed to control and spread Salmon Creek and other unnamed creeks. Northern dune units of the Humboldt Bay NWR are in a fairly pristine state, with the Lanphere Dunes being the most pristine, relative to other preserved dune ecosystems on the west coast of the United States. Humboldt Bay NWR does contain features of scientific, educational, scenic, and historical value. However, Humboldt Bay NWR does not meet the overall criteria for a wilderness study area because:

- most of the Humboldt Bay NWR has been impacted by man;
- most of HBNWR does not offer outstanding opportunities for primitive or unconfined recreation or solitude; and
- it does not encompass 5,000 contiguous acres.

Castle Rock National Wildlife Refuge

Castle Rock National Wildlife Refuge (Castle Rock NWR) is a 14-acre rocky island approximately ½ mile offshore of Crescent City, California. Castle Rock is primarily affected by the forces of nature with any imprint of man's work substantially unnoticeable. The island is road-less with no permanent structures, and it contains unique California north coastal ecological features of great value. Table G-1 summarizes the findings from the wilderness inventory.

Due to the sensitivity of Castle Rock NWR's wildlife and habitats to disturbance, it would be inconsistent with the Castle Rock NWR's purpose to allow public visitation of the island, and Castle Rock NWR is permanently closed to public visitation. However, lack of public use has not prevented other National Wildlife Refuges from receiving wilderness designation from Congress. Congress has designated several National Wildlife Refuge System wilderness areas which are closed to public use to conserve wildlife and fragile habitats. Designated wilderness areas that are permanently closed to the public include the following:

- Farallon Wilderness
- Imperial Refuge Wilderness
- Oregon Islands Wilderness
- Passage Key Wilderness
- Pelican Island Wilderness
- Three Arch Rocks Wilderness
- Vieques Wilderness
- Washington Islands Wilderness
- West Sister Island Wilderness
- Wisconsin Islands Wilderness

Table G-1. Castle Rock National Wildlife Refuge Wilderness Evaluation

Refuge Unit and Acreage	(1) has at least 5,000 acres of land or is of sufficient size to make practicable its preservation and use in an unconfined condition, or is a roadless island	(2) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable	(3a) has outstanding opportunities for solitude	**OR** (3b) has outstanding opportunities for primitive and unconfined type of recreation;	(4) contains ecological, geological or other features of scientific, educational, scenic, or historical value	Parcel qualifies as a wilderness study area (meets criteria 1, 2, and 3a or 3b)
Castle Rock NWR	Yes, 14 acre roadless island	Yes, although it does have remote operated cameras and solar array for powering the camera.	Yes, although closed to the public	Yes, although closed to the public	Yes	Yes

Castle Rock National Wildlife Refuge Wilderness Study

Castle Rock National Wildlife Refuge was found to possess the required wilderness characteristics defined by the Wilderness Act, and is further evaluated through the refuge planning process to determine its suitability for designation, management, and preservation as wilderness. Considerations in this evaluation included:

- Quality of wilderness values
- Evaluation of resource values, public uses, and associated management concerns; and
- Capability for management as wilderness or "manageability."

This information provides a basis to compare the impacts of a range of management alternatives and determine the most appropriate management direction for the WSA.

Evaluation of Wilderness Values

The following information considers the quality of the WSAs' mandatory and supplemental wilderness characteristics.

Naturalness

Castle Rock NWR covers approximately 14 acres and is 235 feet high at its peak off of the coast of Crescent City, California. Castle Rock is primarily affected by the forces of nature with any imprint of man's work substantially unnoticeable. It is a roadless island with no permanent structures, and it contains unique California north coastal ecological features of great ecological value.

Outstanding Opportunities for Solitude and Primitive Recreation

Castle Rock has outstanding opportunities for solitude and primitive recreation, but because it provides habitat for so many sensitive birds and mammals, it is closed to public access. Periodic visits to the island are conducted only by Complex staff and academic researchers accompanied by staff, to install and maintain remote sensing wildlife cameras or to conduct other forms of monitoring and research. The island has typically been reached with the aid of a U.S. Coast Guard piloted helicopter. The island is 1/2 mile south of the flight path of aircraft to and from the Del Norte Airport, and under the current conditions does not seem to disturb the wildlife. A remote viewing site and interpretive panels are provided on shore immediately adjacent to Castle Rock NWR on Pebble Beach Drive in Crescent City, California. From the remote viewing location, visitors can see seabirds in flight and resting pinnipeds.

Kayaking, jet skiing and other recreational boating is common around Castle Rock NWR, but landing is not permitted.

Quality of Supplemental Values

Castle Rock NWR offers outstanding ecological values with features of scientific, educational, and scenic interest. Castle Rock NWR's habitat features include relatively deep topsoil, vegetated terraces, sheer rock cliffs, talus slopes, as well as protected sandy beach and reef habitat. These features allow it to support one of the largest populations of nocturnal cavity nesting seabirds in California and one of the most important colonies of common murres on the Pacific coast (Carter et al. 1992, USFWS 2005). It is one of only five sites in the California Current System that supports more than 100,000 nesting seabirds. One species of shorebird, the black oystercatcher, also nests at Castle Rock NWR. The island is important to non-breeding seabirds as well. It serves as a communal roost for thousands of brown pelicans during migration, and has become one of the most important resting sites on the northern California coast for federally listed species, such as the threatened Steller sea-lion and the brown pelican. Several California Species of Special Concern that utilize Castle Rock NWR include the tufted puffin, fork-tailed storm-petrel, and double-crested cormorant.

Four species of pinnipeds occur regularly at Castle Rock NWR and its associated reef. Two seals, the elephant seal and harbor seal breed at Castle Rock NWR. The island represents the northernmost colonial

site in the Pacific Ocean where elephant seals regularly and successfully breed. In addition, Castle Rock NWR is part of one of the largest haul-outs for California sea-lion in northern California and a key haul-out for a local breeding population of the federally endangered Steller sea-lion.

Management Alternatives

Alternative A (Current Management)

Under Alternative A (the "No Action" Alternative), management of Castle Rock NWR would continue unchanged. The Complex works with partners from Humboldt State University, the NPS, and the U.S. Coast Guard to maintain a remote, automatic camera on Castle Rock NWR that can be viewed by the public over the internet. This project is designed to study the abundance and health of the populations of seabirds nesting on Castle Rock. While some species like common murres nest on rock ledges and can be observed through aerial photography; other species, such as rhinoceros auklets, Cassin's auklets, and leach's storm petrels, are nocturnal and burrow into the soft soil making aerial observation impossible. These burrowing species can make tunnels up to six-feet long, into the soft and fragile ground. Any human disturbance on the surface can simply and easily crush and destroy the underground nest of these seabirds.

Castle Rock would continue to be managed by the Complex as it is now. The Complex staff would only land on Castle Rock NWR as necessary for research as determined by the Castle Rock NWR manager and staff/contractors with specific knowledge of the Castle Rock NWR's ecology. Research would continue to take place from off the island via plane or boat, or by remote sensing cameras placed on the island during periods of low wildlife use. Through the use of video cameras as a remote sensing technique, the biologists are able to gather data on relative abundance, burrow use, attendance and departure, nesting chronologies, and breeding behavior of seabird species on Castle Rock.

Alternative B

Alternative B would entail surveys for flora and fauna, and continued efforts to improve research with remote controlled recording devices. The refuge staff will be participating in at least two community events annually, with increased educational outreach and interpretation, and increased coordination with tribal entities.

Under Alternative B, the Service would not recommend a Wilderness designation for Castle Rock NWR.

Alternative C (Preferred Alternative)

Alternative C would entail restricting any monitoring and research to off-island, recommending Castle Rock NWR for wilderness designation, and completing the associated legislative environmental impact statement. A Wilderness Management Plan would need to be written, with a minimum requirement analysis performed for each planned administrative action because of this recommendation.

The Complex staff would only land on Castle Rock NWR as necessary for research as determined by the Castle Rock NWR manger and staff/contractors with specific knowledge of the Castle Rock NWR's ecology. Research would continue to take place from off the island via plane or boat, or by remote sensing cameras placed on the island during periods of low wildlife use. Through the use of video cameras as a remote sensing technique, the biologists are able to gather data on relative abundance, burrow use, attendance and departure, nesting chronologies, and breeding behavior of seabird species on Castle Rock.

The refuge staff will be participating in at least three community events annually, with increased educational outreach and interpretation, and increased tribal coordination.

Under Alternative C, the Service would recommend a Wilderness designation for Castle Rock NWR and complete the associated environmental impact statement at a later date.

Evaluation of Manageability and Other Resource Values and Uses

Wilderness designation and management of Castle Rock NWR would be fully compatible with current and proposed refuge management, and none of the resource values identified above would be foregone or adversely affected as a result of designation. Castle Rock NWR can be managed to preserve its wilderness character in perpetuity, recognizing that a "minimum requirement analysis" and "minimum tool" approach will be required. There are no valid existing private rights, or mineral rights, in this WSA.

Existing and proposed public uses and refuge management activities within the WSA is consistent with Wilderness Act and current Service wilderness management policy in the Refuge Manual (6RM8). None of the current or expected refuge management activities or public uses would diminish the wilderness character. These include scientific research, resource monitoring, and environmental education.

Recommendation

In summary, wilderness designation and management of Castle Rock NWR would be fully compatible with current and proposed refuge management, and none of the resource values identified above would be forgone or adversely affected as a result of designation. Within the next 15 years, the Refuge Complex plans to submit a recommendation for wilderness designation to the Director for approval and commits to prepare a legislative environmental impact statement (pursuant to National Environmental Policy Act) that supports the recommendation.

Appendix H: Supplemental Legal and Policy Guidance

Supplemental Legal and Policy Guidance

National Wildlife Refuge System Improvement Act of 1997

Statutory authority for Service management and associated habitat management planning on units of the NWRS is derived from the National Wildlife Refuge System Administration Act of 1966 (Refuge Administration Act), which was significantly amended by the National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act, 16 U.S.C. 668dd-668ee). Section 4(a)(3) of the Refuge Improvement Act states, *"With respect to the National Wildlife System [NWRS], it is the policy of the United States that – (A) each refuge shall be managed to fulfill the mission of the System, as well as the specific purposes for which that refuge was established…"* The Refuge Improvement Act also states that the *"…purposes of the refuge and purposes for each refuge mean the purposes specified in or derived from law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit."*

The Refuge Administration Act, as amended, clearly establishes wildlife conservation as the core NWRS mission. House Report 105-106, accompanying the Refuge Improvement Act, states *"…the fundamental mission of our System is wildlife conservation…wildlife and wildlife conservation must come first."* In contrast to some other systems of federal lands which are managed on a sustained-yield basis for multiple uses, the NWRS is a primary-use network of lands and waters. First and foremost, refuges are managed for fish, wildlife, plants, and their habitats. In addition, units of the NWRS are legally closed to all public access and use, including economic uses, unless and until they are officially opened through an analytical, public process called the refuge compatibility process. With the exception of refuge management activities which are not economic in nature, all other uses are subservient to the NWRS' primary wildlife management responsibility and they must be determined compatible before being authorized.

The Refuge Improvement Act provides clear standards for management, use, planning, and growth of the NWRS. Its passage followed the promulgation of Executive Order 12996 (April 1996), "Management of Public Uses on National Wildlife Refuges", reflecting the importance of conserving natural resources for the benefit of present and future generations of people. The Refuge Improvement Act recognizes that wildlife-dependent recreational uses including hunting, fishing, wildlife observation and photography, and environmental education and interpretation, when determined to be compatible with the mission of the System and purposes of the Refuge, are legitimate and appropriate public uses of the Refuge System. Section 5 (C) and (D) of the Refuge Improvement Act states "compatible wildlife-dependent recreational uses are the priority general public uses of the Refuge System and shall receive priority consideration in planning and management; and when the Secretary determines that a proposed wildlife-dependent recreational use is a compatible use within a refuge, that activity should be facilitated, subject to such restrictions or regulations as may be necessary, reasonable, and appropriate."

The Refuge Improvement Act also directs the Service to maintain adequate water quantity and quality to fulfill the NWRS mission and refuge purposes, and to acquire, under state law, water rights that are needed for refuge purposes.

Appropriate Use Policy

This policy describes the initial decision process the refuge manager follows when first considering whether or not to allow a proposed use on a refuge. The refuge manager must find a use is appropriate before undertaking a compatibility review of the use. An appropriate use, as defined by the Appropriate Use Policy (603 FW 1 of the Service Manual), is a proposed or existing use on a refuge that meets at least one of the following four conditions:

- The use is a wildlife-dependent recreational use as identified in the Improvement Act.
- The use contributes to the fulfilling of the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law.
- The use involves the take of fish and wildlife under State regulations.
- The use has been found to be appropriate as specified in section 1.11 (603 FW 1 of the Service Manual).

If an existing use is not appropriate, the refuge manager will eliminate or modify the use as expeditiously as practicable. If a new use is not appropriate, the refuge manager will deny the use without determining compatibility. If a use is determined to be an appropriate refuge use, the refuge manager will then determine if the use is compatible (see Compatibility section below). Although a use may be both appropriate and compatible, the refuge manager retains the authority to not allow the use or modify the use. Uses that have been administratively determined to be appropriate are the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, environmental education, and interpretation) and take of fish and wildlife under State regulations.

This CCP includes a review of appropriateness and compatibility of existing refuge uses and planned future uses in Appendix F.

Compatibility Policy

Lands within the NWRS are different from other multiple use public lands in that they are closed to all visitor uses unless specifically and legally opened. The Improvement Act states that "... the Secretary shall not initiate or permit a new use of a Refuge or expand, renew, or extend an existing use of a Refuge, unless the Secretary has determined that the use is a compatible use and that the use is not inconsistent with public safety." The Improvement Act also states that "... compatible wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, or environmental education and interpretation) are the priority general public uses of the System and shall receive priority consideration in Refuge planning and management."

In accordance with the Improvement Act, the Service has adopted a Compatibility Policy (603 FW 2) that includes guidelines for determining if a use proposed on a national wildlife refuge is compatible with the purposes for which the refuge was established. A compatible use is defined in the policy as a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the NWRS mission or the purposes for which the Refuge was established and contributes to the maintenance of biological integrity, diversity, and environmental health. The Policy also includes procedures for documentation and periodic review of existing refuge uses.

When a determination is made as to whether a proposed use is compatible or not, this determination is provided in writing and is referred to as a compatibility determination. An opportunity for public review and comment is required for all compatibility determinations. For compatibility determinations prepared concurrently with a CCP or step-down management plan, the opportunity for public review and comment is provided during the public review period for the draft plan and associated National Environmental Policy Act document. The Refuge has completed compatibility determinations for 10 uses. These compatibility determinations will be finalized with the CCP. The compatibility determinations prepared in association with the CCP/EA are provided in Appendix F.

Biological Integrity, Diversity, and Environmental Health Policy

Section 4(a)(4)(B) of the Refuge Improvement Act states, "In administering the System, the Secretary shall…ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans…" This legislative mandate represents an additional directive to be followed while achieving refuge purposes and the NWRS mission. The Act requires the consideration and protection of a broad spectrum of fish, wildlife, plant, and habitat resources found on a refuge. Service policy guiding implementation of this statutory requirement provides a refuge manager with an evaluation process to analyze his/her refuge and recommend the best management direction to prevent further degradation of environmental conditions; and, where appropriate, and in concert with refuge purposes and NWRS mission, to restore lost or severely degraded resource components. Within the Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3[3.7B]),

the relationships among biological integrity, diversity, and environmental health; NWRS mission; and refuge purposes are explained as follows, "…each refuge will be managed to fulfill refuge purpose(s) as well as to help fulfill the System mission, and we will accomplish these purpose(s) and our mission by ensuring that the biological integrity, diversity, and environmental health of each refuge are maintained and where appropriate, restored."

When evaluating the appropriate management direction for refuges, Refuge Managers will use sound professional judgment to determine their refuge's contribution to biological integrity, diversity, and environmental health at multiple landscape scales. Sound professional judgment incorporates field experience, an understanding of the refuge's role within an ecosystem, and the knowledge of refuge resources, applicable laws and best available science, including consultation with resource experts both inside and outside of the Service.

The priority visitor uses of the NWRS are not in conflict with this policy when they have been determined to be compatible. The directives of this policy do not envision or necessitate the exclusion of visitors or the elimination of visitor use structures from refuges; however, maintenance and/or restoration of biological integrity, diversity, and environmental health may require spatial or temporal zoning of visitor use programs and associated infrastructures. General success in maintaining or restoring biological integrity, diversity, and environmental health will produce higher quality opportunities for providing wildlife-dependent recreational uses.

Draft Wilderness Stewardship Policy Pursuant to the Wilderness Act of 1964
This policy updates guidance on administrative and public activities on wilderness and proposed wilderness within the NWRS. The purpose of the policy is to prescribe how the Service: "...preserves the character and qualities of designated wilderness while managing for the refuge establishing purpose(s), maintains outstanding opportunities for solitude or primitive and unconfined type of recreation, and conducts minimum requirements analyses before taking any action that may impact wilderness character."

The policy emphasizes recreational uses that are compatible and wilderness-dependent. The policy clarifies conditions upon which generally prohibited uses (motor vehicles, motorized equipment, mechanical transport, structures, and installations) may be necessary for wilderness protection. It confirms that: "... we will generally not modify habitat, species population levels, or natural ecological processes in refuge wilderness unless doing so maintains or restores ecological integrity that has been degraded by human influence or is necessary to protect or recover threatened or endangered species."

National Environmental Policy Act of 1969

This Draft CCP and associated National Environmental Policy Act (NEPA) document has been prepared consistent with the requirements of NEPA, the Council on Environmental Quality (CEQ) NEPA regulations (40 CFR Secs. 1500 et seq.), and the Department of Interior's NEPA procedures (Department Manual, Part 516).

Cultural Resources

In 1994 the Service formalized a policy for consultation with Native American Tribes, including during planning. Specifically the policy requires that "The Service will involve Native American governments in all Service actions that may affect their cultural or religious interests, including archaeological sites. The Service will be guided in this respect by such legislation as the American Indian Religious Freedom Act, the National Historic Preservation Act, the Native American Graves Protection and Repatriation Act, and the Archaeological Resources Protection Act. The Service will take appropriate precautions to ensure that locations of protected sites remain confidential.

In March 2003, the President issued Executive Order 13287 to reaffirm our nation's commitment to preserving heritage resources while assessing Federal land management agencies' approaches to overseeing and managing these important assets.

In its broadest sense the Executive Order seeks to:

- Provide leadership in preserving America's heritage by actively advancing the protection, enhancement, and contemporary use of the historic properties managed by the Federal Government.
- Promote intergovernmental cooperation and partnerships for the preservation and use of historic properties.

- Direct Federal agencies to increase their knowledge of historic properties under their care and enhance the management of these assets.
- Encourage agencies to seek partnerships with State, tribal, and local governments and the private sector to make more efficient and informed use of their resources for economic development and other recognized public benefits.
- Better combine historic preservation and nature tourism by directing the agencies to assist in local and regional tourism programs and historic properties that are a significant feature of many State and local programs.

Environmental Justice

On February 11, 1994, the President issued Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) which directs the US Environmental Protection Agency (EPA) to ensure that agencies analyze environmental effects on minority and low-income communities. The purpose of the executive order is to avoid the disproportionate placement of any adverse environmental, economic, social, or health impacts resulting from Federal actions and policies on minority and low-income populations.

Appendix I: Compliance with Section 7 of the Federal Endangered Species Act

Table 1. Federal Endangered Species Act Protected Species Lists for Humboldt Bay NWR and Castle Rock NWR

Federally Threatened and Endangered Species in Humboldt County

Type	Scientific Name	Common Name	Category	Critical Habitat	Documented on HBNWR?
Plants					
	Erysimum menziesii (only ssp. *eurekense* found on refuge)	Menzies' wallflower (ssp. *eurekense* = Humboldt Bay wallflower)	E	N	Y
	Layia carnosa	beach layia	E	N	Y
	Lilium occidentale	western lily	E	N	N
Invertebrates					
*	*Haliotis cracherodii*	black abalone	E	N	N
Fish					
*	*Acipenser medirostris*	green sturgeon, Southern DPS	T	Y	Y
	Eucyclogobius newberryi	tidewater goby	E	P	Y
*	*Oncorhynchus kisutch*	S. OR/N. CA Coho salmon	T	Y	Y
*	*Oncorhynchus mykiss*	Northern California steelhead	T	Y	Y
*	*Oncorhynchus tshawytscha*	CA coastal Chinook salmon	T	Y	Y
*	*Thaleichthys pacificus*	eulachon, Southern DPS	PT	N	Y
Birds					
	Brachyramphus marmoratus	marbled murrelet	T	P	N
	Charadrius alexandrinus nivosus	Western snowy plover	T		
	Coccyzus americanus	yellow-billed cuckoo (Western DPS)	C	N	Y
	Pelecanus occidentalis	brown pelican	E	N	Y
	Strix occidentalis caurina	northern spotted owl	T	Y	N
Mammals					
*	*Balaenoptera borealis*	sei whale	E	N	N
*	*Balaenoptera musculus*	blue whale	E	N	N
*	*Balaenoptera physalus*	fin whale	E	N	N
*	*Eumetopias jubatus*	Steller (=northern) sea-lion	T	Y	N

Federally Threatened and Endangered Species in Humboldt County (continued)

Type	Scientific Name	Common Name	Category	Critical Habitat	Documented on HBNWR?
	Martes pennanti pacifica	Pacific fisher	C	N	N
*	*Megaptera novaengliae*	humpback whale	E	N	N
*	*Physeter macrocephalus*	sperm whale	E	N	N

Federally Threatened and Endangered Species in Del Norte County

Type	Scientific Name	Common Name	Category	Critical Habitat	Documented on CRNWR?
Plants					
	Arabis macdonaldiana	McDonald's rock-cress	E	N	N
	Lilium occidentale	western lily	E	N	N
Invertebrates					
	Haliotis cracherodii	black abalone	E	N	N
	Polites mardon	mardon skipper	C	N	N
	Speyeria zerene hippolyta	Oregon silverspot butterfly	T	Y	N
Fish					
*	*Acipenser medirostris*	green sturgeon, Southern DPS	T	Y	Y
	Eucyclogobius newberryi	tidewater goby	E	P	N
*	*Oncorhynchus kisutch*	S. OR/N. CA Coho salmon	T	Y	N
*	*Oncorhynchus tshawytscha*	CA coastal Chinook salmon	T	Y	N
*	*Thaleichthys pacificus*	eulachon, Southern DPS	PT	N	Y
Reptiles					
*	*Caretta caretta*	loggerhead turtle	T	N	N
*	*Chelonia mydas (incl. agassizi)*	green turtle	T	N	N
*	*Dermochelys coriacea*	leatherback turtle	E	Y	N
*	*Lepidochelys olivacea*	olive (=Pacific) ridley sea turtle	T	N	N
Birds					
	Brachyramphus marmoratus	marbled murrelet	T	P	nearby waters
	Charadrius alexandrinus nivosus	western snowy plover	T	P	N
	Coccyzus americanus	western yellow-billed cuckoo	C	N	N
	Haliaeetus leucocephalus	bald eagle	delisted	N	N
	Pelecanus occidentalis	brown pelican	E	N	Y
	Phoebastris albatrus	short-tailed albatross	E	N	N
	Strix occidentalis caurina	northern spotted owl	T	Y	N
Mammals					
*	*Balaenoptera borealis*	sei whale	E	N	N
*	*Balaenoptera musculus*	blue whale	E	N	N

Federally Threatened and Endangered Species in Del Norte County (continued)

Type	Scientific Name	Common Name	Category	Critical Habitat	Documented on CRNWR?
*	*Balaenoptera physalus*	fin whale	E	N	N
*	*Eumetopias jubatus*	Steller (=northern) sea-lion	T	Y	Y
	Martes pennanti pacifica	Pacific fisher	C	N	N
*	*Megaptera novaengliae*	humpback whale	E	N	N
*	*Physeter macrocephalus*	sperm whale	E	N	N

(PE) Proposed Endangered Proposed in the Federal Register as being in danger of extinction
(PT) Proposed Threatened Proposed as likely to become endangered within the foreseeable future
(E) Endangered Listed in the Federal Register as being in danger of extinction
(T) Threatened Listed as likely to become endangered within the foreseeable future
(C) Candidate which may become a proposed species
Critical Habitat Y = Designated, P = Proposed, N = None Designated
** Denotes a species Listed by the National Marine Fisheries Service*

REC'D SEP 08 2009

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802- 4213

SEP 01 2009

In response refer to:
2009/11682

Mr. Mark Pelz
Chief, Refuge Planning
Pacific Southwest Region
U.S. Fish and Wildlife Service
2800 Cottage Way, Room W-2606
Sacramento, California 95825-1846

Dear Mr. Pelz:

On May 6, 2009, NOAA's National Marine Fisheries Service (NMFS) received the U.S. Fish and Wildlife Service's (FWS) May 4, 2009, letter and enclosed January 2009 Draft Comprehensive Conservation Plan and Environmental Assessment for the Humboldt Bay National Wildlife Refuge Complex (Plan), requesting formal consultation on the activities described in the Plan (Project) pursuant to section 7(a)(2) of the Endangered Species Act (ESA), as amended (16 U.S.C. 1531 *et seq.*) and its implementing regulations (50 CFR 402). FWS requested concurrence with their determination that the Project may affect, but is not likely to adversely affect the following Federally threatened species: (1) Southern Oregon/Northern California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*) Evolutionarily Significant Unit (ESU), (2) California Coastal (CC) Chinook salmon (*O. tshawytscha*) ESU, (3) Northern California (NC) steelhead (*O. mykiss*) Distinct Population Segment (DPS), (4) Southern DPS of North American green sturgeon (*Acipenser medirostris*), and (5) Eastern DPS of Steller sea lion (*Eumetopias jubatus*). Designated critical habitat for the following species is within the project area, may be affected by the proposed action, and should therefore be included in the consultation: (1) SONCC coho salmon, (2) CC Chinook salmon, and (3) NC steelhead.

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (50 CFR 600), the FWS requested concurrence with their determination that the Project will not adversely affect essential fish habitat for Pacific salmon, Pacific groundfish, and coastal pelagic species.

The FWS should consider requesting conferencing on the effects of the Project on the following: (1) proposed critical habitat for the Southern DPS of green sturgeon, which includes Humboldt Bay; and (2) proposed listing of the Pacific eulachon (*Thaleichthys pacificus*) as threatened. The Pacific eulachon is an anadromous fish which occurred historically in Humboldt Bay. More information about Pacific eulachon can be found here: http://www.nmfs.noaa.gov/pr/species/fish/pacificeulachon.htm.

In cases where a project area includes a species proposed for listing or critical habitat proposed for designation under the ESA , an action agency may choose to conference with NMFS while following the procedures for a formal consultation [50 CFR 402.10(d)]. An opinion issued at the conclusion of the conference may be adopted as the biological opinion when the species is listed or critical habitat is designated, but only if no significant new information has been developed, and no significant changes to the Federal action are made that would alter the content of the opinion. Once a conference opinion has been adopted as a biological opinion, than the incidental take statement becomes effective.

In the May 4, 2009, letter the FWS requested initiation of formal consultation, but also requested concurrence with a determination that the activities associated with the Project may affect, but are not likely to adversely affect, Federally threatened species. NMFS does not concur with FWS' determination that the Project is not likely to adversely affect threatened species. A request for formal consultation is appropriate when the action agency believes the proposed actions are likely to adversely affect listed species or their designated critical habitat. Based on conversations with FWS staff, NMFS considers the May 4, 2009, letter a request for formal consultation.

NMFS has determined that the information in the Plan, along with additional information provided by FWS staff (dated February 18, 2009) that details planned restoration of Salmon Creek, is sufficient to initiate consultation. Section 7 implementation regulations (50 CFR 402.14) provide NMFS 90 calendar days to conduct formal consultation, and another 45 calendar days to prepare our biological opinion. On this basis, we expect to provide you with a biological opinion by January 15, 2010.

If the FWS wants to conference with NMFS on the proposed critical habitat for the Southern DPS of green sturgeon, and proposed listing of the Pacific eulachon, than please respond in writing to NMFS, Arcata Area Office; or email Julie Weeder. Please contact Ms. Julie Weeder at (707) 825-5168, or via email at julie.weeder@noaa.gov, if you have any questions regarding this consultation.

Sincerely,

Rodney R. McInnis
Regional Administrator

Copy to file – ARN 151422SWR09AR00228

2

REC'D JUN 15 2009

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arcata Fish and Wildlife Office
1655 Heindon Road
Arcata, CA 95521-5582
Phone: (707) 822-7201 Fax: (707) 822-8411

In Reply Refer To:
File #: 8-14-2009-I-3680
81331-2009-I-0104

JUN 10 2009

Memorandum

To: Mark Pelz, Chief, Refuge Planning, Region 8
Sacramento, California

From: Acting Field Supervisor, Arcata Fish and Wildlife Office
Arcata, California

Subject: Informal Consultation on the proposed Draft Comprehensive Conservation Plan and Environmental Assessment for Humboldt Bay National Wildlife Refuge Complex (CCP/EA), Humboldt County, California

This memorandum responds to your May 4, 2009, correspondence requesting the Fish and Wildlife Service's (Service) concurrence with your determination of effects for the proposed CCP/EA (action) located on the Humboldt Bay National Wildlife Refuge (HBNWR), Humboldt County, California. Your correspondence was received at the Arcata Fish and Wildlife Office on May 4, 2009. You determined the proposed action may affect but is not likely to adversely affect the following federally-listed species: the endangered Tidewater Goby (*Eucyclogobius newberryi*) and its designated critical habitat, the endangered Brown Pelican (*Pelecanus occidentalis*), the endangered short-tailed albatross (*Phoebastris albatrus*), the endangered Western lily (*Lilium occidentale*), the endangered McDonald's rock-cress (*Arabis macdonaldiana*), the endangered Beach layia (*Layia carnosa*), the endangered Humboldt Bay wallflower (*Erysimum menziesii* spp. *eurekense*), the threatened Northern spotted owl (*Strix occidentalis caurina*), the threatened Marbled murrelet (*Brachyramphus marmoratus*) and its proposed critical habitat, the threatened Western snowy plover (*Charadrius alexandrinus nivosus*) and its proposed critical habitat, and the threatened Oregon silver-spot butterfly (*Speyeria zerene hippolyta*). This response is prepared in accordance with the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act) and its implementing regulations (50 CFR §402).

This consultation is based on information provided in your May 4, 2009, Intra-Service Section 7 Biological Evaluation (BE), your January 2009, Draft CCP/EA, and internal discussions with various AFWO and HBNWR staff. The BE and the CCP/EA are hereby incorporated by reference. The CCP/EA contains a description of the proposed action, the status of the species, and the effects of the proposed action. A complete administrative record for this consultation is on file in this office.

Concurrence

The Service concurs with your determinations that the proposed action may affect but is not likely to adversely affect any of the species of concern, based on the conservation measures listed in Appendix 1 of the CCP/EA.

Conclusion

This concludes informal consultation on the proposed CCP/EA. Unless new information reveals that the proposed action: (1) may affect listed species in a manner, or to an extent, not considered in your correspondence; (2) the action is modified in a manner that causes an effect on the listed species or critical habitat not considered in your correspondence; or (3) a new species is listed or critical habitat is designated that may be affected by the proposed action, no further action pursuant to the Act is necessary.

Please contact staff biologist Ken Hoffman at (707) 822-7201 should you have further questions regarding this consultation.

cc:
USFWS/HBNWR, Humboldt County, California (Attn: Eric Nelson)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Southwest Region
2800 Cottage Way, Room W-2606
Sacramento, California 95825-1846

In Reply Refer to:
80230

May 4, 2009

Clarence Hostler
National Oceanographic and Atmospheric Administration (NOAA), Fisheries
1655 Heindon Road
Arcata, CA 95521

Subject: Request for Initiation of Section 7 Consultation

Dear Mr. Hostler,

The U.S. Fish and Wildlife Service (FWS) is requesting initiation of formal consultation pursuant to section 7 of the Endangered Species Act (ESA), as amended. We request:

1. Confirmation from NOAA's National Marine Fisheries Service that the species listed below correctly reflects the listed species under your jurisdiction that may be affected by the proposed action.

2. Concurrence from NMFS with our determination that the actions described in the CCP may affect, but are not likely to adversely affect the: northern California evolutionarily significant unit (ESU) of the Coho salmon (*Oncorhynchus kisutch*); California coastal ESU of the Chinook salmon (O. tshawytscha); northern California ESU of the steelhead (*O. mykiss*); southern distinct population segment (DPS) of the North American green sturgeon (*Acipsenser medirostris*); and the Steller (northern) sea-lion *(Eumetopias jubatus)*. All 5 species are listed as threatened under the Federal ESA.

The enclosed document entitled *Draft Comprehensive Conservation Plan and Environmental Assessment for Humboldt Bay National Wildlife Refuge Complex* (CCP/EA), the feasibility report: *Lower Salmon Creek Delta Salmonid Habitat Enhancement Opportunities* and the previous consultation with your office (151422SWR2005AR00792: KM, dated June 30, 2006) include the data and analysis upon which we have based our determination of effects.

3. Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act, as amended, we also request concurrence from NMFS with our determination that the actions described in the CCP may affect, but is not likely to adversely affect the essential fish habitat (EFH) for Pacific salmon, Pacific groundfish, and coastal pelagic species.

4. Finally, we request the opportunity to review your draft biological opinion prior to completion of the consultation process.

The CCP/EA is programmatic in nature, with the long term restoration effects being the goal, short term effects are minimized by the extensive conservation measures provided in Appendix E, pages E-88 to E-93.

In the CCP/EA, we evaluated the effects of the proposed 15-year plan for the general management, maintenance, and public use activities. We believe the activities outlined in the CCP will lead to long-term benefits to threatened and endangered species. Phase 2 of the Salmon Creek restoration is described in more detail with Alternative C found in the *Lower Salmon Creek Delta Salmonid Habitat Enhancement Opportunities,* which we have included.

We are enclosing a page with the elements needed for a consultation, and where these elements are found in the CCP/EA. In addition, we are coordinating with the U.S. Fish and Wildlife Service - Arcata Field Office on the species under their jurisdiction.

Should you or your staff have questions, please contact Richard Smith at (916) 414-6502 or via email at richard_smith@fws.gov.

Sincerely,

Mark Pelz
Chief, Refuge Planning

Enclosures

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Southwest Region
2800 Cottage Way, Room W-2606
Sacramento, California 95825-1846

In Reply Refer to:
80230

May 4, 2009

To: Randy Brown, Acting Field Supervisor, Arcata Fish and Wildlife Office
Arcata, California

From: Mark Pelz, Chief, Refuge Planning, Region 8
Sacramento, California

Subject: Intra-Service Section 7 Biological Evaluation

We are requesting your concurrence with our findings in the attached Intra-agency Section 7 Evaluation for *the Draft Comprehensive Conservation Plan and Environmental Assessment for Humboldt Bay National Wildlife Refuge Complex (CCP/EA)*.

The CCP/EA is programmatic in nature, with the long term restoration effects being the goal, short term effects are minimized by the extensive conservation measures provided in Appendix E, pages E-88 to E-93.

We evaluated the proposed general management, maintenance, and public use activities in the CCP/EA and believe the activities outlined in the CCP will lead to long-term benefits to threatened and endangered species. Phase 2 of the Salmon Creek restoration is described in more detail with Alternative C of the *Lower Salmon Creek Delta Salmonid Habitat Enhancement Opportunities* report, which we have included.

Previous consultations with the Refuge and the Arcata Field Office include: 1-14-2005-2612, dated May 9, 2005, and 1-14-2004-2556, dated July 20, 2006. In addition, we are consulting with the Arcata office of the National Oceanographic and Atmospheric Administration – Fisheries on the species under their jurisdiction.

We are enclosing a page with the elements needed for a consultation, and where these elements are found in the CCP/EA.

Thank you for your prompt attention to this matter. If you have any questions regarding this request or the CCP/EA, please call Richard Smith of my staff at (916) 414-6502 or via email at richard_smith@fws.gov.

Enclosures

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Richard Smith
Telephone Number: (916) 414-6502
Date: 5/4/09

I. Region: 8

II. Service Activity (Program):

Humboldt Bay National Wildlife Refuge Complex, Draft Comprehensive Conservation Plan (CCP)

III. Pertinent Species and Habitat:

A. Listed species and/or their critical habitat within the action area:

Threatened and Endangered Species List for Humboldt Bay NWR National Wildlife Refuge.

Threatened and Endangered Species in Humboldt County					
TYPE	SCIENTIFIC NAME	COMMON NAME	CATEGORY	CRITICAL HABITAT	DOCUMENTED ON HBNWR?
Plants					
	Erysimum menziesii (only *ssp. eurekense* found on refuge)	Menzies' wallflower	E	N	Y
	Layia carnosa	beach layia	E	N	Y
Fish					
	Eucyclogobius newberryi	tidewater goby	E	P	Y
Birds					
	Brachyramphus marmoratus	marbled murrelet	T	P	N
	Pelecanus occidentalis	brown pelican	E	N	Y
	Strix occidentalis caurina	northern spotted owl	T	Y	N
Mammals					
	Martes pennanti pacifica	Pacific fisher	C	N	N

Threatened and Endangered Species List for Castle Rock NWR National Wildlife Refuge.

Threatened and Endangered Species in Del Norte County					
TYPE	SCIENTIFIC NAME	COMMON NAME	CATEGORY	CRITICAL HABITAT	DOCUMENTED ON CRNWR?
Plants					
	Arabis macdonaldiana	McDonald's rock-cress	E	N	N
	Lilium occidentale	western lily	E	N	N

Invertebrates					
	Polites mardon	mardon skipper	C	N	N
	Speyeria zerene hippolyta	Oregon silverspot butterfly	T	Y	N
Fish					
	Eucyclogobius newberryi	tidewater goby	E	P	N
Birds					
	Brachyramphus marmoratus	marbled murrelet	T	P	Y
	Charadrius alexandrinus nivosus	western snowy plover	T	P	N
	Coccyzus americanus	Western yellow-billed cuckoo	C	N	N
	Pelecanus occidentalis	brown pelican	E	N	Y
	Phoebastris albatrus	short-tailed albatross	E	N	N
	Strix occidentalis caurina	northern spotted owl	T	Y	N
Mammals					
	Martes pennanti pacifica	Pacific fisher	C	N	N

B. Proposed critical habitat within the action area:

tidewater goby (*Eucyclogobius newberryi)* proposed critical habitat
marbled murrelet (*Brachyramphus marmoratus)* proposed critical habitat
western snowy plover (*Charadrius alexandrinus nivosus)* proposed critical habitat

C. Candidate species within the action area:

Pacific fisher (West coast distinct population) *(Martes pennanti pacifica*) (C)
Mardon skipper butterfly *(Polites mardon*) (C)
Western yellow-billed cuckoo (*Coccyzus americanus)* (C)

D. Include species/habitat occurrence on a map.

Please see pages 8, 10, 35, 38, 55, 68, & 89 of the CCP.

IV. Geographic area or station name and action:

Humboldt Bay National Wildlife Refuge Complex, Comprehensive Conservation Plan

V. Location (attach map):

Please see page 32 of the CCP.

A. Ecoregion Number and Name:

KLAMATH/CENTRAL PACIFIC COAST ECOREGION (#2)

B. County and State:
Humboldt and Del Norte Counties, California

C. Section, township and range (or latitude and longitude):

D. Distance (miles) and direction to nearest town:
Headquarters is 4.5 miles from Loleta, CA.
Other nearby towns include Arcata and Eureka.

E. Species/habitat occurrence:
Humboldt Bay NWR – pages 31-54
Castle Rock NWR – pages 67-81

VI. Description of proposed action (attach additional pages as needed):
Refuge Complex Goals, Objectives, and Strategies – pages 95-121
Management Plan Implementation – pages 121-130

VII. Determination of effects:

A. Explanation of effects of the action on species and critical habitats in items III. A, B, and C (attach additional pages as needed):

CCP, Humboldt Bay NWR - Appendix E, pages E-59 to E-60, E-70 to E-74, and E-76 to E-77.

Salmon Creek Restoration design elements found on pages 68-70 of the Lower Salmon Creek Delta Salmonid Enhancement Opportunities Report

Castle Rock NWR – Appendix E, pages E-83 to E-84

B. Explanation of actions to be implemented to reduce adverse effects:
Conservation Measures - Appendix E, pages E-88 to E-93

VIII. Effect Determination and response requested: [* = optional].

A. Listed species/designated critical habitat:

Determination	Response Requested
May affect, but is not likely to adversely effect	
Tidewater goby *(Eucyclogobius newberryi)*	__ **Concurrence**
Menzies' wallflower *(Erysimum menziesii [ssp. eurekense])* (E)	__ **Concurrence**
Beach layia (*Layia carnosa*) (E)	__ **Concurrence**
Northern spotted owl (*Strix occidentalis caurina*) (T)	__ **Concurrence**
Marbled murrelet (*Brachyramphus marmoratus*) (T)	__ **Concurrence**
Brown pelican (*Pelecanus occidentalis*) (E)	__ **Concurrence**
McDonald's rock-cress (*Arabis macdonaldiana*) (E)	__ **Concurrence**
Western lily (*Lilium occidentale)* (E)	__ **Concurrence**
Oregon silverspot butterfly (*Speyeria zerene hippolyta*) (T)	__ **Concurrence**
short-tailed albatross (*Phoebastris albatrus*) (E)	__ **Concurrence**
Western snowy plover (*Charadrius alexandrinus nivosus)* (T)	__ **Concurrence**

B. Proposed critical habitat:

Determination	Response Requested
May affect, but no adverse modification of proposed critical habitat	
Tidewater goby (*Eucyclogobius newberryi)* (E), PCH	__ ***Concurrence**
Marbled murrelet (*Brachyramphus marmoratus)* (T), PCH	__ ***Concurrence**
Western snowy plover (*Charadrius alexandrinus nivosus*) (T), PCH	__ ***Concurrence**

C. Candidate species:

Determination	Response Requested
May affect, but is not likely to adversely effect	
Pacific fisher (West coast distinct population) *(Martes pennanti pacifica*) (C)	__ ***Concurrence**
Yellow-billed cuckoo (Western continental US) *(Coccyzus americanus*) (C)	__ ***Concurrence**
Mardon skipper butterfly *(Polites mardon*) (C)	__ ***Concurrence**

Mark Pelz
Signature

5-4-09
Date

Mark Pelz, Chief, Refuge Planning

Appendix J: Plant Lists

Humboldt Bay Flora

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Aceraceae								
Acer macrophyllum Pursh		big leaf maple	FS		X		N	X
Agavaceae								
Cordyline australis Hook. F.		cabbage tree	FM, BM				E	
Aizoaceae								
Carpobrotus chilensis (Molina) N.E. Br.		sea fig	DM	X			E	X
Carpobrotus edulis (L.) N.E. Br.		iceplant	DM	X			E, I	X
Alismataceae								
Alisma lanceolatum With.		lanceleaf water plantain	FM		X		E	
Alisima plantago-aquatica L.		water plantain	FM		X		N	
Anacardiaceae								
Toxicodendron diversilobum Torrey & A. Gray (E. Greene)		poison oak	CDF, RF	X	X		N	X
Apiaceae								
Angelica lucida L.		seacoast angelica	BM		X	X	N, C	X
Anthriscus caucalis M. Bieb		bur chevril	DM	X			E	
Cicuta douglasii (DC.) J. Coulter & Rose		western water hemlock	FM		X		N	
Conium maculatum L.		poison hemlock	RF, AW		X		I	X
Daucus carota L.		Queen Anne's lace	AW, DM	X	X		I	X
Daucus pusillus Michaux		American wild carrot	DM, SW	X	X		N	X
Foeniculum vulgare Miller		sweet fennel	AW, FM, SW	X	X		I	X
Glehnia littoralis (A. Gray) Miq. ssp. leiocarpa (Mathias) Hultén		American silvertop	DM	X			N, C	X
Heracleum lanatum Michaux	*Heracleum maximum* Bartram	cow parsnip	FM, AW		X		N	X
Hydrocotyle ranunculoides L.f.		marsh pennywort	FM		X		N	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Lilaeopsis occidentalis J. Coulter & Rose		western lilaeopsis	BM, SW		X	X	N	X
Oenanthe sarmentosa J.S. Presel		water parsely	FM, BM, FS, RF		X		N	X
Sanicula arctopoides Hook. & Arn.		footsteps of spring	DM	X	X		N	
Sanicula crassicaulis DC.		Pacific sanicle	CDF	X			N	X
Torilis arvensis (Hudson) Link		spreading hedge-parsley	CDF	X			E	
Apocynaceae								
Vinca major L.		bigleaf periwinkle	DM, FM, CDF, DS	X	X		E, I	X
Aquifoliaceae								
Ilex aquifolium L.		English holly	CDF	X	X		E, I	X
Araceae								
Lysichiton americanus Hultén & St. John		yellow skunk cabbage	RF, FS		X		N	X
Zantedeschia aethiopica (L.) Sprengel		callalily	FM, DM, DS	X	X		E, I	
Araliaceae								
Hedera helix L.		English ivy	CDF, RF	X	X		E, I	X
Asteraceae								
Achillea millefolium L.		common yarrow	DM, CDF, SW	X	X		N	X
Ambrosia chamissonis (Less.) E. Greene		beach-bur	DM, DS	X			N	X
Anaphalis margaritacea (L.) Benth. & Hook.		pearly everlasting	CDF, DM, SW	X	X		N	X
Anthemis arvensis L.		corn chamomile	DM				E	
Anthemis cotula L.		mayweed	AW, FM		X		E, I	X
Arctotheca calendula (L.) Levyns		cape weed	CDF,FS	X	X		E,I	
Artemisia pycnocephala DC.		coastal sagewort	DM	X			N	X
Aster chilensis Nees	*Symphyotrichum chilense* (Nees) G.L. Nesom var. *chilense*	common California aster	SW, BM, FM		X		N	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Baccharis douglasii DC.		saltmarsh baccharis	BM, FM		X	X	N	X
Baccharis pilularis DC.		coyote brush	DM, AW, BM, FM, FS, RF	X	X	X	N	X
Bellis perennis L.		lawn daisy	AW		X		E	X
Bidens cernua L. var. *cernua*		nodding beggartick	FM, BM		X		N	X
Chamomilla suaveolens (Pursh) Rydb.	*Matricaria discoidea* D.C.	pineapple weed	AW, CDF, R	X	X		E	X
Chrysanthemum segetum L.	*Glebionis segetum* (L.) Fourr.	corn chrysanthemum	DM	X			E, I	
Cichorium intybus L.		chicory	AW		X		E	
Cirsium arvense (L.) Scop.		Canada thistle	AW		X		E, I	X
Cirsium vulgare (Savi) Ten.		bullthistle	SW, DM, AW, FM		X		E, I	X
Conyza canadensis (L.) Cronq.		Canada horseweed	DM, CDF, AW	X	X		E, I	X
Conyza floribunda Kunth		asthmaweed	CDF, DM, AW	X	X		E	X
Cotula australis (Sieber) Hook. f.		Australian waterbuttons	DM, DS	X			E	
Cotula coronopifolia L.		brass buttons	BM, SM		X	X	E	X
Crepis capillaris (L.) Wallr.		hawksbeard	AW		X		E,I	
Erechtites glomerata (Poiret) DC.		cutleaf burnweed	DM, SW, FM, DS, RF, CDF	X	X		E, i	X
Erechtites minima (Poiret) DC.		coastal burnweed	CDF, DM, BM, FM, DS, RF	X	X		E, I	X
Erigeron glaucus Ker-Gawler		seaside daisy	DM, DS	X			N	X
Euthamia occidentalis Nutt.		western flat-topped goldenrod	FM		X		N	X
Gnaphalium purpureum L.	*Gamochaeta purpurea* (L.) Cabrera	purple cudweed	DM	X			N	X
Gnaphalium palustre Nutt.		western marsh cudweed	SW, DM, AW	X	X		N	X
Gnaphalium ramosissimum Nutt.	*Pseudognaphalium ramosissimum* (Nutt.) Anderb.	pink cudweed	CDF	X			N	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Gnaphalium stramineum Kunth.	*Pseudognaphalium stramineum* (Kunth) Anderb.	cotton-batting plant	DM, SW, AW	X	X		N	X
Grindelia stricta DC. var. stricta		coastal gumplant	SM, BM			X	N	X
*Hesperevax sparsiflora (*A. Gray) E. Greene var. *brevifolia*		shortleaf dwarf-cudweed	DM	X			N, C	
Hieracium albiflorum Hook.		white hawkweed	CDF	X			N	X
Hypochaeris glabra L.		smooth cat's ear	FM, DM, SW	X	X		E	X
Hypochaeris radicata L.		rough cat's ear	DM, CDF, AW	X	X		E	X
Jaumea carnosa (Less.) A. Gray		marsh jaumea	SM			X	N	X
Layia carnosa (Nutt.) Torrey & A. Gray		beach layia	DM	X			N, C	X
Leontodon taraxacoides (Villars) *Mérat* ssp. *taraxacoides*		lesser hawkbit	SW, DM, BM, FM, DS, AW	X	X		E, I	X
Lessingia filaginifolia (Hook & Arn.)	*Corethrogyne filaginifolia* (Hook & Arn.) Nutt var. *californica*	California sand-aster	DM	X			N	X
Leucanthemum vulgare Lam.		oxe-eye daisy	FM, DM, AW	X	X		E, I	X
Madia sativa Molina		coast tarweed	SW, BM, DM	X	X		N	X
Petasites frigidus (L.) Fries var. *palmatus* (Aiton) Cronq.		coltsfoot	RF		X		N	
Picris echioides L.		bristly oxtongue	FM, CDF, AW	X	X		E, I	X
Senecio vulgaris L.		old man of spring	DM, DS	X			E	X
Senecio elegans L.		purple ragwort	DM, DS	X			E, I	X
Senecio jacobaea L.		tansy ragwort	BM	X	X		E,I	
Senecio mikanioides Walp.	*Delairea odorata* Lem.	Cape ivy	DM, FS	X	X		E	
Senecio sylvaticus L.		woodland ragwort	CDF, AW	X	X		E, I	X
Silybum marianum (L.) Gaetner		milkthistle	AW		X		E, I	
Solidago canadensis L. ssp. elongata (Nutt.) Keck		meadow goldenrod	BM		X		N	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Solidago spathulata DC. ssp. *spathulata*		dune goldenrod	DM, CDF	X			N	X
Soliva sessilis Ruiz & Pavon		field burnweed	DM, CDF	X			E, I	
Sonchus asper ssp. *asper* (L.) Hill		spiny sow-thistle	AW, DS, CDF		X		E, I	X
Sonchus oleraceus L.		common sow thistle	DM, AW	X	X		E, I	X
Tanacetum camphoratum Less.		dune tansy	DM	X			N	X
Taraxacum officinale Wigg.		red-seeded dandelion	AW		X		E	X
Azollaceae								
Azolla filiculoides Lam.		Pacific mosquito fern	FM, SW, OW		X		N	X
Azolla mexicana C. Presl		Mexican mosquito fern	OW, FM		X		N	X
Betulaceae								
Alnus rubra Bong.		red alder	RF, FS, SW		X		N	X
Boraginaceae								
Amsinckia spectabilis Fischer & C. Meyer var. *spectabilis*		seaside fiddleneck	DM	X		X	N	X
Borago officinalis L.		common borage	AW		X		E	
Cryptantha leiocarpa (Fischer & C. Meyer) E. Greene		coastal cryptantha	DM	X			N	X
Myosotis discolor Pers.		forget-me-not	AW, FM		X		E	
Symphytum asperum Lepchin		rough comfrey	AW		X		E	
Brassicaceae								
Barbarea vulgaris R. Br.		common wintercress	AW		X		E	
Brassica rapa L.		common mustard	AW, FM		X		E, I	X
Cakile edentula (Bigelow) Hook.		American sea rocket	DM	X			E	X
Cakile maritima Scop.		European sea rocket	DM	X			E	X
Capsella bursa-pastoris (L.) Medikus		shepherd's purse	DM, DS, AW	X	X		E	X
Cardamine oligosperma Torrey & Gray		bitter cress	DM, AW, DS, SW	X	X		N	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Coincya monensis (L.) Greuter & Burdet		star-mustard	DM	X			E,I	
Draba verna L.		small fruiting spring draba	DM, SW	X	X		N	
Erysimum menziesii (Hook) ssp. *eurekense* R.A. Price		Humboldt Bay wallflower	DM	X			N, C	X
Hirschfeldia incana (L.) Lagr.-Fossat		shortpod mustard	DM, AW	X	X		E,I	X
Lepidium nitidum Torrey & A. Gray var. *nitidum*		shining pepperweed	DM	X			N	X
Lobularia maritima (L.) Desv.		sweet alyssum	DS	X			E	
Raphanus raphanistrum L.		wild radish	DM, AW, RF	X	X		E	X
Rorippa nasturtium-aquaticum (L.) Hayek	*Nasturtium officinale* W.T. Aiton	water cress	FM, RF		X		N	
Sisymbrium officinale L.		hedge mustard	AW, CDF	X	X		E, I	X
Callitrichaceae								
Callitriche heterophylla (Pursh) var. *bolanderi* (Hegelm.) Fassett		water starwort	DS, AW, FM	X	X		N	
Callitriche stagnalis Scop.		pond water-starwort	OW, FM		X		E	
Caprifoliaceae								
Linnaea borealis L. var. *longiflora* Torrey	*Linnaea borealis* L. ssp. *longiflora* (Torrey) Hultén	twin flower	CDF	X			N	planted
Lonicera hispidula Douglas var. *vacillans* A. Gray		pink honeysuckle	CDF, RF	X			N	X
Lonicera involucrata (Richardson) Banks var. *ledebourii* (Eschsch.) Zabel		coast twinberry	CDF, FS, RF	X	X		N	X
Sambucus racemosa L.		red elderberry	RF, CDF, FS	X	X		N	X
Caryophyllaceae								
Cardionema ramosissimum (J. A. weinm.) Nelson & J.F. Macbr.		sandmat	DM, DS	X			N	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Cerastium glomeratum Thuill.		sticky chickweed	DM, DS, SW, AW, FM	X	X		E	X
Polycarpon tetraphyllum (L.) L.		four-leaved manyseed	DM	X			E	
Sagina decumbens (Elliot) Torrey & Gray ssp. *occidentalis* (S. Watson) G. Crow		western pearlwort	SW		X		N	X
Sagina procumbens L.		birdeye pearlwort	AW		X		E	
Silene gallica L.		common catchfly	DM	X			E	X
Spergula arvensis L. ssp. *arvensis*		spurry	DM, DS, FM	X	X		E	
Spergularia canadensis (Pers.) G. Don var. *occidentalis* R. Rossbach		western sand-spurrey	BM, SM		X	X	N, C	X
Spergularia marina (L.) Griseb.	*Spergularia salina* (L.) (Griseb.) J. Presl & C. Presl	salt marsh sand spurrey	SM, BM, AW		X	X	N	X
Spergularia macrotheca (Hornem.) Heynh. var. *macrotheca*		sticky sand spurrey	SM, SW		X	X	N	X
Spergularia rubra (L.) J.S. Presl. & C. Presl.		red sand spurry	BM, AW		X		E	
Stellaria nitens Nutt.		northern starwort	BM, SW		X		N	X
Stellaria longipes Goldie. var. *longipes*		meadow starwort	FM		X		N	
Stellaria media L. Villars		common chickweed	AW, DM, FM, DS, SW	X	X		E	X
Chenopodiaceae								
Atriplex leucophylla (Moq.) D. Dietr.		beach salt bush	DM, SM	X		X	N	
Atriplex patula L.		spear saltbush	BM, SM			X	N	X
Atriplex triangularis Willd.	*Atriplex prostrata* Bouchér ex DC.	triangle oracle	BM, SM, AW		X	X	E, I	X
Chenopodium album L.		lamb's quarters	DM, CDF, BM	X	X		E, I	X
Chenopodium ambrosioides L.		Mexican tea	R, CDF	X	X		E, I	X
Chenopodium foliosum (Moench) Asch.		leafy goosefoot	BM, AW		X	X	E, I	

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Salicornia bigelovii Torrey		dwarf saltwort	SM			X	N	range extension
Salicornia virginica L.	*Sarcocornia pacifica* (Standl.) A.J. Scott	common pickleweed	SM, BM, AW		X	X	N	X
Convolvulaceae								
Calystegia soldanella (L.) R. Br.		beach morning-glory	DM	X			N	X
Calystegia silvatica (Kit.) griseb. ssp. *disjuncta* Brummitt		shortstalk false bindweed	RF, FS, AW		X		E, I	X
Convolvulus arvensis L.		field bindweed	AW, FM		X		E	X
Crassulaceae								
Crassula connata (Ruiz Lopez & Pavon)		sand pygmy-weed	DM				N	X
Cucurbitaceae								
Marah oreganus (Torrey & A. Gray) Howell		coast wild-cucumber	CDF, RF	X	X		N	
Cupressaceae								
Cupressus macrocarpa Gordon		Monterey cypress	CDF, AW, DM	X	X		E	X
Thuja plicata D. Don		red cedar	RF		X		N	
Cuscutaceae								
Cuscuta salina Engelm. var. *major* Yuncker		saltmarsh dodder	SM, BM		X	X	N	X
Cyperaceae								
Carex cusickii Mackenzie		Cusick's sedge	FS		X		N	
Carex deweyana Schwein. ssp. *leptopoda* (Mackenzie) Calder & R. Taylor	*Carex leptopoda* Mack.	Dewey's taper-fruit sedge	CDF				N	
Carex lyngbyei Hornem		Lyngbye's sedge	BM, SM		X	X	N, C	X
Carex obnupta L. Bailey		slough sedge	SW, FM		X		N	X
Carex pansa L. Bailey		sand-dune sedge	SW, DM	X	X		N	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Cyperus eragrostis Lam.		tall flatsedge	FM, SW, BM, DM, R	X	X	X	N	X
Eleocharis macrostachya Britton		common spikerush	SW, FM		X		N	X
Eleocharis pachycarpa Desv.		broad-fruit spikerush	FM		X		E	
Eleocharis parvula (Roemer & Schultes) Link		small spikerush	FM		X		N C	
Scirpus acutus Bigelow var. *occidentalis* (S. Watson) Beetle	*Schoenoplectus acutus* (Muhl. ex Bigelow) A Löve & D. Löve var. *occidentalis* (S. Watson) S.G. Sm.	hard-stemmed tule	FM, BM		X	X	N	X
Scirpus americanus Pers.	*Schoenoplectus americanus* (Pers.) Volkart ex Schinz & R. Keller	bulrush	FM, BM		X	X	N	
Scirpus cernuus (Roemer & Schultes) Vahl.	*Isolepis cernua (Vahl)* Roem. & Schult.	low clubrush	SW, FM, BM, SM		X	X	N	X
Scirpus microcarpus C. Presl		small-fruited bulrush	FM, RF		X		N	X
Scirpus maritimus L.	*Schoenoplectus maritimus* (L.) Lye	seacoast bulrush	BM		X	X	N	X
Scirpus pungens Vahl	*Schoenoplectus pungens* (Vahl) Palla var. *badius* (J. Presl & C. Presl) S.G. Sm.	three-square	FM, BM		X	X	N	X
Scirpus robustus Pursh	*Schoenoplectus robustus* (Pursh) M.T. Strong	sturdy bulrush	BM		X	X	N	
Dennstaedtiaceae								
Pteridium aquilinum (L.) Kuhn var. *pubescens* L.		western bracken fern	CDF, DM, DS	X			N	X
Dipsicaceae								
Dipsacus fullonum L.		wild teasel	AW, FM		X		E, I	
Dryopteridaceae								
Dryopteris arguta (Kaulf.) Maxon		coastal wood fern	RF, FM, FS		X		N	X
Polystichum munitum (Kaulf.) C. Presl		sword fern	CDF, RF	X	X		N	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Equisetaceae								
Equisetum arvense L.		common horsetail	FM, RF		X		N	
Equisetum laevigatum A. Braun		smooth scouring-rush	RF, SW		X		N	
Equisetum telmateia Ehrh. ssp. *Braunii* (Milde) R.L.Hauke		giant horsetail	FM, RF, AW, CDF	X	X		N	X
Ericaceae								
Allotropa virgata A. Gray		sugar-stick	CDF	X			N	X
Arbutus menziesii Pursh		Pacific madrone	CDF	X			N	X
Arctostaphylos columbiana Piper		hairy manzanita	CDF	X			N	X
Arctostaphylos uva-ursi (L.) Sprengel		bearberry	CDF, DM	X			N	X
Arctostaphylos x *media* E. Greene		hybrid manzanita	CDF	X			N	X
Chimaphila umbellata (L.) Bartram		pipsissewa	CDF	X			N	X
Erica lusitanica Rudolphi		Spanish heath	FM/FS		X		E,I	
Gaultheria shallon Pursh		salal	CDF	X			N	X
Pyrola picta Smith		white-veined wintergreen	CDF	X			N	X
Vaccinium ovatum Pursh		evergreen huckleberry	CDF, FS	X	X		N	
Fabaceae								
Acacia dealbata Link		silver wattle	FS, CDF	X	X		E, I	
Cytisus scoparius (L.) Link		scotch broom	CDF, RF, FS, DS, SW	X	X		E, I	X
Genista monspessulana (L.) L. Johnson		French broom	FS		X		E, I	
Lathyrus latifolius (L.)		perennial sweet pea	BM, DM	X	X		E	
Lathyrus littoralis (Nutt.) Endl.		silky beach pea	DM	X			N	
Lathyrus palustris L.		marsh pea	FS, FM		X		N, C	
*Lathyrus vestitus*Nutt.var. *vestitus*		hillside pea	CDF	X			N	X
Lotus corniculatus L.		bird's-foot trefoil	FM, SW, AW		X		E, I	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Lotus formosissimus E. Greene		coastal lotus	FM, FS		X		N	
Lotus micranthus Benth.		small-flowered lotus	DM, SW	X	X		N	X
Lotus purshianus (Benth.) Clements & E.G. Clements var. *purshianus*	*Lotus unifoliatus* (Hook) Benth. var. *unifoliatus*	American bird's-foot trefoil	SW, DM	X	X		N	X
Lotus uliginosus Schk.	*Lotus pedunculatus* Cav.	big trefoil	AW, FM		X		E, I	X
Lupinus arboreus Sims		yellow bush lupine	DM, DS	X			E,I	X
Lupinus bicolor Lindley		miniature lupine	DM	X			N	X
Lupinus littoralis Douglas		seashore lupine	DM	X			N	X
Lupinus polyphyllus Lindley var. *polyphyllus*		bigleaf lupine	AW		X		N	
Lupinus rivularis Lindley		riverbank lupine	AW, DM, DS	X	X		N	X
Medicago polymorpha L.		bur-clover	DS, BM, DM	X	X		E	X
Melilotus alba Medikus	*Melilotus officinalis* (L.) Lam.	yellow sweetclover	DM, DS, AW	X			E	X
Melilotus officinalis (L.) Pall.		yellow sweetclover	DM. DS, AW	X			E	X
Trifolium arvense L.		rabbitfoot clover	DM, DS	X			E	
Trifolium campestre Schreber		hop clover	DM, DS	X			E	
Trifolium dubium Sibth.		shamrock	DM, DS, CDF, AW	X	X		E, I	
Trifolium fragiferum L.		strawberry clover	AW		X		E, I	X
Trifolium glomeratum L.		clustered clover	CDF	X			E	X
Trifolium hirtum All.		rose clover	DM, DS	X			E	
Trifolium macraei Hook. & Arn.		Macrae's clover	DM	X			N	X
Trifolium microcephalum Pursh		small-headed clover	DM	X			N	X
Trifolium microdon Hook. & Arn.		thimble clover	DM	X			N	X
Trifolium pratense L.		red clover	AW		X		E	X
Trifolium repens L.		white clover	AW, SW		X		E, I	X
Trifolium subterraneum L.		subterranean clover	SW, AW		X		E, I	X
Trifolium wormskioldii Lehm.		coast clover	SW, AW, FM		X		N	X
Vicia benghalensis L.		purple vetch	DM, DS, BM	X	X	X	E, I	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Vicia gigantea Hook.	*Vicia nigricans* Hook. & Arn. ssp. *gigantea* (Hook.) Lassetter & C.R. Gunn.	giant vetch	FS, RF		X		N	X
Vicia hirsuta (L.) S.F. Gray		hairy vetch	CDF, DM, DS	X			E	X
Vicia sativa L. ssp. *sativa*		spring vetch	FM, RF		X		E	
Vicia sativa L. ssp. *nigra* (L.)		common vetch	AW, DM		X		E	X
Vicia villosa Roth ssp. *villosa*		hairy vetch	CDF	X			E, I	X
Garryaceae								
Garrya elliptica Lindley		coast silk tassel	CDF	X			N	X
Gentianaceae								
Centaurium davyi (Jepson) Abrams		Davy's centaury	BM			X	N	
Centaurium muehlenbergii (Griseb.)		Muhlenberg's centaury	FM, SW		X		N	X
Geraniaceae								
Erodium botrys (Cav.) Bertol.		long-beaked filaree	DS, DM	X			E	
Erodium cicutarium (L.) L'Hér.		red-stemmed filaree	AW, DM	X	X		E	
Geranium dissectum L.		cutleaf geranium	AW		X		E	X
Geranium molle L.		dove's-foot geranium	AW, DM, DS	X	X		E	
Geranium robertianum L.		Robert's geranium	RF, FS		X		E, I	
Grossulariaceae								
Ribes divaricatum Douglas var. *pubiflorum* Koehne		spreading gooseberry	CDF	X			N	X
Ribes laxiflorum Pursh		trailing black currant	CDF	X			N	X
Ribes sanguineum Pursh var. *glutinosum* (Benth)		pink-flowering currant	CDF, FS, RF	X	X		N	X
Guttiferae								
Hypericum anagalloides Cham. & Schdl.		tinker's penny	AW, FM		X		N	
Hypericum perforatum L.		common St. Johnswort	DM, DS, BM	X	X	X	E, I	

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Hippuridaceae								
Hippuris vulgaris L.		common mares-tail	FM		X		N	
Hydrocharitaceae								
Egeria densa Planchon		Brazilian elodea	OW		X		E, I	
Iridaceae								
Crocosmia xcrocosmiiflora (Burb. & Dean) N.E. Br.		monbretia	DM, DS, FM	X	X		E, I	
Iris douglasiana Herbert		Douglas Iris	CDF, FM	X	X		N	
Iris germanica L. var. *florentina* (L.) Dykes		orris-root	DS	X			E	
Iris pseudacorus L.		water iris	FM		X		E	
Sisyrinchium bellum S. Watson		blue-eyed grass	FM		X		N	
Sisyrinchium californicum (Ker Gawler) Dryander		California golden-eyed grass	SW, FM		X		N	X
Juncaceae								
Juncus ambiguus Guss.		saline toad rush	BM, SM,		X	X	N	
Juncus articulatus L.		joinleaf rush	FM		X		N	
Juncus balticus Willd.	*Juncus arcticus* Willd. ssp. *littoralis* (Engelm.) Hultén	Baltic rush	SM, BM		X	X	N	
Juncus bolanderi Engelm.		Bolander's rush	AW, FM		X		N	X
Juncus breweri Engelm.		Brewer's rush	SW, DM	X	X		N	X
Juncus bufonius L. var. *bufonius*		toad rush	SW, AW, FM		X		N	X
Juncus bufonius L. var. *occidentalis F.J. Herm*		western toad rush	DM, SW	X	X		N	X
Juncus effusus L. var. *brunneus* Engelm.		bog rush	AW, FM		X		N	X
Juncus effusus L. var. *pacificus* Fern. & Wieg.		Pacific Bog Rush	AW		X		N	X
Juncus ensifolius Wikstrom		three-stamened rush	AW, FM		X		N	

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Juncus falcatus E. Meyer var. *falcatus*		sickle-leafed rush	SW	X			N	X
Juncus gerardii Loisel.		salt-meadow rush	SM		X		E	
Juncus lesueurii Bolander		salt rush	BM, SM		X	X	N	X
Luzula comosa E. Meyer		common wood-rush	CDF, DM, DS	X			N	X
Luzula subcongesta (S. Watson) Jepson		Donner wood rush	CDF, DM				N	X
Juncaginaceae								
Lilaea scilloides (Poiret) Hauman		flowering quillwort	SM, BM			X	N	
Triglochin concinna var. *concinna* Burtt Davy	*Triglochin maritima* L.	arrow-grass	SM			X	N	X
Triglochin maritima L.		seaside arrow-grass	BM, SM		X	X	N	X
Triglochin striata Ruiz Lopez & Pavon		three-ribbed arrow-grass	BM, FM		X		N	X
Lamiaceae								
Lamium purpureum L.		purple dead-nettle	FM, DM, DS	X	X		E	X
Mentha pulegium L.		pennyroyal	SW, AW, FM		X		E, I	X
Prunella vulgaris L. ssp. *vulgaris*		self-heal	AW		X		E	
Satureja douglasii (Benth.) Briq.		yerba buena	CDF	X			N	X
Stachys chamissonis Benth.		coast hedge-nettle	RF, FS		X		N	X
Stachys ajugoides Benth. var. *rigida* Jepson & Hoover	*Stachys rigida* Nutt. ex Benth. var. *rigida*	rigid hedge-nettle	FM, BM, RF, SW, AW		X		N	X
Lemnaceae								
Lemna minuscula Herter	*Lemna minuta* Kunth	least duckweed	OW, FM		X		N	X
Liliaceae								
Allium triquetrum L.		three-cornered leek	FS, FM, DM	X	X		E	
Allium unifolium Kellogg		one-leaf onion	CDF	X			N	X
Amaryllis belladonna L.		belladonna lily	DS, AW	X	X		E	
Brodiaea coronaria (Salisb.) Engl.		early harvest brodiaea	DM, CDF	X			N	X

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Dichelostemma capitatum (Benth.) A.W. Wood		blue dicks	DM , CDF	X			N	X
Dichelostemma congestum (Sm.) Kunth		fork-toothed ookow	CDF	X			N	X
Fritillaria affinis (Schultes) Sealy var. *affinis*		checker lily	CDF	X			N	X
Lilium occidentale		western lily	FS,FM		X		E	
Maianthemum dilatatum (Alph. Wood) Nelson & J.F. Macbr.		false lily of the vally	CDF, RF	X	X		N	X
Muscari botryoides (L.) Miller		common grape hyacinth	CDF	X			E	
Narcissus pseudonarcissus		daffodil	AW, DS, SW	X	X		E	X
Triteleia hyacinthina (Lindley) E. Greene		white brodiaea	DM, CDF	X			N	X
Linaceae								
Linum bienne Miller		narrow-leaved flax	DM, FM, BM	X	X		E	
Lythraceae								
Lythrum hyssopifolium L.		hyssop loosestrife	SW, AW, FM		X		E, I	X
Malvaceae								
Malva neglecta Wallr.		common mallow	AW		X		E	X
Myrtaceae								
Eucalyptus globulus Labill.		blue gum	RF, AW, CDF		X		E	X
Myricaceae								
Myrica californica Cham.	*Morella californica* (Cham.) Wilbur	wax myrtle	CDF, RF, FS, SW	X	X		N	X
Nyctaginaceae								
Abronia latifolia Eschsch		yellow sand verbena	DM	X			N	X
Abronia umbellata Lam. ssp. *breviflora* (Standley) Munz		pink sand verbena	DM	X			N, C	X
Nymphaeaceae								

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Nuphar luteum (L.) Sibth. & Sm. ssp. *polysepalum* (Engelm.) E. Beal		yellow pond-lily	FM		X		N	X
Onagraceae								
Camissonia cheiranthifolia (Sprengel) Raim ssp. *cheiranthifolia*		beach-primrose	DM	X			N	X
Camissonia strigulosa (Fischer & C. Meyer) Raven		strigose sun-cup	CDF, DM	X			N	X
Clarkia davyi (Jespon) Harlan Lewis & M. Lewis		Davy's clarkia	DM, DS	X			N	X
Clarkia purpurea (Curtis) Nelson & J.F. Macbr ssp. *quadrivulnera* (Douglas) Harlan Lewis & M. Lewis		purple clarkia	SW		X		N	X
Epilobium angustifolium L. ssp. *circumvagum* Mosq.	*Chamerion angustifolium (*L.) Holub ssp. *circumvagum* (Mosquin) Hoch	fireweed	FM, RF		X		N	X
Epilobium ciliatum Raf. ssp. *watsonii* (Barbey) P. Hoch & Raven		Watson's willowherb	SW, FM, BM, AW		X	X	N	X
Fuchsia magellanica Lam.		hardy fuchsia	FS		X		E	
Oenothera glazioviana Micheli		red-sepaled evening-primrose	DM, DS, FM	X	X		E, I	
Ophioglossaceae								
Botrychium multifidum (S. Gmelin) Rupr.		common grapefern	FM, FS, SW		X		N	X
Orchidaceae								
Calypso bulbosa (L.) Oakes		fairy slipper	CDF	X	X		N	X
Corallorhiza maculata Raf.		summer coral root	CDF	X			N	X
Goodyera oblongifolia Raf.		rattlesnake plantain	CDF	X			N	X
Listera cordata (L.)		heart-leaved twayblade	CDF	X			N	X
Piperia elegans (Lindley) Rydb.		coast piperia	SW, CDF	X	X		N	X
Piperia transversa Suksd.		rein orchid	CDF	X			N	X

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Spiranthes romanzoffiana Cham.		hooded ladies-tresses	SW, CDF	X	X		N	X
Oxalidaceae								
Oxalis corniculata L.		creeping woodsorrel	FS, DS	X	X		E	X
Oxalis pes-caprae L.		Bermuda buttercup	DM, DS	X			E, I	
Oxalis rubra A. St. Hil.		red oxalis	DM, DS	X			E, I	
Papaveraceae								
Eschscholzia californica Cham.		California poppy	AW, DM	X	X		N	X
Fumaria officinalis (L.)		fumitory	AW		X		E	
Platystemon californicus Benth.		cream cups	DM, DS	X			N	X
Pinaceae								
Abies grandis (Douglas) Lindley		grand fir	CDF, RF	X	X		N	X
Picea sitchensis (Bong.) Carriere		Sitka spruce	CDF, FS, SW	X	X		N	X
Pinus contorta ssp. *contorta* Loudon	*Pinus contorta* Douglas ex Louden var. *contorta*	shore pine	CDF, SW	X	X		N	X
Pinus radiata D. Don		Monterey pine	AW, CDF	X	X		E	X
Pseudotsuga menziesii (Mirbel) Franco var. *menziesii*		Douglas-fir	CDF	X			N	X
Pittosporaceae								
Pittosporum tenuifolium Gaertner		short-leaf box	CDF	X			E, I	X
Plantaginaceae								
Plantago coronopus L.		cut-leaf plantain	DM, SW	X	X		E	
Plantago erecta E. Morris		California plantain	DM, SW, DS	X	X		N	X
Plantago lanceolata L.		narrow-leaved plantain	CDF, DM, AW	X	X		E	X
Plantago major L.		common plantain	SW, AW, FM		X		E	
Plantago maritima L.		maritime plantain	SM			X	N	X
Plantago subnuda Pilger		tall coastal plantain	AW, SW, FM		X		N	
Plumbaginaceae								

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Armeria maritima (Miller) Willd. ssp. *californica* (Boiss.)		California sea-pink	DM, DS	X			N	X
Limonium californicum (Boiss.) *A.A. Heller*		western marsh-rosemary	SM			X	N	X
Poaceae								
Agrostis exarata Trin.		spike bentgrass	AW, BM		X		N	X
Agrostis hallii Vasey		Hall's bentgrass	CDF	X			N	X
Agrostis microphylla Steudel		little-leaf bentgrass	SW	X			N	X
Agrostis stolonifera L.		creeping bentgrass	BM, AW, FM		X		E, I	X
Agrostis viridis Gouan		green bentgrass	AW, BM	X	X		E	X
Aira praecox L.		yellow hairgrass	DM, DS, SW	X	X		E, I	X
Aira caryophyllea L.		silver hairgrass	DM, DS, SW	X	X		E, I	X
Alopecurus aequalis Sobol.		short-awn foxtail	FM		X		N	X
Alopecurus geniculatus L.		water foxtail	FM, AW		X		N	X
Alopecurus pratensis L.		meadow foxtail	AW		X		E	
Ammophila arenaria (L.) Link		European beach grass	DM, DS	X			E, I	X
Anthoxanthum odoratum L.		sweet vernal grass	DM, DS, SW, AW, FS, CDF	X	X		E, I	X
Avena fatua L.		wild oats	AW, DM		X		E	
Avena sativa L.		common oats	AW		X		E	X
Briza maxima L.		big quaking grass	DM, DS, SW	X	X		E , I	X
Briza minor L.		little quaking grass	SW, FM		X		E	
Bromus carinatus Hook & Arn. var. *carinatus*		California brome	DM, DS	X			N	X
Bromus carinatus Hook & Arn. var. *carinatus*		mountain brome	DM	X			N	X
Bromus diandrus Roth		ripgut brome	DM, DS, SW	X			E, I	X
Bromus hordeaceus L.		soft chess	DM, BM , SW	X	X	X	E, I	X
Calamagrostis nutkaensis (C. Presl) Steudel		reedgrass	CDF, BM	X	X		N	X

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Cortaderia jubata (Lemoine) Stapf		jubata grass	DM, SW, CDF, RF	X	X		E, I	X
Cortaderia selloana (Schultes) Asch & Graebner		pampas grass	DM	X			E, I	
Cynodon dactylon (L.) Pers.		bermuda grass	DM, DS, AW	X	X		E, I	
Cynosurus echinatus L.		dogtail grass	DM, DS, CDF	X			E, I	X
Dactylis glomerata L.		orchard-grass	CDF, AW	X	X		E, I	X
Deschampsia cespitosa (L.) Beauv. ssp. *holciformis* (C. Presel) W.E. Lawrx	*Deschampsia holciformis* J. Presl	coastal tufted hair-grass	BM,SM		X	X	N	X
Distichlis spicata (L.) E. Greene		saltgrass	SM, BM, SW, AW		X	X	N	X
Echinochloa crus-galli (L.) P. Beauv.		barnyard grass	FM		X		E, I	X
Elymus glaucus Buckley ssp. *jepsonii* (Burtt Davy) Gould		Jepson's blue wildrye	CDF, AW	X			N	
Festuca arundinacea Schreber	*Schedonorus phoenix* (Scop.) Holub	tall fescue	FM, BM, AW		X		E, I	X
Festuca occidentalis Hook.		western fescue	CDF	X			N	X
Festuca rubra L.		red fescue	DM, CDF	X			N	X
Glyceria elata (Nash) A. Hitchc.	*Glyceria striata* (Lam.) Hitchc.	tall mannagrass	FM		X		N	X
Glyceria occidentalis (Piper) J.C. Nelson		western mannagrass	FM, RF		X		N	X
Hierochloe occidentalis Buckley		western sweetgrass	CDF	X			N	X
Holcus lanatus L.		common velvetgrass	AW, SW, FM, CDF	X	X		E, I	X
Hordeum brachyantherum Nevski ssp. *brachyantherum*		meadow barley	BM			X	N	X
Hordeum jubatum L.		foxtail barley	BM, SM		X	X	N	X
Hordeum marinum Hudson ssp. *gussoneanum* (Parl.) Thell.		Mediterranean barley	AW, SM		X	X	E	
Hordeum murinum L. ssp. *glaucum* (Stuedel) Tzvelev		smooth barley	DM	X			E	
Hordeum murinum L. ssp. *murinum*		wall barley	DM, DS	X			E	

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Leymus mollis (Trin.) Pilger ssp. *mollis*		dune wild-rye	DM	X			N	X
Leymus x*vancouverensis* (Vasey) Pilger		Vancouver wild-rye	AW, DM, BM	X	X	X	N	X
Lolium multiflorum Lam.	*Lolium perenne* L. ssp. *multiflorum* (Lam.) Husnot	Italian rye-grass	AW, RF		X		E, I	X
Lolium perenne L.		perennial ryegrass	AW, CDF	X	X		E	X
Parapholis incurva (L.) C.E. Hubb.		curved sicklegrass	SM			X	E	X
Parapholis strigosa (Dumort) C.E. Hubb.		hairy sickle grass	SM			X	E, I	X
Phalaris aquatica L.		Harding grass	FM, AW		X		E, I	X
Phalaris arundinacea L.		reed canarygrass	FM, AW, RF, FS		X		E, I	X
Phragmites australis (Cav.) Steudel		common reed	BM, SM		X	X	E, I	
Pleuropogon californicus (Nees) Vasey		semaphore grass	AW		X		N	
Poa annua L.		annual blue grass	CDF, DM, DS, AW	X	X		E	X
Poa confinis Vasey		coastline bluegrass	DM	X			N	X
Poa macrantha Vasey		large-flowered sand-dune blue grass	DM	X			N	X
Poa pratensis L. ssp. *pratensis*		Kentucky blue grass	CDF	X			E	X
Polypogon interruptus Kunth		ditch beard grass	AW, FM		X		E	X
Polypogon maritimus Willd.		Mediterranean beard grass	SW, FM		X		E, I	X
Polypogon monspeliensis (L.) Desf.		rabbitsfoot grass	SW, FM		X		E, I	X
Puccinellia nutkaensis (J.S. Presl.) Fern. & Weath.		Alaska alkali grass	SM			X	N	X
Spartina densiflora Brongn.		dense-flowered cordgrass	SM, BM		X	X	E, I	X
Torreyochloa pallida (J.S. Presl) Church var. *pauciflora* (J.S. Presl) J.I. Davis		weak mannagrass	FM		X		N	

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Trisetum canescens Buckley		nodding oatgrass	CDF	X			N	X
Vulpia bromoides (L.) S.F. Gray		brome fescue	DM, DS	X			E, I	X
Vulpia myuros (L.) C. Gmelin		six-weeks fescue	CDF, R	X			E	X
Zea mays L.		corn	AW		X		E	
Polemoniaceae								
Gilia millefoliata Fischer & C. Meyer		dark-eyed gilia	DM	X			N, C	X
Navarretia squarrosa (Eschsch.) Hook. & Arn.		skunkweed	DM, AW	X	X		N	
Polygonaceae								
Eriogonum latifolium Smith		coast buckwheat	DM	X			N	X
Polygonum arenastrum Boreau	*Polygonum aviculare* Linnaeus ssp. *depressum* (Meisner) Arcangeli	common knotweed	AW		X		E	
Polygonum cuspidatum Sieb. & Zucc.	*Fallopia japonica* (Houttuyn) Ronse Decraene	Japanese knotweed	DM	X			E, I	
Polygonum hydropiperoides Michaux	*Persicaria hydropiperoides* (Michaux) Small	water pepper	FM		X		N	X
Polygonum lapathifolium L.	*Persicaria lapathifolia* (Linnaeus) Gray	willow weed	FM, AW		X		N	X
Polygonum paronychia Cham. & Schldl.		beach knotweed	DM, DS	X			N	X
Polygonum persicaria L.	*Persicaria maculosa* Gray	lady's thumb	AW, FM, BM, RF		X		E, I	X
Rumex acetosella L.		sheep sorrel	DM, DS,SW, CDF, RF	X	X		E, I	X
Rumex conglomeratus Murr.		green dock	AW		X		E	X
Rumex crispus L.		curly dock	FM, SW, AW, BM		X	X	E, I	X
Rumex maritimus L.		golden dock	BM		X	X	N	X
Rumex occidentalis S. Watson	*Rumex aquaticus* L. var. *fenestratus* (Greene) Dorn	western dock	FM, BM		X		N	X
Rumex pulcher L.		fiddle dock	AW		X		E	X

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Rumex salicifolius J.A. Weinm.var. *crassus* (Rech.f.) J. Howell	*Rumex crassus* Rechinger f.	willow-leaved dock	SW, BM		X	X	N	X
Rumex salicifolius J.A. Weinm. var. *transitorius* (Rech.f.) J. Hickman	*Rumex transitorius* Rechinger f	willow dock	FM, BM		X		N	X
Polypodiaceae								
Athyrium filix-femina (L.) Roth var. *cyclosorum* Rupr.		lady fern	CDF, FS	X	X		N	X
Polypodium calirhiza S. Whitmore & A. R. Smith		licorice fern	CDF, DS	X			N	X
Polypodium scouleri Hook. & Grev.		leather-leaf fern	CDF	X			N	X
Portulacaceae								
Calandrinia ciliata (Ruíz Lopez & Pavón) DC.		red-maids	DM, DS, SW	X	X		N	X
Claytonia exigua Torrey & A. Gray ssp. *exigua*		little spring beauty	DM, DS	X			N	X
Claytonia perfoliata Willd. ssp. *perfoliata*		miner's lettuce	DM, DS, RF	X	X		N	X
Claytonia rubra (Howell) Tidestrom ssp. *depressa* (A. Gray) John M. Miller & Chambers		red-stemmed spring beauty	DM	X			N	X
Potamogetonaceae								
Potamogeton nodosus Poiret (x natans)		long-leaved pondweed	OW		X		N	
Potamogeton pectinatus L.	*Stuckenia pectinata* (L.) Böerner	fennel pondweed	OW		X		N	X
Ruppia maritima L.		ditch grass	SM, BM			X	N	X
Primulaceae								
Anagallis arvensis L.		scarlet pimpernel	FM, DM, BM, SW	X	X	X	E	
Glaux maritima L.		sea milk-wort	BM, SM		X	X	N	X

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Pteridaceae								
Pentagramma triangularis (Kaulf.) G. Yatskievych, M.D. Windham & E. Wollenweber ssp. *triangularis*		gold-back fern	CDF, DM	X			N	X
Ranunculaceae								
Ranunculus muricatus L.		spiny buttercup	AW		X		E	
Ranunculus repens L.		creeping buttercup	FM, RF, AW		X		E	X
Rhamnaceae								
Rhamnus purshiana DC.	*Frangula purshiana* (DC.) Cooper	cascara	CDF	X			N	X
Rosaceae								
Aphanes occidentalis (Nutt.) Rydb.	*Aphanes arvensis* L.	lady's mantle	DM, SW	X	X		N	
Crataegus monogyna Jacq.		hawthorn	AW		X		E, I	
Cotoneaster franchetii Boiss.		Francheti cotoneaster	CDF	X			E, I	X
Fragaria chiloensis (L.) Duchesne		beach strawberry	DM, CDF	X			N	X
Holodiscus discolor (Pursh.) Maxim.		oceanspray	FS		X		N	X
Malus fusca (Raf.) C. Schneider		Oregon crabapple	RF, CDF	X	X		N	X
Malus sylvestris Miller	*Malus pumila* Mill.	common apple	CDF, FS	X	X		E	X
Oemleria cerasiformis (Hook. &Arn.) J.W. Landon		oso berry	RF		X		N	X
Potentilla anserina L. ssp. *pacifica* (Howell) Rousi	*Argentina anserina* (L.) Rydb.	silverweed	SW, BM, FM		X	X	N	X
Rosa nutkana Presl var. *nutkana*		Nootka rose	CDF	X			N	X
Rubus discolor Weihe & Nees	*Rubus armeniacus* Focke	Himalaya-blackberry	FS, SW, RF, AW,		X		E, I	X
Rubus parviflorus Nutt.		thimbleberry	FS, RF		X		N	X
Rubus spectabilis Pursh		salmonberry	RF, FS		X		N	X
Rubus ursinus Cham. & Schdl.		California blackberry	CDF, RF, FS, DM, DS, SW	X	X		N	X
Spiraea douglasii Hook.		Douglas' spirea	FM, FS, AW		X		N	

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Rubiaceae								
Galium aparine L.		common bedstraw	CDF, RF, BM, FM, AW	X	X		N	X
Galium divaricatum Lam.		Lamarck's bedstraw	FM		X		E	X
Galium trifidum L. var. *pacificum* Wieg.	*Galium trifidum* L. ssp. *columbianum* (Rydb.) Hultén	three-petaled bedstraw	BM		X	X	N	X
Salicaceae								
Populus balsamifera L. ssp. *trichocarpa* (Torry & A. Gray) Brayshaw		black cottonwood	FS, RF		X		N	
Salix alba L.		white willow	FS		X		E, I	
Salix hookeriana Hook.		coastal willow	SW, FS, DS	X	X		N	X
Salix lucida Muhlenb. ssp. *lasiandra* (Benth.) E. Murray		yellow willow	FS, RF		X		N	X
Salix sitchensis Bong.		Coulter Willow	FS		X		N	
Saxifragaceae								
Tellima grandiflora (Pursh) Lindley		fringe cups	RF		X		N	X
Tolmiea menziesii (Pursh) Torrey & A. Gray		pig-a-back plant	RF		X		N	
Scrophulariaceae								
Bellardia trixago (L.) All.		Mediterranean lineseed	FM, DM	X	X		E, I	
Castilleja ambigua Hook & Arn. ssp. *humboldtiensis* (Keck) Chuang & Heckard		Humboldt Bay owl's-clover	SM		X	X	N, C	X
Castilleja attenuata (A. Gray) Chuang & Heckard		narrow-leaved owl's clover	DM	X			N	X
Castilleja exserta (A.A. Heller) Chuang & Heckard ssp. *latifolia* (S. Watson)		purple owl's clover	DM	X			N	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Cordylanthus maritimus Benth. ssp. *palustris* (Behr) Chuang & Heckard		Point Reyes bird's-beak	SM			X	N, C	X
Digitalis purpurea L.		fox glove	FM, DS		X		E, I	
Linaria canadensis (L.) Dum.-Cours.	*Nuttallanthus canadensis* (L.) D.A. Sutton	blue toad-flax	DM	X			E	X
Mimulus guttatus DC.		common monkeyflower	FM, AW, RF		X		N	X
Parentucellia viscosa (L.) Caruel		yellow glandweed	SW, FM, AW		X		E, I	X
Scrophularia californica Cham. & Schldl.		California figwort	DS, SW, CDF	X	X		N	X
Triphysaria eriantha (Benth.) Chuang & Heckard ssp. *eriantha*		butter 'n' eggs	DM	X			N	
Triphysaria versicolor Fischer & C. Meyer ssp. *versicolor*		yellow owl's clover	AW		X		N	
Triphysaria pusilla (Benth.) Chuang & Heckard		little owl's clover	DS, DM, CDF	X			N	
Veronica americana (Raf.) Schwein.		American speedwell	FM		X		N	
Veronica persica Poiret		bird's-eye speedwell	AW		X		E	X
Solanaceae								
Solanum americanum Miller		white nightshade	FM, CDF	X	X		N	X
Solanum aviculare Forst. F.		New Zealand nightshade	CDF	X			E, I	X
Solanum douglasii Dunal		greenspot nightshade	FS		X		N	
Solanum nigrum L.		black nightshade	CDF, AW, FM	X	X		E, I	X
Taxodiaceae								
Sequoia sempervirens (D. Don) Endl.		coastal redwood	AW, RF		X		N	
Typhaceae								
Sparganium eurycarpum Engelm. ssp. *eurycarpum*	*Sparganium eurycarpum* Engelm.	bur-reed	BM		X	X	N	X
Typha latifolia L.		cattail	SW, BM, FM		X	X	N	X

Species	Name Changes	Common Name	Habitat (specific)	Habitat (broad)			Status	On Refuge
				UD	PW	EW		
Urticaceae								
Urtica dioica L. ssp. *gracilis* (Aiton) *Selander*		stinging nettle	RF, AW, FM		X		N	
Valerianaceae								
Plectritis congesta (Lindley) A. DC.		sea blush	DM, SW, DS	X	X		N	X
Plectritis brachystemon Fischer & C. Meyer	*Plectritis congesta* (Lindl.) DC. ssp. *brachystemon* (Fisch. & C.A. Mey.) Morey	short-spur sea blush	AW		X		N	
Zosteraceae								
Zostera japonica Aschers. & Graebn.	*Nanozostera japonica* (Asch. & Graebn.) P. Toml. & U. Posl.	dwarf eelgrass	MF			X	E, I	
Zostera marina L.		eelgrass	MF			X	N	X

Status: Conservation concern (C); Exotic (E); Invasive (I); California Native (N); Broad Habitat: Upland dune (UD), Palustrine wetland (PW), Estuarine wetland (EW). Specific Habitat: Dune mat (DM), Dune scrub (DS), Dune swale (SW), Coniferous dune forest (CDF), Riparian forest (RF), Freshwater swamp (FS), Freshwater marsh (FM), Open water (OW), Brackish marsh (BM), Salt marsh (SM), Mudflat (MF) Agricultural wetland (AW).

Revised from G. Leppig, and A. Pickart 2005. Vascular plants of Humboldt Bay Dunes and Wetlands Release 1.2. Unpublished document, U.S. Fish and Wildlife Service, Arcata, California. This vascular plant list for Humboldt Bay dunes and wetlands is still in progress. It is based on collections made by the authors primarily between 2001 and 2008. Please email comments to andrea_pickart@fws.gov or gleppig@dfg.ca.gov. Nomenclature follows the Jepson Manual, Higher Plants of California (U.C. Press 1993).

Castle Rock NWR Flora

Species	Common name	CRNWR Habitat (see codes)	Status
Asteraceae			
Achillea borealis ssp. *arenicola* (syn. *Achillea millefolium* spp. *Arenicola)*	common yarrow	M	N
Chamomilla suaveolens (syn. *Matricaria matricarioides)*	pineapple weed	D	E
Cotula coronopifolia	brass buttons	D	E
Cirsium vulgare	bull thistle	D	E, I
Erigeron glaucus	seaside daisy	NCS	N
Lasthenia maritima (syn. *Lasthenia minor* ssp. *maritima*)	maritime goldfields	NCS	N
Sonchus oleraceus	sow thistle	D	E
Apiaceae			
Angelica hendersonii	coast angelica	NCS, CS	N
Daucus carota	Queen Anne's lace	D	E
Brassicaceae			
Cochlearia officinalis var. *arctica*	Arctic spoonwort	N	C
Coronopus didymus	lesser swine cress	D	E
Raphanus sativus	wild radish	D	E
Caryophyllaceae			
Spergularia macrotheca	sand spurrey	CS, NCS	N
Stellaria media	chickweed	D	E
Chenopodiaceae			
Chenopodium album	lamb's quarters	D	E
Crassulaceae			
Dudleya farinosa	bluff lettuce	CS, CSS	N
Cyperaceae			
Carex obnupta	slough sedge	CS	N
Fabaceae			
Trifolium wormskioldii	coast clover	V	N
Juncaceae			
Juncus lesueurii	salt rush	CS	N
Lamiaceae			
Stachys chamissonis	coast hedge nettle	NCS	N
Plantaginaceae			
Plantago lanceolata	narrow leaved plantain	D	E
Poaceae			
Bromus sp.	brome	many	N
Calamagrostis nutkaensis	Pacific reedgrass	FW	N

Species	Common name	CRNWR Habitat (see codes)	Status
Distichlis spicata	salt grass	G	N
Poa annua	annual blue grass	D	E
Polygonaceae			
Rumex acetosella	common sheep sorrel	D	E, I
Rumex crispus	curly leaved dock	D	E
Polypodiaceae			
Polypodium scouleri	leather fern	CP, CS	N
Portulacaceae			
Calandrinia ciliata	red maids	G	N
Claytonia perfoliata	miner's lettuce	CSS	N
Scrophulariaceae			
Synthyris reniformis	snow queen	F	N

Status: Conservation concern (C); Exotic (E); Invasive (I); California Native (N); Presumed extirpated (PX). Habitat: Meadows (M), Disturbed areas (D), Northern Coastal Scrub (NCS), Coastal Sage Scrub (CSS), Coastal Strand (CS), Coastal Salt Marsh (CSM), Coastal Prairie (CP), Various communities (V), Freshwater wetland (FW), Grassland (G), Forest (F)

Compiled from John O. Sawyer's list of "The Plants Recognized or Collected from Castle Rock, Del Norte, Co. CA." Prepared October 16, 1984, Humboldt State University, Osborne (1972), and from collections by refuge staff in 2005.

Appendix K: Wildlife Lists

Wildlife Lists

Reptiles and Amphibians

Common Name	Scientific Name	Habitat
Class AMPHIBIA (*amphibians*)		
Order ANURA (*frogs and toads*)		
Family BUFONIDAE (*true toads*)		
western toad	*Bufo boreas*	d,ds
Family HYLIDAE (*tree frogs and relatives*)		
Pacific treefrog	*Pseudacris regilla*	r,fm
Family RANIDAE (*true frogs*)		
bullfrog	*Rana catesbeiana*	o,fm,r
red-legged frog	*Rana aurora*	o,fm,r,ds
Order CAUDATA (*salamanders*)		
Family AMBYSTOMATIDAE (*mole salamanders*)		
northwestern salamander	*Ambystoma gracile*	r,g
Family DICAMPTODONTIDAE (*Pacific giant salamanders*)		
California giant salamander	*Dicamptodon ensatus*	c
Family PLETHODONTIDAE (*lungless salamanders*)		
ensatinas	*Ensatina* sp.	c
Family SALAMANDRIDAE (*newts and salamanders*)		
rough-skinned newt	*Taricha granulosa*	ds
Class REPTILIA (*reptiles*)		
Order SQUAMATA (*lizards and snakes*)		
Family ANGUIDAE (*alligator lizards and relatives*)		
northern alligator lizard	*Elgaria coerulea*	r,d
Family BOIDAE (*boas and pythons*)		
coastal rubber boa	*Charina bottae*	g,r,c
Family COLUBRIDAE (*Colubrids*)		
western yellowbelly racer	*Coluber constrictor mormon*	r,g
California kingsnake	*Lampropeltis getula californiae*	wide
gopher snake	*Pituophis catenifer*	s,g
western aquatic garter snake	*Thamnophis couchii*	r
western terrestrial gartersnake (coast gartersnake)	*Thamnophis elegans* *(Thamnophis elegans terrestris)*	r,c,d
northwestern gartersnake	*Thamnophis ordinoides*	g,a

Common Name	Scientific Name	Habitat
California red-sided gartersnake	*Thamnophis sirtalis infernalis*	f,g,s,fm,d
common garter snake	*Thamnophis sirtalis*	s,fm
Family VIPERIDAE (*vipers*)		
northern Pacific (western) rattlesnake	*Crotalus oreganus oreganus*	c,g
Family SCINCIDAE (*skinks*)		
western skink	*Eumeces skiltonianus*	g,c,r
Family PHRYNOSOMATIDAE (*North American spiny lizards*)		
western fence lizard	*Sceloporus occidentalis*	s,g
Order TESTUDINES (*turtles*)		
Family EMYDIDAE (*box and water turtles*)		
northern Pacific pond turtle	*Actinemys marmorata marmorata (syn. Clemmys marmorata marmorata)*	ds

Habitats: b-beaches; bm - brackish marshes; c - coniferous forest; d - dunes; ds - dune swales; e- Eelgrass beds, Bay shores; fm - freshwater marshes; g - Agricultural grasslands; r - Riparian forests; sm - saltwater marshes; rb-Rocky beaches; m - mudflats ; o - Open water, lakes, creeks, ponds; om - open water marine; s - seasonal wetlands, mudflats, flooded fields; wide - Widespread, found in a variety of habitats

Mammals

Common Name	Scientific Name	Habitat
Order ARTIODACTYLA (*even-toed hoofed animals*) **Family CERVIDAE** (*deer, moose, reindeer, elk*)		
black-tailed deer	*Odocoileus hemionus*	r,s,g
Order CARNIVORA (*meat-eaters*) **Family CANIDAE** (*coyotes, dogs, foxes, jackals and wolves*)		
coyote	*Canis latrans*	wide
gray fox	*Urocyon cinereoargenteus*	g,r
Family ERETHIZONTIDAE (*New World porcupines*)		
North American porcupine	*Erethizon dorsatum*	wide
Family FELIDAE (*cats*)		
feral house cat	*Felis catus*	r,g,c
bobcat	*Lynx rufus*	r,g,d
mountain lion (cougar)	*Puma concolor*	r,c
Family MEPHITIDAE (*skunks and stink badgers*)		
striped skunk	*Mephitis mephitis*	wide
western spotted skunk	*Spilogale gracilis*	rb,r,d
Family MUSTELIDAE (*badgers, otters, weasels and relatives*)		
river otter	*Lontra canadensis*	o,r
long-tailed weasel	*Mustela frenata*	r,g,d
American mink	*Mustela vison*	r
Family OTARIIDAE (*fur seals and sea-lions*)		
California sea-lion	*Zalophus californianus*	om,rb
Family PHOCIDAE (*seals*)		
harbor seal	*Phoca vitulina*	b,rb,om
Family PROCYONIDAE (*coatis, raccoons, lesser pandas*)		
ringtail	*Bassariscus astutus*	c,r
raccoon	*Procyon lotor*	wide
Family URSIDAE (*bears*)		
American black bear	*Ursus americanus*	r,c
Order CETACEA (*dolphins, porpoises, and whales*) **Family PHOCOENIDAE** (*porpoises*)		
harbor porpoise	*Phocoena phocoena*	om
Order CHIROPTERA (*bats*) **Family MOLOSSIDAE** (*free-tailed bats*)		
lump-nosed bat (Rafinesque's big-eared bat)	*Corynorhinus rafinesquei*	c
big brown bat	*Eptesicus fuscus*	c
California myotis	*Myotis californicus*	c
long-eared bat (western long-eared myotis)	*Myotis evotis*	c
fringed bat (fringed myotis)	*Myotis thysanodes*	unknown

Common Name	Scientific Name	Habitat
hairy-winged myotis (long-legged myotis)	*Myotis volans*	r,c
Yuma myotis	*Myotis yumanensis*	c
Order DIDELPHIMORPHIA (*American marsupials*) **Family DIDELPHIDAE** (*opossums*)		
Virginia opossum	*Didelphis virgiana*	r
Order INSECTIVORA (*insect-eaters*)		
Family Soricidae (shrews)		
marsh shrew	*Sorex bendirii*	fm,s
Pacific shrew	*Sorex pacificus*	r,g
Trowbridge's shrew	*Sorex trowbridgii*	r,g
vagrant shrew	*Sorex vagrans*	c
Family TALPIDAE (*desmans, moles, and relatives*)		
American shrew mole	*Neurotrichus gibbsii*	c
coast mole	*Scapanus orarius*	g
Townsend's mole	*Scapanus townsendii*	g,r,c
Order LAGOMORPHA (*pikas, hares and rabbits*) **Family LEPORIDAE** (*hares and rabbits*)		
black-tailed jackrabbit	*Lepus californicus*	s,g,d,c
brush rabbit	*Sylvilagus bachmani*	c
Order RODENTIA (*gnawing mammals*) **Family CRICETIDAE** (*New World rats and mice, voles, hamsters and relatives*)		
white footed vole	*Arborimus albipes*	c
California vole (California meadow mouse)	*Microtus californicus*	g,r
long-tailed vole (long-tailed meadow mouse)	*Microtus longicaudus*	g,r
creeping vole (Oregon meadow mouse)	*Microtus oregoni*	r
dusky-footed woodrat	*Neotoma fuscipes*	r
deer mouse	*Peromyscus maniculatus*	c,r,g
western harvest mouse	*Reithrodontomys megalotis*	fm,s,g,c
Family GEOMYIDAE (*gophers*)		
Botta's pocket gopher	*Thomomys bottae*	g
Family MURIDAE (*Old World mice, rats*)		
house mouse	*Mus musculus*	s,g,r
black rat	*Rattus rattus*	s,g,r
Family SCIURIDAE (*chipmunks, squirrels, marmots*)		
northern flying squirrel	*Glaucomys sabrinus*	c,r
California (Beechey) ground squirrel	*Spermophilus beecheyi*	r,g

Habitats: a - Aerial, usually observed in flight; b-beaches; bm - brackish marshes; c - coniferous forest; d - dunes; ds - dune swales; e- Eelgrass beds, Bay shores; fm - freshwater marshes; g - Agricultural grasslands; r - Riparian forests; sm - saltwater marshes; rb-Rocky beaches; m - mudflats ; o - Open water, lakes, creeks, ponds; om - open water marine; s - seasonal wetlands, mudflats, flooded fields; wide - Widespread, found in a variety of habitats

Birds

Common Name	Scientific Name	Primary Habitat	Sp	S	F	W	Breeding Range?	Habitat Source
Order ANSERIFORMES (*waterfowl*)								
Family ANATIDAE (*ducks, geese and swans*)								
*wood duck	*Aix sponsa*	o,r	o	o	o	o	yes	BONA
northern pintail	*Anas acuta*	g,s,fm,bm,m	c	r	c	c	no	BONA
American wigeon	*Anas americana*	fm,r,s,bm	c	r	c	c	no	BONA
*northern shoveler	*Anas clypeata*	fm,bm,sm,s	c	r	c	c	no	BONA
green-winged teal	*Anas crecca*	o,fm	c	o	c	c	no	BONA
*cinnamon teal	*Anas cyanoptera*	s,fm	u	c	u	u	yes	BONA
blue-winged teal	*Anas discors*	s,fm,bm	u	o	o	r	no	BONA
eurasian wigeon	*Anas penelope*	s	r		o	o	yes	BONA
*mallard	*Anas platyrhynchos*	fm,s,g,o	c	c	c	c	yes	BONA
*gadwall	*Anas strepera*	o,fm,bm	u	o	u	u	no	BONA
greater white-fronted goose	*Anser albifrons*	g,s	o		o	o	no	BONA
lesser scaup	*Aythya affinis*	o,s	c	o	c	c	no	BONA
redhead	*Aythya americana*	sm,bm	o	r	o	u	no	BONA
ring-necked duck	*Aythya collaris*	o,s	o		o	o	no	BONA
tufted duck	*Aythya fuligula*	o,s,om,fm,sm,bm	r		r	r		BONA
greater scaup	*Aythya marila*	om,sm,bm	c	o	c	c	no	BONA
canvasback	*Aythya valisineria*	o,s	r	r	u	u	yes	BONA
bufflehead	*Bucephala albeola*	om,o,s	c	r	c	c	no	BONA
common goldeneye	*Bucephala clangula*	om,o,s	o		o	u	no	BONA
barrow's goldeneye	*Bucephala islandica*	om,o,s				r	no	BONA
Pacific brant	*Branta bernicla*	e,sm	a	u	u	c	no	BONA
Pacific brant	*Branta bernicla nigricans*	e,sm	a	u	u	c	no	BONA
*Moffit (Great Basin) Canada goose	*Branta canadensis*	o,s,g	a	a	a	a	no	BONA
Aleutian cackling goose	*Branta canadensis leucopareia*	g,o,s	c		c	c	no	BONA
cackling goose	*Branta canadensis minima*	om	c		u	c	no	BONA
snow goose	*Chen caerulescens*	o,s,g	o		o	r	no	BONA

Common Name	Scientific Name	Primary Habitat	Sp	S	F	W	Breeding Range?	Habitat Source
emperor goose	*Chen canagica*	om				r	no	check w staff to confirm may be out of range
Ross' goose	*Chen rossii*	o,s,g	o		r	r	no	BONA
long-tailed duck (oldsquaw)	*Clangula hyemalis*	om,o	r	r	o	o	no	BONA
tundra swan	*Cygnus columbianus*	o,s	o		o	c	no	BONA
harlequin duck	*Histrionicus histrionicus*	e,b	r		r	o	no	BONA
hooded merganser	*Lophodytes cucullatus*	o,s	o		o	o	no	BONA
white-winged scoter	*Melanitta fusca*	om	c	r	c	c	no	BONA
black scoter	*Melanitta nigra*	b	o		o	u	no	BONA
surf scoter	*Melanitta perspicillata*	b,m	c	r	c	a	no	BONA
common merganser	*Mergus merganser*	o,s	u	u	u	u	yes	BONA
red-breasted merganser	*Mergus serrator*	om,sm	c		c	c	no	BONA
*ruddy duck	*Oxyura jamaicensis*	fm,o	c	u	c	c	yes	BONA
Order APODIFORMES (*swifts and hummingbirds*)								
Family APODIDAE (*swifts*)								
Vaux's swift	*Chaetura vauxi*	r,c	c	c	c	r	yes	
black swift	*Cypseloides niger*	g	o		r		no	
Family TROCHILIDAE (*hummingbirds*)								
*Anna's hummingbird	*Calypte anna*	c,r	c	c	c	c	yes	
Costa's hummingbird	*Calypte costae*	c	r	r	r		no	
rufous hummingbird	*Selasphorus rufus*	c	r				yes	
*Allen's hummingbird	*Selasphorus sasin*	c,r	c	c	c		yes	
calliope hummingbird	*Stellula calliope*	c,r	r	r			yes	
Order CAPRIMULGIFORMES (*nightbirds*)								
Famiy CAPRIMULGIDAE (*nightjars*)								
*common nighthawk	*Chordeiles minor*	d,g	u	u			yes	BONA
common poorwill	*Phalaenoptilus nuttallii*	g	r		r		yes	BONA
Order CHARADRIIFORMES (*shorebirds*)								
Famiy ALCIDAE (*puffins, murres, auklets, and relatives*)								
marbled murrelet	*Brachyramphus marmoratus*	cf,rb	o	u	u	r	yes	BONA
pigeon guillemot	*Cepphus columba*	rb,om	u	u	u	r	yes	BONA

Common Name	Scientific Name	Primary Habitat	Sp	S	F	W	Breeding Range?	Habitat Source
rhinoceros auklet	*Cerorhinca monocerata*	om	o	o	o	o	no	BONA
tufted puffin	*Fratercula cirrhata*	rb,om		r		r	no	BONA
horned puffin	*Fratercula corniculata*	om	r	r		r	no	BONA
Cassin's auklet	*Ptychoramphus aleuticus*	rb,om	o	o	o	o	yes	BONA
ancient murrelet	*Synthliboramphus antiquus*	om				r	no	BONA
common murre	*Uria aalge*	rb,om	o	c	c	o	yes	BONA
Family CHARADRIIDAE (*plovers and lapwings*)								
*snowy plover	*Charadrius alexandrinus*	b	u	o	u	u	yes	BONA
mountain plover	*Charadrius montanus*	g			r	r	no	BONA
semipalmated plover	*Charadrius semipalmatus*	b,m,g,sm	c	o	c	c	no	BONA
*killdeer	*Charadrius vociferus*	m,g,s,	c	c	c	c	yes	BONA
Pacific golden-plover (syn. lesser golden-plover)	*Pluvialis fulva*	s,g,b	o		u	o	no	BONA
black-bellied plover	*Pluvialis squatarola*	s,g,b	c	u	c	c	no	BONA
Family HAEMATOPODIDAE (*oystercatchers*)								
*black oystercatcher	*Haematopus bachmani*	rb,e	r	r	r	r	yes	BONA
Family LARIDAE (*gulls and terns*)								
black tern	*Chlidonias niger*	o,s,a	r		r		no	BONA
herring gull	*Larus argentatus*	rb,m	u		u	u	no	
California gull	*Larus californicus*	wide	c	c	c	c	no	
mew gull	*Larus canus*	wide	c	r	c	c	no	
ring-billed gull	*Larus delawarensis*	fm,g,s	c	c	c	c	no	
glaucous-winged gull	*Larus glaucescens*	om,sm,br,m	c	u	c	c	no	
Thayer's gull	*Larus glaucoides*	om,rb	o		o	o	no	
Heermann's gull	*Larus heermanni*	om,rb	r	c	c	r	no	
glaucous gull	*Larus hyperboreus*	wide				o	no	
Bonaparte's gull	*Larus philadelphia*	wide	c	o	c	o	no	
Franklin's gull	*Larus pipixcan*	wide	r		o	r	no	
western gull	*Larus occidentalis*	rb,m	c	c	c	c	yes	
black-legged kittiwake	*Rissa tridactyla*	om	u		u	u	no	

Common Name	Scientific Name	Primary Habitat	Sp	S	F	W	Breeding Range?	Habitat Source
long-tailed jaeger	*Stercorarius longicaudus*	om			o		no	BONA
parasitic jaeger	*Stercorarius parasiticus*	om	r	r	c	r	no	BONA
Pomarine jaeger	*Stercorarius pomarinus*	om	o	r	c	r	no	BONA
*Caspian tern	*Sterna caspia*	wide	c	u	c	c	yes	
elegant tern	*Sterna elegans*	e		u	u		no	
Forster's tern	*Sterna forsteri*	fm,bm,sm	u	r	c	u	no	
common tern	*Sterna hirundo*	om,e	c	r	c		no	
black tern	*Chlidonias niger*	fm,s,o,r	r		r		no	
Arctic tern	*Sterna paradisaea*	om,b			o		no	
Sabine's gull	*Xema sabini*	om	r		r		no	
Family RECURVIROSTRIDAE (*avocets and stilts*)								
*black-necked stilt	*Himantopus mexicanus*	s,sm,g	r	r	r	r	no	BONA
*American avocet	*Recurvirostra americana*	s,sm,g	c	r	c	c	no	BONA
Family SCOLOPACIDAE (*sandpipers and phalaropes*)								
*spotted sandpiper	*Actitis macularius*	o,b	u	u	u	u	yes	BONA
surfbird	*Aphriza virgata*	rb,b,m	c		c	c	no	BONA
ruddy turnstone	*Arenaria interpres*	rb,m,e	u	r	u	u	no	BONA
black turnstone	*Arenaria melanocephala*	g,m,rb,sm	c	r	c	c	no	BONA
sanderling	*Calidris alba*	m,rb,s	c		c	c	no	BONA
sharp-tailed sandpiper	*Calidris acuminata*	g,m			r		no	various
dunlin	*Calidris alpina*	e,s,g,m	a	r	a	a	no	BONA
Baird's sandpiper	*Calidris bairdii*	fm,s,b	r		u		no	BONA
red knot	*Calidris canutus*	e	u		u	r	no	BONA
stilt sandpiper	*Calidris himantopus*	br,sm,fm,m,s			0		no	BONA
western sandpiper	*Calidris mauri*	m,s	a	o	a	c	no	BONA
pectoral sandpiper	*Calidris melanotos*	s,g,sm	r		u		no	BONA
least sandpiper	*Calidris minutilla*	m,s,g,sm	c	o	c	c	no	BONA
rock sandpiper	*Calidris ptilocnemis*	b,rb	r		r	o	no	BONA
semipalmated sandpiper	*Calidris pusilla*	fm,sm,m,g			o		no	BONA
willet	*Catoptrophorus semipalmatus*	g,sm,b,rb	c	u	c	c	no	BONA
Wilson's snipe	*Gallinago delicata*	g,s,fm					no	BONA

Common Name	Scientific Name	Primary Habitat	Sp	S	F	W	Breeding Range?	Habitat Source
common snipe	*Gallinago gallinago*	m	c	r	c	c	no	various
wandering tattler	*Heteroscelus incanus*	rb,o	u	o	u	o	no	BONA
short-billed dowitcher	*Limnodromus griseus*	sm,m,s,g	c	r	c	u	no	BONA
long-billed dowitcher	*Limnodromus scolopaceus*	fm,m,s,b	c		c	c	no	BONA
marbled godwit	*Limosa fedoa*	g,s	a	o	a	a	no	BONA
whimbrel	*Numenius phaeopus*	rb,sm,b,g,m	c	o	c	u	no	BONA
long-billed curlew	*Numenius americanus*	g,sm,m	u	o	u	u	no	BONA
red phalarope	*Phalaropus fulicarius*	om	o		o		no	BONA
red-necked phalarope	*Phalaropus lobatus*	om,sm,bm,fm,o	c	r	c		no	BONA
Wilson's phalarope	*Phalaropus tricolor*	m,om	o	r	o		no	BONA
ruff	*Philomachus pugnax*	g,s			r		no	BONA
lesser yellowlegs	*Tringa flavipes*	o,s,sm,fm,g,m	o	o	c	o	no	BONA
greater yellowlegs	*Tringa melanoleuca*	s,g,sm,m	c	o	c	c	no	BONA
solitary sandpiper	*Tringa solitaria*	m,o,r	o		o		no	BONA
buff-breasted sandpiper	*Tryngites subruficollis*	g			r		no	BONA
Order CICONIIFORMES (*storks, herons and relatives*)								
Family ARDEIDAE (*bitterns, herons and egrets*)								
*great egret	*Ardea alba*	fm,s,r	c	c	c	c	yes	BONA
*great blue heron	*Ardea herodias*	fm,s,r	c	c	c	c	yes	BONA
*American bittern	*Botaurus lentiginosus*	fm,bm,s	o	o	o	o	yes	BONA
*cattle egret	*Bubulcus ibis*		c	r	c	c	yes	BONA
*green heron	*Butorides virescens*	fm,r	u	u	u	o	yes	BONA
*snowy egret	*Egretta thula*	fm,s,r	c	c	c	c	yes	BONA
*black-crowned night-heron	*Nycticorax nycticorax*	fm,s,r	c	c	c	c	yes	BONA
Family CATHARTIDAE (*vultures*)								
turkey vulture	*Cathartes aura*	a	c	c	c	u	yes	BONA
Family THRESKIORNITHIDAE (*ibises*)								
white-faced ibis	*Eudocimus albus*	sg					no	BONA

Common Name	Scientific Name	Primary Habitat	Sp	S	F	W	Breeding Range?	Habitat Source
Order COLUMBIFORMES (*pigeons*)								
Family COLUMBIDAE (*doves and pigeons*)								
*rock pigeon	*Columba livia*	rb,g	u	u	u	u	yes	BONA
*band-tailed pigeon	*Patagioenas fasciata*	c,r	c	c	c	o	yes	BONA
white-winged dove	*Zenaida asiatica*	r,g			r		no	BONA
*mourning dove	*Zenaida macroura*	g,c,r	c	c	c	u	yes	BONA
Order CORACIIFORMES (*kingfishers and relatives*)								
Family ALCEDINIDAE (*kingfishers*)								
*belted kingfisher	*Ceryle alcyon*	o,r	c	c	c	c	yes	BONA
Order FALCONIFORMES (*diurnal birds of prey*)								
Family ACCIPITRIDAE (*osprey, kites, eagles and hawks*)								
*Cooper's hawk	*Accipiter cooperii*	r,c	u	u	u	u	yes	BONA
sharp-shinned hawk	*Accipiter striatus*	c,r	c	u	c	c	yes	BONA
*red-tailed hawk	*Buteo jamaicensis*	wide	c	c	c	c	yes	BONA
*red-shouldered hawk	*Buteo lineatus*	r,c	c	c	c	c	yes	BONA
rough-legged hawk	*Buteo lagopus*	g,d			u	c	no	BONA
ferruginous hawk	*Buteo regalis*	r,c	r		r	o	no	BONA
Swainson's hawk	*Buteo swainsoni*	r,s,g,d					no	BONA
*northern harrier	*Circus cyaneus*	fm,s,g	c	u	c	c	yes	BONA
*white-tailed kite	*Elanus leucurus*	wide					yes	BONA
*bald eagle	*Haliaeetus leucocephalus*	a	o	o	o	u	no (islands off coast)	BONA
*osprey	*Pandion haliaetus*	wide	c	c	c	u	yes	BONA
Family FALCONIDAE (*falcons*)								
merlin	*Falco columbarius*	g,c,r	u		u	u	no	BONA
prairie falcon	*Falco mexicanus*	g			o	o	no	BONA
peregrine falcon	*Falco peregrinus*	wide	u	o	u	u	yes	BONA
*American kestrel	*Falco sparverius*	g,c,r	c	c	c	c	yes	BONA
Order GALLIFORMES (*megapodes, curassows, pheasants, quails and relatives*)								
Family ODONTOPHORIDAE								
*California quail	*Callipepla californica*	g,c	c	c	c	c	yes	BONA
Order GAVIIFORMES (*loons and divers*)								
Family GAVIIDAE (*loons or divers*)								
yellow-billed loon	*Gavia adamsii*	om				r	no	BONA
common loon	*Gavia immer*	om	c	u	u	c	no	BONA
Pacific loon	*Gavia pacifica*	om	c	r	c	u	no	BONA
red-throated loon	*Gavia stellata*	om	c	o	c	c	no	BONA

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Order GRUIFORMES (*coots, cranes and rails*)								
Family GRUIDAE (*cranes*)								
sandhill crane	*Grus canadensis*	s,g,m	r		r	r	no	BONA
Family RALLIDAE								
*American coot	*Fulica americana*	fm,o,s,bm,sm	c	u	c	c	yes	BONA
common moorhen	*Gallinula chloropus*	fm,o	r		r	r	no	BONA
sora	*Porzana carolina*	fm,bm,sm,s,g	u	o	u	u	no	BONA
*Virginia rail	*Rallus limicola*	fm,s,g	c	c	c	c	yes	BONA
Order PASSERIFORMES (*perching birds*)								
Family AEGITHALIDAE (*bushtits*)								
*bushtit	*Psaltriparus minimus*	c,r	u	u	u	u	yes	BONA
Family ALAUDIDAE (*larks*)								
horned lark	*Eremophila alpestris*	g,d	o		o	o	no	BONA
Family BOMBYCILLIDAE (*waxwings*)								
*cedar waxwing	*Bombycilla cedrorum*	c,r,g	c	u	c	r	yes	
Bohemian waxwing	*Bombycilla garrulus*	r,c				r	no	
Family CERTHIIDAE (*creepers*)								
*brown creeper	*Certhia americana*	c,r	u	u	u	u	yes	
Family CINCLIDAE (*dippers*)								
*American dipper	*Cinclus mexicanus*	r	r	r	r	r	yes	BONA
Family CORVIDAE (*jays, magpies and crows*)								
*western scrub-jay	*Aphelocoma californica*	c,r			r		yes	BONA
*American crow	*Corvus brachyrhynchos*	wide	c	c	c	c	yes	BONA
*common raven	*Corvus corax*	wide	c	c	c	c	yes	BONA
*Steller's jay	*Cyanocitta stelleri*	c,r	c	c	c	c	yes	BONA
Family EMBERIZIDAE (*towhees and sparrows*)								
saltmarsh sharp-tailed sparrow	*Ammodramus caudacutus*	g,s,fm	r		r	r	no	BONA
grasshopper sparrow	*Ammodramus savannarum*	g	r	r		r	yes	BONA
lark bunting	*Calamospiza melanocorys*	g,r			r		no	BONA
Lapland longspur	*Calcarius lapponicus*	g	o		o	o	no	BONA
chestnut-collared longspur	*Calcarius ornatus*	g			r	r	no	BONA

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lark sparrow	*Chondestes grammacus*	r,g			o	r	yes	BONA
*spotted towhee	*Pipilo maculatus*	c,r	c	c	c	c	yes	BONA
*dark-eyed junco	*Junco hyemalis*	c,g,r	c	c	c	c	yes	BONA
swamp sparrow	*Melospiza georgiana*	wide	o		o	o	no	BONA
Lincoln's sparrow	*Melospiza lincolnii*	c,r	u		c	u	no	BONA
*song sparrow	*Melospiza melodia*	c,r	c	c	c	c	yes	BONA
*savannah sparrow	*Passerculus sandwichensis*	g,r,c,sm	c	c	c	c	yes	BONA
fox sparrow	*Passerella iliaca*	c	u		u	u	no	BONA
California towhee	*Pipilo crissalis*	r	r		r	r	yes	BONA
snow bunting	*Plectrophenax nivalis*	g,sm,d			r	r	no	BONA
vesper sparrow	*Pooecetes gramineus*	g	o	r	o	r	no	BONA
American tree sparrow	*Spizella arborea*	g,s,fm,r,c			r	r	no	BONA
Brewer's sparrow	*Spizella breweri*	c,r	r		r		no	BONA
clay-colored sparrow	*Spizella pallida*	g,r,c			o	r	no	BONA
*chipping sparrow	*Spizella passerina*	g,r,c	u	u	u		yes	BONA
white-throated sparrow	*Zonotrichia albicollis*	r	o		o	o	no	BONA
golden-crowned sparrow	*Zonotrichia atricapilla*	r	u		u	c	no	BONA
*white-crowned sparrow	*Zonotrichia leucophrys*	g,c,r	c	c	c	c	yes	BONA
Harris's sparrow	*Zonotrichia querula*	r,a	r		r	r	no	BONA
Family FRINGILLIDAE (*finches*)								
*lesser goldfinch	*Carduelis psaltria*	r	c	c	c	u	yes	BONA
*American goldfinch	*Carduelis tristis*	g,r	c	c	c	c	no	BONA
*house finch	*Carpodacus mexicanus*	g,r,c					yes	BONA
*pine siskin	*Carduelis pinus*	c,r	c	c	c	c	yes	BONA
*purple finch	*Carpodacus purpureus*	c,r	c	c	c	c	yes	BONA
*evening grosbeak	*Coccothraustes vespertinus*	c	u	u	u	u	yes	BONA
*red crossbill	*Loxia curvirostra*	c	u	u	u	u	yes	BONA
Family HIRUNDINIDAE (*swallows*)								
*barn swallow	*Hirundo rustica*	g,fm	c	c	c	r	yes	BONA

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*cliff swallow	*Petrochelidon pyrrhonota*	g,r	c	c	c		yes	BONA
purple martin	*Progne subis*	c,r,fm	o		o		yes	BONA
bank swallow	*Riparia riparia*	a,m	o		o		no	BONA
*northern rough-winged swallow	*Stelgidopteryx serripennis*	c,r	c	c	c		yes	BONA
*tree swallow	*Tachycineta bicolor*	g,s,fm,bm,r	c	c	c	r	yes	BONA
*violet-green swallow	*Tachycineta thalassina*	c,r	c	c	c	r	yes	BONA
Family ICTERIDAE (*icterids*)								
*red-winged blackbird	*Agelaius phoeniceus*	wide	c	c	c	c	yes	BONA
tricolored blackbird	*Agelaius tricolor*	fm,r	r		r	r	yes	BONA
bobolink	*Dolichonyx oryzivorus*	g,fm	r		r		no	BONA
rusty blackbird	*Euphagus carolinus*	g			r		no	BONA
*Brewer's blackbird	*Euphagus cyanocephalus*	wide	c	c	c	c	yes	BONA
*hooded oriole	*Icterus cucullatus*	r	o	o	o		yes	BONA
*Baltimore oriole	*Icterus galbula*	r	c	c	c	r	no	BONA
orchard oriole	*Icterus spurius*	g			r	r	no	BONA
*brown-headed cowbird	*Molothrus ater*	g,r,c	c	c	c	r	yes	BONA
*western meadowlark	*Sturnella neglecta*	g	c	c	c	c	yes	BONA
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	g	o		o	r	no	BONA
Family LANIIDAE (*shrikes*)								
northern shrike	*Lanius excubitor*	wide	o		o	o	no	BONA
loggerhead shrike	*Lanius ludovicianus*	g,r,c	r		r	r	no	BONA
Family MIMIDAE (*mockingbirds and thrashers*)								
northern mockingbird	*Mimus polyglottos*	g,r,c					yes	BONA
sage thrasher	*Oreoscoptes montanus*	g					no	BONA
Family MOTACILLIDAE (*wagtails and pipits*)								
American pipit	*Anthus rubescens*	r,s,m	c		c	c	no	BONA
Family PARIDAE (*titmice*)								
*black-capped chickadee	*Poecile atricapilla*	r,c	u	u	u	u	yes	BONA
mountain chickadee	*Poecile gambeli*	c,r			r	r	no	BONA
*chestnut-backed chickadee	*Poecile rufescens*	c,r	c	c	c	c	yes	BONA

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Family PARULIDAE (*warblers*)								
black-throated blue warbler	*Dendroica caerulescens*	r			r		no	BONA
bay-breasted warbler	*Dendroica castanea*	c,r	r		r		no	BONA
*yellow-rumped warbler	*Dendroica coronata*	c,r	c	u	c	c	yes	BONA
yellow-throated warbler	*Dendroica dominica*	c	r				no	BONA
prairie warbler	*Dendroica discolor*	c	r		r	r	no	BONA
blackburnian warbler	*Dendroica fusca*	c,r			r		no	BONA
magnolia warbler	*Dendroica magnolia*	c,g	r		r		no	BONA
black-throated gray warbler	*Dendroica nigrescens*	c,r	c	c	c	r	yes	BONA
*hermit warbler	*Dendroica occidentalis*	c	u	u	u		yes	BONA
palm warbler	*Dendroica palmarum*	r,c	u		u	u	no	BONA
chestnut-sided warbler	*Dendroica pensylvanica*	r	r		o	r	no	BONA
*yellow warbler	*Dendroica petechia*	r	c	c	c	r	yes	BONA
blackpoll warbler	*Dendroica striata*	c,r	r		o		no	BONA
cape may warbler	*Dendroica tigrina*	r,c	r		r		no	BONA
townsend's warbler	*Dendroica townsendi*	c,r	c		c	c	no	BONA
common yellowthroat	*Geothlypis trichas*	r,c	u	u	u	r	yes	BONA
yellow-breasted chat	*Icteria virens*	r,c	o	o	o		yes	BONA
black-and-white warbler	*Mniotilta varia*	r,c	o	r	o	o	no	BONA
Macgillivray's warbler	*Oporornis tolmiei*	c,r	u	u	u		yes	BONA
northern parula	*Parula americana*	c	r		r		no	BONA
prothonotary warbler	*Protonotaria citrea*	fm,r				r	no	BONA
ovenbird	*Seiurus aurocapilla*	r,c	r		r		no	BONA
northern waterthrush	*Seiurus noveboracensis*	r	r		o	r	no	BONA
American redstart	*Setophaga ruticilla*	r,c	r	r	r	r	no	BONA
*orange-crowned warbler	*Vermivora celata*	c,d,r	c	c	c	u	yes	BONA
Tennessee warbler	*Vermivora peregrina*	c,d	o		o	o	no	BONA
Nashville warbler	*Vermivora ruficapilla*	c,r	c	c	c	o	no	BONA

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Virginia's warbler	*Vermivora virginiae*	r			r		no	BONA
hooded warbler	*Wilsonia citrina*	c,r		r	r		no	BONA
Wilson's warbler	*Wilsonia pusilla*	r	c	c	c	r	yes	BONA
Family PASSERIDAE (*Old World sparrows*)								
*house sparrow	*Passer domesticus*	g	c	c	c	c	yes	BONA
Family REGULIDAE (*kinglets*)								
ruby-crowned kinglet	*Regulus calendula*	c,r	c		c	c	no	BONA
golden-crowned kinglet	*Regulus satrapa*	r,c	c	c	c	c	yes	BONA
Family SITTIDAE (*nuthatches*)								
red-breasted nuthatch	*Sitta canadensis*	c			o	r	yes	BONA
Family STURNIDAE (*starlings*)								
*European starling	*Sturnus vulgaris*	wide	a	c	a	a	yes	BONA
Family SYLVIIDAE (*gnatchatchers*)								
blue-gray gnatcatcher	*Polioptila caerulea*	r	r	r	r	r	yes	BONA
Family TIMALIIDAE (*babbler*)								
wrentit	*Chamaea fasciata*	r,c	c	c	c	c	yes	BONA
Family TROGLODYTIDAE (*wrens*)								
*marsh wren	*Cistothorus palustris*	fm	c	c	c	c	yes	BONA
*house wren	*Troglodytes aedon*	r,c	c	c	c	r	yes	BONA
*Bewick's wren	*Thryomanes bewickii*	r	c	c	c	c	yes	BONA
*winter wren	*Troglodytes troglodytes*	c,r,fm,s,o	c	c	c	c	yes	BONA
Family TURDIDAE (*thrushes*)								
hermit thrush	*Catharus guttatus*	c,r,g	c		c	c	yes	BONA
Swainson's thrush	*Catharus ustulatus*	r	c	c	c		yes	BONA
varied thrush	*Ixoreus naevius*	c,r,g	c	c	c	c	yes	BONA
Townsend's solitaire	*Myadestes townsendi*	c,g	r			r	no	BONA
mountain bluebird	*Sialia currucoides*	g,r	r		r		no	BONA
western bluebird	*Sialia mexicana*	c,r			o	o	yes	BONA
American robin	*Turdus migratorius*	r,c,g	c	c	c	c	yes	BONA
Family TYRANNIDAE (*flycatchers*)								
*olive-sided flycatcher	*Contopus cooperi*	c,r	c	c	c		yes	BONA
*western wood-pewee	*Contopus sordidulus*	r,c	c	c	c		yes	BONA
*pacific-slope flycatcher	*Empidonax difficilis*	c,r	c	c	c		yes	BONA

Common Name	Scientific Name	Primary Habitat	Sp	S	F	W	Breeding Range?	Habitat Source
least flycatcher	*Empidonax minimus*	r			r		no	BONA
dusky flycatcher	*Empidonax oberholseri*	c,r	r		r		yes	BONA
willow flycatcher	*Empidonax traillii*	r	o	o	o		no	BONA
gray flycatcher	*Empidonax wrightii*	r,c	r				no	BONA
ash-throated flycatcher	*Myiarchus cinerascens*	c,r	o		o	r	yes	BONA
*black phoebe	*Sayornis nigricans*	rb,r,g,o	c	c	c	c	yes	BONA
Say's phoebe	*Sayornis saya*	g	r		r	r	no	BONA
tropical kingbird	*Tyrannus melancholicus*	g			o	r	no	BONA
eastern kingbird	*Tyrannus tyrannus*	wide	r	r	r		no	BONA
western kingbird	*Tyrannus verticalis*	wide	u		u		yes	BONA
Family VIREONIDAE (*vireos*)								
*warbling vireo	*Vireo gilvus*	wide	c	c	c		yes	BONA
*Hutton's vireo	*Vireo huttoni*	c,r	c	c	c	c	yes	BONA
red-eyed vireo	*Vireo olivaceus*	r,c	r		r		no	BONA
*blue-headed vireo	*Vireo solitarius*	c,r	u	u	u	r	yes	BONA
Order PELECANIFORMES (*pelicans, tropicbirds, cormorants and relatives*)								
Family FREGATIDAE (*frigatebirds*)								
magnificent frigatebird	*Fregata magnificens*	om		r	r		no	BONA
Family PELECANIDAE (*pelicans*)								
American white pelican	*Pelecanus erythrorhynchos*	o,r	r		r		no	BONA
California brown pelican	*Pelecanus occidentalis californicus*	om	o	c	c	o	no	BONA
Family PHALACROCORACIDAE (*cormorants*)								
*double-crested cormorant	*Phalacrocorax auritus*	om,o	c	c	c	c	yes	BONA
pelagic cormorant	*Phalacrocorax pelagicus*	om	c	c	c	c	yes	BONA
Brandt's cormorant	*Phalacrocorax penicillatus*	om	c	c	c	r	yes	BONA
Order PICIFORMES (*woodpeckers and relatives*)								
Family PICIDAE (*woodpeckers*)								
*northern flicker	*Colaptes auratus*	r	o	o	o	o	yes	BONA

Common Name	Scientific Name	Primary Habitat	Sp	S	F	W	Breeding Range?	Habitat Source
*pileated woodpecker	*Dryocopus pileatus*	r,c	o	o	o	o	yes	BONA
acorn woodpecker	*Melanerpes formicivorus*	r,c	r		r		yes	BONA
Lewis's woodpecker	*Melanerpes lewis*	r			r		no	BONA
*downy woodpecker	*Picoides pubescens*	r,c	c	c	c	c	yes	BONA
*hairy woodpecker	*Picoides villosus*	r,c	c	c	c	c	yes	BONA
red-naped sapsucker	*Sphyrapicus nuchalis*	c	r		r	r	yes	BONA
*red-breasted sapsucker	*Sphyrapicus ruber*	c,r	u	u	u	u	yes	BONA
yellow-bellied sapsucker	*Sphyrapicus varius*	c,r	r		r	r	no	BONA
Order PODICIPEDIFORMES (*grebes*)								
Family PODICIPEDIDAE (*grebes*)								
Clark's grebe	*Aechmophorus clarkii*	om	o		o	o	yes	BONA
*western grebe	*Aechmophorus occidentalis*	om	c	u	c	c	yes	BONA
horned grebe	*Podiceps auritus*	o,om	c	r	c	c	no	BONA
red-necked grebe	*Podiceps grisegena*	om,o	u	r	u	u	no	BONA
eared grebe	*Podiceps nigricollis*	o,om	c		c	c	no	BONA
*pied-billed grebe	*Podilymbus podiceps*	o,om	u	u	u	u	yes	BONA
Order PROCELLARIIFORMES (*tube-nosed seabirds*)								
Family PROCELLARIIDAE (*petrels and shearwaters*)								
northern fulmar	*Fulmarus glacialis*	om	r		o	r	no	BONA
pink-footed shearwater	*Puffinus creatopus*	om	r	r	o	r	no	BONA
sooty shearwater	*Puffinus griseus*	om	o	o	r	r	no	BONA
short-tailed shearwater	*Puffinus tenuirostris*	om			r	r	no	BONA
Order STRIGIFORMES (*owls*)								
Family TYTONIDAE (*typical owls*)								
northern saw-whet owl	*Aegolius acadicus*	c,r	o	o	o	o	yes	BONA
long-eared owl	*Asio otus*	g,r,c			r		no	BONA
*short-eared owl	*Asio flammeus*	g,s,fm,sm,bm	u	o	u	c	yes	BONA
burrowing owl	*Athene cunicularia*	g,d	r	r	r	r	no	unknown
snowy owl	*Bubo scandiacus*	g,s,d,fm			r	r	no	BONA
*great horned owl	*Bubo virginianus*	wide	c	c	c	c	yes	BONA
*northern pygmy-owl	*Glaucidium gnoma*	c,r	u	u	u	u	yes	BONA

Common Name	Scientific Name	Primary Habitat	Sp	S	F	W	Breeding Range?	Habitat Source
*western screech-owl	*Megascops kennicottii*	r,c	c	c	c	c	yes	BONA
spotted owl	*Strix occidentalis*	c		o	o		yes	BONA
*barn owl	*Tyto alba*	wide	c	c	c	c	yes	BONA

Habitats: a - Aerial, usually observed in flight; b-beaches; bm - brackish marshes; c - coniferous forest; d - dunes; ds - dune swales; e- Eelgrass beds, Bay shores; fm - freshwater marshes; g - Agricultural grasslands; r - Riparian forests; sm - saltwater marshes; rb-Rocky beaches; m - mudflats ; o - Open water, lakes, creeks, ponds; om - open water marine; s - seasonal wetlands, mudflats, flooded fields; wide - Widespread, found in a variety of habitats

Seasons: Sp - Spring, March through May; S - Summer, June through August; F - Fall, September through November; W - Winter, December through February

*Abundance: a - Abundant, expected to be observed 80 to 100 percent of the time in appropriate habitat; c - Common: 60 to 80 percent; u - Uncommon: 30 to 60 percent; o - Occasionally: 10 to 30 percent; r - Rare: 0 to 10 percent; * - Birds known to nest locally; ! -Threatened/Endangered Species; # - Observed less than 10 times in the past 10 years*

BONA: Birds of North America

Fish

Common name	Scientific name	Population Resilience*	Population Res. data
Order ACIPENSERIFORMES (*sturgeons and paddlefishes*) **Family ACIPENSERIDAE** (*sturgeons*)			
green sturgeon	*Acipenser medirostris*	Low, minimum population doubling time 4.5 - 14 years	FisBase
Order ANGUILLIFORMES (*eels and morays*) **Family OPHICHTHIDAE** (*snake eels*)			
yellow snake eel	*Ophichthus zophochir*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Order ATHERINIFORMES (*silversides*) **Family ATHERINIDAE** (*neotropical silversides*)			
topsmelt	*Atherinops affinis*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
jack silverside (jacksmelt)	*Atherinopsis californiensis*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Order CARCHARHINIFORMES (*ground sharks*) **Family TRIAKIDAE** (*houndsharks*)			
soupfin (tope) shark	*Galeorhinus galeus*	Very low, minimum population doubling time more than 14 years	FisBase
brown smoothhound	*Mustelus henlei*	Low, minimum population doubling time 4.5 - 14 years	FisBase
leopard shark	*Triakis semifasciata*	Very low, minimum population doubling time more than 14 years	FisBase
Order CHIMAERIFORMES (*chimaeras*) **Family CHIMAERIDAE** (*shortnose chimaeras or ratfishes*)			
Spotted ratfish	*Hydrolagus colliei*	Low, minimum population doubling time 4.5 - 14 years	
Order CLUPEIFORMES (*herrings*) **Family CLUPEIDAE** (*herrings, shads, sardines, menhadens*)			
American shad	*Alosa sapidissima*	Low, minimum population doubling time 4.5 - 14 years	FisBase
Pacific herring	*Clupea pallasii*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
threadfin shad	*Dorosoma petenense*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Family ENGRAULIDAE (*anchovies*)			
Californian anchoveta (northern anchovy)	*Engraulis mordax*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Order GADIFORMES (*cods*) **Family GADIDAE** (*cods and haddocks*)			
Pacific tomcod	*Microgadus proximus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase

Common name	Scientific name	Population Resilience*	Population Res. data
Order GASTEROSTEIFORMES (*sticklebacks and seamoths*) **Family AULORHYNCHIDAE** (*tubesnouts*)			
tube-snout	*Aulorhynchus flavidus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Family GASTEROSTEIDAE (*sticklebacks*)			
threespine stickleback	*Gasterosteus aculeatus*	High, minimum population doubling time less than 15 months	FisBase
Order HEXANCHIFORMES (*frill and cow sharks*) **Family HEXANCHIDAE** (cow sharks)			
broadnose sevengill shark	*Notorynchus cepedianus*	Very low, minimum population doubling time more than 14 years	FisBase
Order LAMPRIDIFORMES (*velifers, tube-eyes and ribbonfishes*) **Family TRACHIPTERIDAE** (*ribbonfishes*)			
king-of-the-salmon	*Trachipterus altivelis*	Low, minimum population doubling time 4.5 - 14 years	FisBase
Order MYCTOPHIFORMES (*lanternfishes*) **Family MYCTOPHIDAE** (*Lanternfishes*)			
northern lampfish	*Stenobrachius leucopsarus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
blue lanternfish	*Tarletonbeania crenularis*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Order OPHIDIFORMES (*cusk eels*) **Family OPHIDIIDAE** (*brotulas and cusk eels*)			
spotted cusk-eel	*Chilara taylori*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Order OSMERIFORMES (*smelts*) **Family OSMERIDAE** (*smelts*)			
whitebait smelt	*Allosmerus elongatus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
surf smelt	*Hypomesus pretiosus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
night smelt	*Spirinchus starksi*	High, minimum population doubling time less than 15 months	FisBase
longfin smelt	*Spirinchus thaleichthys*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
eulachon	*Thaleichthys pacificus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Order PERCIFORMES (*perch-likes*) **Family AMMODYTIDAE** (*sand lances*)			
Pacific sand lance	*Ammodytes hexapterus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Family ANARHICHADIDAE (*wolffishes*)			
wolf-eel	*Anarrhichthys ocellatus*	Low, minimum population doubling time 4.5 - 14 years	FisBase

Common name	Scientific name	Population Resilience*	Population Res. data
Family CENTROLOPHIDAE (*medusafishes*)			
brown rudderfish (Medusafish)	*Icichthys lockingtoni*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Family EMBIOTOCIDAE (*surfperches*)			
calico surfperch	*Amphistichus koelzi*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
redtail surfperch	*Amphistichus rhodoterus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
shiner perch	*Cymatogaster aggregata*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
striped seaperch	*Embiotoca lateralis*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
spotfin surfperch	*Hyperprosopon anale*	High, minimum population doubling time less than 15 months	FisBase
walleye surfperch	*Hyperprosopon argenteum*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
silver surfperch	*Hyperprosopon ellipticum*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
white seaperch	*Phanerodon furcatus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
pile perch (pile seaperch)	*Rhacochilus vacca*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Family GOBIIDAE (*gobies*)			
arrow goby	*Clevelandia ios*	High, minimum population doubling time less than 15 months	FisBase
blackeye goby	*Coryphopterus nicholsi*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
tidewater goby	*Eucyclogobius newberryi*	High, minimum population doubling time less than 15 months	FisBase
bay goby	*Lepidogobius lepidus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Family LUVARIDAE (*louvar*)			
louvar	*Luvarus imperialis*	unknown	FisBase
Family MORONIDAE (temperate basses) FisBase			
striped bass	*Morone lineatus*	Low, minimum population doubling time 4.5 - 14 years	FisBase
Family PHOLIDAE (*gunnels*)			
penpoint gunnel	*Apodichthys flavidus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
saddleback gunnel	*Pholis ornata*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase

Common name	Scientific name	Population Resilience*	Population Res. data
Family SCIAENIDAE (*drums or croakers*)			
white weakfish (white seabass)	*Atractoscion nobilis*	Low, minimum population doubling time 4.5 - 14 years	FisBase
white croaker	*Genyonemus lineatus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
cabezon	*Larimus breviceps*	High, minimum population doubling time less than 15 months	FisBase
Family SERRANIDAE (*wreckfishes*)			
giant sea bass	*Stereolepis gigas*	Very low, minimum population doubling time more than 14 years	FisBase
Family STICHAEIDAE (*pricklebacks*)			
high cockscomb	*Anoplarchus purpurescens*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
monkeyface prickleback	*Cebidichthys violaceus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
decorated warbonnet	*Chirolophis decoratus*	Low, minimum population doubling time 4.5 - 14 years	FisBase
giant wrymouth	*Cryptacanthodes giganteus*	unknown	FisBase
snake prickleback	*Lumpenus sagitta*	Very low, minimum population doubling time more than 14 years	FisBase
Family STROMATEIDAE (*butterfishes*)			
Pacific pompano	*Peprilus simillimus*	High, minimum population doubling time less than 15 months	FisBase
Family TRICHODONTIDAE (*sandfishes*)			
Pacific sandfish	*Trichodon trichodon*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Order PETROMYZONTIFORMES (*lampreys*) **Family PETROMYZONTIDAE** (*lampreys*)			
Pacific lamprey	*Lampetra tridentata*	Low, minimum population doubling time 4.5 - 14 years	
Order PLEURONECTIFORMES (*flatfishes*) **Family CYNOGLOSSIDAE** (*tonguefishes*)			
California tonguefish	*Symphurus atricauda*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Family PARALICHTHYIDAE (*large-tooth flounders*)			
Pacific sanddab	*Citharichthys sordidus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
speckled sanddab	*Citharichthys stigmaeus*	High, minimum population doubling time less than 15 months	FisBase
California flounder (California halibut)	*Paralichthys californicus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Family PLEURONECTIDAE (*righteye flounders*)			
dover sole	*Microstomus pacificus*	Low, minimum population doubling time 4.5 - 14 years	FisBase

Common name	Scientific name	Population Resilience*	Population Res. data
starry flounder	*Platichthys stellatus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
butter sole	*Pleuronectes isolepis*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
English sole	*Pleuronectes vetulus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
c-o sole	*Pleuronichthys coenosus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
curlfin sole	*Pleuronichthys decurrens*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Pacific sand sole	*Psettichthys melanostictus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Order RAJIFORMES (*skates and rays*) **Family MYLIOBATIDAE** (*eagle and manta rays*)			
bat eagle ray	*Myliobatis californica*	Low, minimum population doubling time 4.5 - 14 years	FisBase
Family RAJIDAE (skates)			
big skate	*Raja binoculata*	Low, minimum population doubling time 4.5 - 14 years	FisBase
Family UROLOPHIDAE (*round rays*)			
Haller's round ray	*Urobatis halleri*	Low, minimum population doubling time 4.5 - 14 years	FisBase
Order SALMONIFORMES (*salmons*) **Family SALMONIDAE** (*salmonids*)			
cutthroat trout	*Oncorhynchus clarkii*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Coho salmon	*Oncorhynchus kisutch*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
rainbow trout	*Oncorhynchus mykiss*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Chinook salmon	*Oncorhynchus tshawytscha*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Order SCORPAENIFORMES (*scorpionfishes and flatheads*) **Family AGONIDAE** (*poachers*)			
pygmy poacher	*Odontopyxis trispinosa*	High, minimum population doubling time less than 15 months	FisBase
tubenose poacher	*Pallasina barbata*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
pricklebreast poacher	*Stellerina xyosterna*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Family COTTIDAE (*sculpins*)			
padded sculpin	*Artedius fenestralis*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
scalyhead sculpin	*Artedius harringtoni*	High, minimum population doubling time less than 15 months	FisBase

Common name	Scientific name	Population Resilience*	Population Res. data
bonehead sculpin	*Artedius notospilotus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
rosylip sculpin	*Ascelichthys rhodorus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
silverspotted sculpin	*Blepsias cirrhosus*	unknown	FisBase
sharpnose sculpin	*Clinocottus acuticeps*	High, minimum population doubling time less than 15 months	FisBase
coastrange sculpin	*Cottus aleuticus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
prickly sculpin	*Cottus asper*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
buffalo sculpin	*Enophrys bison*	Low, minimum population doubling time 4.5 - 14 years	FisBase
red irish lord	*Hemilepidotus hemilepidotus*	Very low, minimum population doubling time more than 14 years	FisBase
brown irish lord	*Hemilepidotus spinosus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Pacific staghorn sculpin	*Leptocottus armatus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
sailfin sculpin	*Nautichthys oculofasciatus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
fluffy sculpin	*Oligocottus snyderi*	High, minimum population doubling time less than 15 months	FisBase
Family CYLOPTERIDAE (*snailfishes*)			
slipskin snailfish	*Liparis fucensis*	High, minimum population doubling time less than 15 months	FisBase
showy snailfish	*Liparis pulchellus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
ringtail snailfish	*Liparis rutteri*	High, minimum population doubling time less than 15 months	FisBase
Family HEXAGRAMMIDAE (*greenlings*)			
kelp greenling	*Hexagrammos decagrammus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
rock greenling	*Hexagrammos lagocephalus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
lingcod	*Ophiodon elongatus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
painted greenling	*Oxylebius pictus*	Medium, minimum population doubling time 1.4 - 4.4 years	FisBase
Family SCORPAENIDAE (*rockfishes, rockcods and thornyheads*)			
brown rockfish	*Sebastes auriculatus*	Low, minimum population doubling time 4.5 - 14 years	FisBase
copper rockfish	*Sebastes caurinus*	Low, minimum population doubling time 4.5 - 14 years	FisBase
yellowtail rockfish	*Sebastes flavidus*	Low, minimum population doubling time 4.5 - 14 years	FisBase

Common name	Scientific name	Population Resilience*	Population Res. data
black rockfish	*Sebastes melanops*	Low, minimum population doubling time 4.5 - 14 years	FisBase
vermillion rockfish	*Sebastes miniatus*	Low, minimum population doubling time 4.5 - 14 years	FisBase
blue rockfish	*Sebastes mystinus*	Low, minimum population doubling time 4.5 - 14 years	FisBase
bocaccio	*Sebastes paucispinis*	Low, minimum population doubling time 4.5 - 14 years	FisBase
grass rockfish	*Sebastes rastrelliger*	Low, minimum population doubling time 4.5 - 14 years	FisBase
Order SQUALIFORMES (*bramble, sleeper and dogfish sharks*) **Family SQUALIDAE** (*dogfish sharks*)			
piked dogfish (spiny dogfish)	*Squalus acanthias*	Very low, minimum population doubling time more than 14 years	FisBase
Order STOMIIFORMES (*lightfishes and dragonfishes*) **Family GONOSTOMATIDAE** (*bristlemouths*)			
benttooth bristlemouth	*Cyclothone acclinidens*	High, minimum population doubling time less than 15 months	FisBase
Order SYNGNATHIFORMES (*pipefishes and seahorses*) **Family SYNGNATHIDAE** (*pipefishes and seahorses*)			
bay pipefish	*Syngnathus leptorhynchus*	High, minimum population doubling time less than 15 months	FisBase
Order TETRAODONTIFORMES (*puffers and filefishes*) **Family MOLIDAE** (*Molas or ocean sunfishes*)			
ocean sunfish	*Mola mola*	Low, minimum population doubling time 4.5 - 14 years	FisBase

* *Population Resilience Information from www.fishbase.org/*

Appendix L: Locally Occurring Special Status Species

Locally Occurring Special Status Species

Taxon	Scientific Name	Common Name	Status	Habitat Type	On HBNWR?	On CRNWR?
Amphibians	*Rana aurora aurora*	Northern Red-Legged Frog	CA: SSC	freshwater emergent wetland, riverine, wet meadow	yes, resident and common	no
Birds	*Agelaius tricolor*	Tricolored BlackBirds	FED: BCC CA: SSC	freshwater emergent wetland, pasture	yes, migratory	no
Birds	*Ammodramus savannarum*	Grasshopper sparrow	CA: SSC	grasslands	yes, migratory	no
Birds	*Asio flammeus*	Short-Eared Owl	CA: SSC	wide variety of habitats	yes, winter, possible breeding	no
Birds	*Asio otus*	Long-Eared Owl	CA: SSC	wide variety of habitats	yes, migratory	no
Birds	*Aquila chrysaetos*	Golden Eagle	FED: BBC CA: Fully protected	wide variety of habitats	yes, migratory	no
Birds	*Athene cunicularia*	Burrowing Owl	CA: SSC FED: BCC	annual, perennial grassland	yes, migratory	no
Birds	*Brachyramphus marmoratus*	Marbeled Murrelet	FED: Threatened CA: Endangered; Critical Habitat	old growth forest, ocean	no	in water only
Birds	*Branta bernicla*	Brant	CA: SSC	shallow bays and estuaries	Yes, winter	no
Birds	*Buteo swainsoni*	Swainson's Hawk	CA: Threatened	annual, perennial grassland	yes, migratory, very rare	no
Birds	*Chaetura vauxi*	Vaux's Swift	CA: SSC	riparian, also upland forest nesting, foraging in wide variety of habitats	yes, migratory	no

Taxon	Scientific Name	Common Name	Status	Habitat Type	On HBNWR?	On CRNWR?
Birds	*Charadrius alexandrinus nivosus*	Western Snowy Plover (Coastal Population)	FED: Threatened, FED: BCC (full species) CA: SSC	shoreline, dunes	yes, breed	no
Birds	*Chlidonias niger*	Black Tern	CA: SSC	marine, estuarine, wet meadow	yes, migratory, very rare	no
Birds	*Circus cyaneus*	Northern Harrier	CA: SSC	wide variety of habitats	yes, breed	no
Birds	*Coccyzus americanus*	Western Yellow-billed Cuckoo	FED: Candidate CA: Endangered	open woodlands, dense shrub layers	vagrant	no
Birds	*Contopus cooperi*	Olive-Sided Flycatcher	FED: BCC CA: SSC	Douglas-fir forest, also found in other habitats	yes, breed	no
Birds	*Cypseloides niger*	Black Swift	FED: BCC CA: SSC	grasslands	yes, migratory	no
Birds	*Dendroica petechia brewsteri*	Yellow Warbler	CA: SSC	montane riparian, valley foothill riparian woodland	yes, breed	no
Birds	*Elanus leucurus*	White-Tailed Kite	CA: Fully Protected	freshwater, saline emergent wetland, annual grassland	yes	no
Birds	*Empidonax traillii*	Willow Flycatcher	CA: Endangered	montane riparian, valley foothill riparian woodland	yes, migratory	no
Birds	*Falco peregrinus anatum*	American Peregrine Falcon	FED: BBC CA: Delisted, Fully Protected	variety of habitats	yes, migratory	no
Birds	*Fratercula cirrhata*	Tufted Puffin	CA: SSC	marine, offshore rocks	no	yes, breed
Birds	*Haliaeetus leucocephalus*	Bald Eagle	FED: Threatened FED: Delisted CA: Delisted, Fully protected	wide variety of habitats	yes, breed	no

Taxon	Scientific Name	Common Name	Status	Habitat Type	On HBNWR?	On CRNWR?
Birds	*Icteria virens*	Yellow-Breasted Chat	CA: SSC	valley-foothill riparian	yes, migratory	no
Birds	*Lanius ludovicianus*	Loggerhead Shrike	FED: BCC CA: SSC	wide variety of habitats	yes, migratory, very rare	no
Birds	*Melanerpes lewis*	Lewis' Woodpecker	FED: BCC	wide variety of habitats	yes, migratory, very rare	no
Birds	*Oceanodroma furcata*	Fork-Tailed Storm-Petrel	CA: SSC	marine, offshore rocks	no	yes, breed
Birds	*Pelecanus erythrorhynchos*	American White Pelican	CA: SSC	estuarine	yes, vagrant	no
Birds	*Pelecanus occidentalis*	Brown Pelican	FED: Threatened CA: Fully Protected	marine	yes, migratory	yes, migratory
Birds	*Phoebastris albatrus*	Short-tailed Albatross	FED: Endangered	open ocean	no	migratory, in water only
Birds	*Progne subis*	Purple Martin	CA: SSC	wide variety of habitats	yes, migratory	no
Birds	*Ptychoramphus aleuticus*	Cassin's Auklet	FED: BCC CA: SSC	marine, offshore rocks	no	yes
Birds	*Riparia riparia*	Bank Swallow	CA: Threatened	valley-foothill riparian	yes, migratory, very rare	no
Birds	*Sterna caspia*	Caspian Tern	FED: BCC	freshwater emergent wetland, marine, riverine, estuarine	yes, migratory	yes, migratory
Birds	*Strix occendentalis caurina*	Northern Spotted Owl	FED: Threatened; Critical Habitat CA: SSC	forest, multi-canopied	no	no
Birds	*Synthliboramphus hypoleucus*	Xantus's Murrelet	FED: Candidate CA: Threatened	ocean, offshore islands	no	very rare, in water only

Taxon	Scientific Name	Common Name	Status	Habitat Type	On HBNWR?	On CRNWR?
Fish	*Acipenser medirostris*	North American Green Sturgeon	CA: SSC FED: Threatened Southern DPS; Proposed Critical Habitat for Southern DPS	riverine, marine, estuarine	yes, Bay	no
Fish	*Eucyclogobius newberryi*	Tidewater Goby	FED: Endangered CA: SSC	riverine, estuarine	yes, breed	no
Fish	*Lampetra tridentata*	Pacific lamprey	CA: SSC	estuarine	yes, ammocoetes in Salmon Creek	no
Fish	*Oncorhynchus clarki clarki*	Coast Cutthroat Trout	CA: SSC	marine, estuarine, riverine	yes, migratory	no
Fish	*Oncorhynchus kisutch*	Coho Salmon - Southern Oregon / Northern California ESU	CA, FED: Threatened	marine, estuarine, riverine	yes, migratory	no
Fish	*Oncorhynchus mykiss*	Steelhead-Northern California ESU	FED: Threatened CA: SSC	marine, riverine, estuarine	yes, migratory	no
Fish	*Oncorhynchus tshawytscha*	Chinook Salmon - California Coastal ESU	FED: Threatened	marine, riverine, estuarine	yes, migratory	no
Fish	*Spirinchus thaleichthys*	Longfin Smelt	CA: Threatened	estuarine, riverine	yes, Bay, Salmon Creek, Hookton Slough	no
Fish	*Thaleichthys pacificus*	Eulachon, Southern DPS	FED:PT CA: SSC	marine, riverine, estuarine	yes, migratory	no
Mammals	*Arborimus albipes*	White-Footed Vole	CA: SSC	redwood, Douglas fir, riparian forest	yes	no
Mammals	*Eumetopias jubatus*	Steller (northern) Sea-Lion	FED: Threatened	marine, offshore rocks	no	yes
Plants	*Abronia umbellata ssp. brevifolia*	Pink Sand Verbena	CA: Special Plant	dune mat	yes	no
Plants	*Castilleja ambigua* ssp. *humboldtiensis*	Humboldt Bay Owl's Clover	CA: Special Plant	saline estuarine marsh	yes	no

Taxon	Scientific Name	Common Name	Status	Habitat Type	On HBNWR?	On CRNWR?
Plants	*Cordylanthus maritimus Benth.* ssp. *palustris*	Point Reyes Bird's-beak	CA: Special Plant	saline estuarine marsh	yes	no
Plants	*Erysimum menziesii* ssp. *eurekense*	Humboldt Bay Wallflower	FED: Endangered CA: Endangered	dune mat	yes	no
Plants	*Layia carnosa*	Beach Layia	FED: Endangered CA: Endangered	dune mat	yes	no
Reptiles	*Emys (=Clemmys) marmorata marmorata*	Northwestern Pond Turtle	CA: SSC	wide variety of habitats	yes	no
Note: It is unknown at this time whether the species below exist on the NWR						
Arthropods	*Icaricia icarioides missionensis*	Mission Blue Butterfly	FED: Endangered	annual grassland		
Arthropods	*Lycaeides argyrognomon lotis*	Lotis Blue Butterfly	FED: Endangered	wet meadow		
Amphibians	*Plethodon elongatus*	Del Norte Salamander	CA: SSC	wide variety of habitats		
Arthropods	*Polites mardon*	Mardon Skipper	FED: Candidate	annual grassland		
Arthropods	*Speyeria zerene behrensii*	Behren's Silverspot Butterfly	FED: Endangered	closed-cone pine-cypress		
Arthropods	*Speyeria zerene hippolyta*	Oregon Silverspot Butterfly	FED: Threatened	perennial grassland, dunes		
Arthropods	*Speyeria zerene myrtleae*	Myrtle's Silverspot Butterfly	FED: Endangered	dunes, coastal scrub		
Arthropods	*Syncaris pacifica*	California Freshwater Shrimp	FED: Endangered, CA: Endangered	riverine		

FED=listed under the Federal Endangered Species Act; CA=listed under the California Endangered Species Act; SSC=Species of Special Concern; BCC=Birds of Conservation Concern; DPS=Distinct Population Segment.

Listing Categories

California Endangered Species Act (CESA) Listing Codes:

- CA: E State-listed as Endangered
- CA: T State-listed as Threatened
- CA: CE State candidate for listing as Endangered
- CA: CT State candidate for listing as Threatened
- CA: CD State candidate for delisting

Endangered Species Act (ESA) Listing Codes:

- FED: E Federally listed as Endangered
- FED: T Federally listed as Threatened
- FED: PE Federally proposed for listing as Endangered
- FED: PT Federally proposed for listing as Threatened
- FED: PD Federally proposed for delisting
- FED: C Federal candidate species (former Category 1 candidates)
- FED: SC Species of Concern – list established by National Marine Fisheries Service (NMFS) *effective 15 April 2004*

Other Codes:

SSC: California Species of Special Concern. It is the goal and responsibility of the Department of Fish and Game to maintain viable populations of all native species. To this end, the Department has designated certain vertebrate species as "Species of Special Concern" because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. More information is available on the Department's web site at: http://www.dfg.ca.gov/hcpb/species/ssc/ssc.shtml. All of the Species of Special Concern reports are now available on-line:
Birds: http://www.dfg.ca.gov/hcpb/info/bird_ssc.shtml.
Mammals: http://www.dfg.ca.gov/hcpb/info/mammal_ssc.shtml.
Fish: http://www.dfg.ca.gov/hcpb/info/fish_ssc.pdf.
Amphibians & Reptiles: http://www.dfg.ca.gov/hcpb/info/herp_ssc.pdf.

Fully Protected: The classification of Fully Protected was the State's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. More information on Fully Protected species and the take provisions can be found in the Fish and Game Code, (birds at §3511, mammals at §4700, reptiles and amphibians at §5050, and fish at §5515). Additional information on Fully Protected fish can be found in the California Code of Regulations, Title 14, Division 1, Subdivision 1, Chapter 2, Article 4, §5.93. The category of Protected Amphibians and Reptiles in Title 14 has been repealed. The Fish and Game Code is available online at: http://www.leginfo.ca.gov/cgibin/calawquery?codesection=fgc. Title 14 of the California Code of Regulations is available at: http://ccr.oal.ca.gov.

BCC: US Fish and Wildlife Service has designated Birds of Conservation Concern: The goal of the Birds of Conservation Concern 2002 report is to accurately identify the migratory and nonmigratory bird species (beyond those already designated as Federally threatened or endangered) that represent our highest conservation priorities and draw attention to species in need of conservation action.

Vagrant: Visitor or vagrant. Those with very few records, and not expected but once in every 5 to 10+ years.

This report is available at: http://library.fws.gov/Bird_Publications/BCC2002.pdf

Appendix M: Public Involvement Process for the Humboldt Bay National Wildlife Refuge Complex CCP/EA

Public Involvement Process for the Humboldt Bay National Wildlife Refuge Complex CCP/EA

Advertisement of Public Scoping Meetings and Initiation of CCP/NEPA process

Prior to public scoping meetings the Complex issues a press release to many local media outlets including: local radio stations such as KHSU, KHUM , KSLUG, and KEKA; local newspapers such as the Eureka Times Standard, Eureka Reporter, Humboldt Beacon, Eco News, and the North Coast Journal; and local television stations such as FOX, ABC, NBC, and PBS (community calendar). Flyers advertising the public meetings were posted at community bulletin boards by members of the Service in January of 2007. A planning update was distributed to interested stakeholders that had been identified through other, prior Complex planning processes. Planning officially began when a Notice of Intent published in the Federal Register announcing the Service's intent to prepare a comprehensive conservation plan and environmental assessment for the Complex (Vol. 72, No. 18, p. 4020). The Notice of Intent requested that the public submit comments on the CCP by March 15, 2007. An issues workbook was also distributed to the mailing list and at public meetings to help focus public input.

Public Scoping Meetings

Three Public Scoping Meetings were held on February 13, 15, and 17, 2007 in Del Norte and Humboldt County to receive public input on the Complex comprehensive conservation plan and associated National Environmental Policy Act document. Each public scoping meeting consisted of a presentation by Service staff on the CCP/NEPA process, a presentation on the history of the Complex, questions and answers, and documentation of public comments. The majority of each public meeting was spent documenting public comments.

The first meeting was held on February 13, 2007 at the Del Norte Family Resource Center from 6:00 pm–8:30 pm in Crescent City, California. Five members of the public attended the meeting as well as three members of the Service. The second meeting was held on February 15, 2007 at the College of the Redwoods from 5:30 pm–8:00 pm in Eureka, California. Approximately 23 members of the public attended (23 signed in) the meeting as well as nine members of the Service. The third meeting was held on February 17, 2007 at the Humboldt Area Foundation from 2:30 pm–5:00 pm in Bayside, California. Approximately 14 members of the public attended (14 signed in) the meeting as well as nine members of the Service. Members of the public attending the meetings were encouraged to also submit written comments by March 15, 2007. Copies of the Issues Workbook were distributed to interested stakeholders at the meetings.

Supplemental Request for Comments on Castle Rock NWR

Due to Castle Rock NWR's seasonal popularity, primarily related to birding events, the Service attempted to obtain additional public comment on the CCP by distributing a planning update to members of the public attending the annual Aleutian cackling goose festival during the week of April 2, 2007. The second planning update encouraged the public to provide comments on the future management of Castle Rock NWR by May 17, 2007.

Public Scoping Comments Received

A complete list of public comments received orally and in writing, during the public scoping process, are contained in Appendix M: Public Involvement Process. Hundreds of comments were received during the public scoping meetings, on a wide variety of Complex management topics. In total 14 completed issues workbooks were returned during the public scoping period. In total 13 letters or e-mails were received during the open comment period. In addition 3 sets of written comments were turned in during public meetings.

Summary of HBNWRC CCP Written Public Scoping Comments received during the open comment period from January 29 through March 15, 2007

In total 13 letters or e-mails were received during the open comment period. In addition 3 sets of written comments were turned in during public meetings.

Comments and suggestions from agencies, tribes and the public:

Humboldt Bay NWR Biological Resources Management

- Increase short grass habitat for Aleutian cackling geese and other species (1 comment)
- Use grazing animals, instead of machinery, to maintain pastoral lands (1 comment)
- Willing to see White Slough go tidal, but Hookton Slough Unit should be freshwater marsh (1 comment)
- Enhance existing properties for waterfowl (1 comment)

Humboldt Bay NWR Visitors Services

Hunting general

- Educate hunters about the value of sportsmanship and ethics on the refuge (2 comments)
- Initiate pre and post season hunting meetings (1 comment)
- Update the Sport Hunting Management Plan (including recalculate the refuge acreage and re-evaluate the percentage of land presently open and closed to hunting, re-evaluate hunting of de-listed species) (1 comment)
- Enter into agreements with local and State agencies to enhance and protect sport hunting opportunities in and around Humboldt Bay (1 comment)

Hunting facilities/infrastructure

- Create retrieval zone at blinds D, 2, 4 and 14 along hunting/ no hunting boundary (1 comment)
- Improve blinds by adding more pit blinds and improving others (1 comment)
- There should be less blinds and they should be spaced farther apart (1 comment)
- Add a blind between #8 and #13 (1 comment)
- Acquire and enhance new hunting properties (1 comment)
- Want goose blinds/pits in eastern fields of Salmon Creek Unit (1 comment)

Hunting rules and regulations

- Increase LE, particularly to count the shells brought in (3 comments)
- Want season pass for hunting (3 comments)
- Add one hunt day/allow hunting on Thursday (2 comments)
- Allow hunting until sunset (2 comments)
- Conduct draw the night before hunt day (2 comments)
- Joining up should be allowed for the re-draw, provided all joining hunters were drawn in the morning (2 comments)
- The refill could be improved by allowing joining up with any card that was drawn at morning draw, this could bring in more $ and allow more hunting opportunity (2 comments)
- Want improved opportunities for pairing up during redraw (1 comment)
- A person should only be able to come for a chance to be drawn once per week (1 comment)
- Eliminate the second refill drawing (1 comment)
- Want review of D-blind draw rules (1 comment)
- Expand the hunting area (1 comment)
- Junior hunters should have a day a month or a day a week where only they are allowed to hunt (1 comment)

Hunting Salmon Creek Unit

- Overall Salmon Creek Unit drawn hunt is good (1 comment)

Hunting Hookton Slough Unit

- Want hunting access from Hookton Slough dock (1 comment)
- Provide hunting access to Hookton Slough off Toroni Rd. (1 comment)
- On specific days close motorized boat access to Teal Island (Hookton Slough Unit access) and only allow non-motorized access (1 comment)

Hunting Jacoby Creek Unit

- Want parking access at Jacoby Creek for hunting (1 comment)
- Improve access at Jacoby Creek Unit or develop an appropriate non-motorized boat launch (1 comment)

Hunting Eureka Slough Unit

- Improve hunter access at Eureka Slough, the location is suited to creation of non-motorized boat access (1 comment)

Dune Units facilities/infrastructure

- May want to consider speed bumps for Ma-le'l access, but not as severe as Salmon Creek Unit speed bumps (1 comment)
- Hiking trails of 3-6 foot width should only be used for Ma-le'l Americans with Disabilities Act (ADA) accessible trails. Dune trails should be narrower, Class 4 trail designation, to preserve the integrity of the forest and dunes (1 comment)
- Railings should be 48" high for the Ma-le'l view deck for liability reasons (1 comment)

Dune Units rules and regulations

- Bikes going on the trail will be an ongoing issue for Ma-le'l (1 comment)
- Ma-le'l north entry: do not allow RVs or trailers, only allow non-motorized boat launch (1 comment)
- Consider contingency planning to close access based on actual or projected wind speeds detected on off shore buoys (1 comment)
- If the caretaker is a FWS employee, towing procedures may be o.k., but if not it may be best for the caretaker to notify headquarters (1 comment)
- Consider caretaker safety and training regarding towing of vehicles (1 comment)
- Make open/close/tow times for Ma-le'l the same as for the South Jetty for ease of understanding (1 comment)

Dune Units signage

- Ma-le'l boundary signage: too much signage is intrusive, recommend having the primary standard by LOS (1 comment)
- Redwood Gun Club entry: the "do not enter" sign is vague, noise from the gun club should be addressed in information provided to the public (1 comment)
- Lanphere Dunes boundaries are not clearly marked (1 comment)
- Rules for public use and dune unit boundaries should be clearly posted and maintained (1 comment)
- The boundary between Ma-le'l South and Ma-le'l North must be clearly posted because dogs are only allowed in the South (1 comment)
- Fences would be a clear boundary (1 comment)

Humboldt Bay NWR Cultural Resources Management

- The CCP should recognize and protect Wiyot cultural resources as mandated under Section 110 of the National Historic Preservation Act (1 comment)
- Include separate provisions for the protection of cultural resources, including archaeological and traditional cultural properties (1 comment)
- The refuge should employ a professional archaeological assessment of identified properties in consultation with Tribal representatives and develop procedural language to allow flexible management practices (1 comment)
- Acknowledge all Service regulatory responsibilities under the NHPA in CCP drafts (1 comment)
- Clarify the historic status determination for the Jacoby Creek hunting shack [under criteria A, broad patterns of history] (1 comment)
- The Humboldt National Wildlife Refuge is located within the ancestral and current territory of the Wiyot Tribe (1 comment)

- Many historic Wiyot village sites are located within the boundaries of the refuge (1 comment)
- Should make provisions to consider a transfer of lands such that the Wiyot Tribe may acquire refuge property located on Indian Island (1 comment)
- Consider co-management of lands within the refuge boundaries held sacred by the Wiyot Tribe, when appropriate (includes Indian Island lands and potentially other refuge lands) (1 comment)
- Coordinate with the Wiyot Tribe regarding the protection of sensitive cultural resources located on property owned by the refuge (1 comment)
- Coordinate management and monitoring of species valuable to the Wiyot Tribe for subsistence and cultural purposes (1 comment)
- Coordinate with the Wiyot Tribe on refuge-scale and watershed-scale activities that may affect property held by the Wiyot Tribe and the resources valued by the Tribe (ie. water quality, cultural resource protection, habitat improvement, etc.) (1 comment)

Humboldt Bay NWR General Comments

- Want continued access to islands in Mad River Slough (1 comment)
- Leave white refuge signs in place and post greed boundary signs down the middle of the [Mad River] slough so that we can retrieve dead or wounded ducks (1 comment)
- Promote science based, service learning programs for 5th – 8th grade children on the refuge (1 comment)

Castle Rock NWR Biological Resources Management

- The best way to manage Castle Rock NWR seabirds is to stay away from them (1 comment)

Castle Rock NWR Community Outreach

- Consider additional posters at Point St. George in conjunction with the Point St. George working group (1 comment)
- Informational flyers specific to Castle Rock should be developed and distributed to Redwood State and Nat'l Park visitors center, the Chamber of Commerce, through the Humboldt NWR and other locations (1 comment)
- Provide excursions, field trips, and courses using CRNWR to showcase wildlife concepts (1 comment)

Castle Rock NWR signage

- Signs should be posted along Pebble Beach Drive and at Anchor Way, in Crescent City Harbor, to educate kayakers and other users to the risk of disturbance, the potential impact on seabirds, and illegality of trespass or flushing wildlife (1 comment)
- Review content of signs along Pebble Beach Drive and possibly add new ones (1 comment)

Castle Rock NWR Research Comments

- Should fund a study to quantify sources, frequency and severity of disturbance [of seabirds and pinnipeds] on Castle Rock NWR (1 comment)
- Review the impact of research activities on Castle Rock NWR resources (1 comment)
- Continue photo surveys by remote camera for colony counts (1 comment)
- Monitor disturbance by staff landing on the island via a remote observer (1 comment)
- Additional remote sensing projects should be encouraged (ex. high resolution and thermal imaging aerial photography) (1 comment)
- Conduct on site flora and invertebrate surveys during the winter to avoid impacts to other wildlife (1 comment)
- The remote camera feed should be available to the public (1 comment)

Summary of HBNWRC CCP Verbal Comments Received During the Public Scoping Meetings on February 13, 15, 17, 2007.

Meeting #1 was held on 2/13/07 at the Del Norte Family Resource Center from 6:00-8:30 pm in Crescent City -5 members of the public attended the meeting as well as 3 USFWS staff (Eric Nelson, David Bergendorf and Amy Kocourek).

Meeting #2 was held on 2/15/07 at the College of the Redwoods from 5:30-8 pm in Eureka, CA -Approximately 23 members of the public attended (23 signed in) the meeting as well as 9 USFWS staff (Eric Nelson, Shannon Smith, Andrea Pickart, Patti Clifford, Steve Lewis, Dominic Bachman, Amy Kocourek, Emily Jenniings and David Bergendorf).

Meeting #3 was held on 2/17/07 at the Humboldt Area Foundation from 2:30-5 pm in Bayside, CA -Approximately 14 members of the public attended (14 signed in) the meeting as well as 9 USFWS staff (Eric Nelson, Shannon Smith, Andrea Pickart, Patti Clifford, Steve Lewis, Dominic Bachman, Amy Kocourek, Emily Jennings and David Bergendorf).

Comments and suggestions from the public follow:

Castle Rock NWR

Castle Rock NWR Biological Resources/Habitat Protection

- The refuge should look into rare salamanders that may occur on Castle Rock and the genetic importance of potential island populations [the Nature Conservancy may have some records].
- Should protect Castle Rock from watercraft disturbance, such as sea kayaks (speaker has witnessed flushing of birds and marine mammals by watercraft and people walking on the reef).

Castle Rock NWR Environmental Interpretation

Castle Rock NWR Facilities/infrastructure

- Transportation funds might be available for improvements including interpretive signage.
- The county (local transportation district) could apply for TEA21funds including restrooms, parking and interpretive signage.
- Need interpretive displays that connect the public (ie. Visitors) with Castle Rock and encourage "destination" visits to Castle Rock as well as raising awareness and understanding of the resources.
- Could develop a kiosk for Castle Rock, but it should not be immediately on the beach side (would be an eye sore).
- Should add interpretive panels that talk about Castle Rock related rules and how to prevent wildlife disturbance.
- Interpretive signs should be at Pebble Beach drive.

Castle Rock NWR Interpretive Activities

- Should explore using volunteers for interpretation (ex. Summer interns that could stay on local public lands such as state park land). Some students from Humboldt County might be interested.
- Most visitors find their own way to the Castle Rock area (they drive by) so the interpretive programs should be static and self-guided.

Castle Rock NWR Wildlife Observation/Photography

- Should research high powered remote sensing tools that can allow observation of wildlife at Castle Rock without disturbing the wildlife.
- Garth Reef is a good place for Castle Rock observation.

Castle Rock NWR Community Outreach

- Should develop a brochure for Castle Rock.
- Should develop a display for the Crescent City visitors center.

- A Castle Rock brochure could clearly indicate rules that apply to watercraft near Castle Rock and the brochures could be distributed to surf shops, etc.
- Should coordinate strategies of education vs. law enforcement with local organizations (ex. Articles in local papers, research who is actually disturbing wildlife so that that demographic can be targeted with an appropriate message).
- Point St. George and Castle Rock should integrate their interpretive programs (Point St. George is Del Norte County land).
- Should team up with Pebble Beach (county managed) for interpretive signage integration.
- Should team up with Redwood Park (Martha McClure-county supervisor) for interpretive signage integration.

Castle Rock NWR Potential Conflicts with Other Landowners

- Need data on the impact of overflights on birds at Castle Rock and need to clarify what are the regulations for overflights.
- Should try to avoid conflicts such as goose/plane conflicts if the planes are taking off while geese are in flight.

Castle Rock NWR Cultural Resources

- Smith River Rancheria has a good cultural resources historian, Loren Bommelyn, who may be able to supply information on native American use of Castle Rock.
- Research the Del Norte Airport expansion plan and get involved with that planning process. The airport expansion plan should also be addressed in the CCP.

Humboldt Bay National Wildlife Refuge

Humboldt Bay NWR Biological Resources/Habitat

Humboldt Bay NWR Aleutian cackling goose habitat management

- Maintain short grass, geese areas (seem to be doing a good job).
- Idea: Use burning to attract Aleutian cackling geese (experiment with this technique to compare burning with grazing and haying).
- If Aleutians (cackling geese) were here pre-European the native Americans may have been burning to maintain their habitat.

Humboldt Bay NWR Wetland management/restoration

- Maintain as much fresh water marsh habitat on the Salmon Creek Unit (there is not enough fresh water marsh habitat on the refuge).
- (maintain) drainage so neighbors and highway 101 are not flooded.
- Cooperative agreement with Arkleys to extend restoration up channel and deal with overbank flooding.
- (conduct) More restoration of tidal areas on southern units for fish habitat and salt marsh.

Humboldt Bay NWR Biological Surveys and monitoring

- Be sure to incorporate mammal population surveys and monitoring, especially with vegetation surveys.

Humboldt Bay NWR Invasive species management

- Control Spartina at Eureka slough and Jacoby Creek using weed eaters (get a bigger propane tank).

Humboldt Bay NWR Agricultural wetland management

- (should use) More grazing and less haying because of loss of clover.

Humboldt Bay NWR Other species management

- Re-introduce elk.
- Model the deer population, there may be too many.
- Use the HBWAC salmonid conservation plan.
- Do endangered species management to address sloughs beyond our boundary.
- More management of Table Bluff Unit.

Humboldt Bay NWR Hunting/Fishing Management

Humboldt Bay NWR Hunting facilities/infrastructure

- (should) Have pit tanks instead of blinds, take out the blinds.
- Expand the parking lot and/or expand the entrance road (when there are many people on the refuge they park on the roadside) for safety.
- Expand parking toward the eucalyptus trees as well as expanding the road in that area.
- The Salmon Creek hunting unit should have a call box and there should be a second call box next to the disabled blind (the call box should connect to the refuge office or to an outside line in case of emergencies).
- Make sure blind #12 and #13 are not in the same line of fire.
- Blind #10 needs a pond for the early season.
- Pits need new lids (too many frogs and other wildlife are stranded in them).
- Pits should be bailed before (the) season.
- Teal island (is) too close to (the) walking trail, Hookton trail and the Y blind is too near (the) trail for shooting.
- Hookton slough access encourages hunters to come in illegally.
- (should) Make Salmon Creek Unit parking area safer.
- Plant native vegetation around blinds (ex. willows, coyote brush) using volunteers.
- Re-design blinds so doors are positioned better & hunters can get their faces close to the front of the blind. Build up the ground so blinds are dry and native vegetation could survive (ex. #11 is a good example).
- Provide parking at Jacoby Creek cabin.
- Improve access at Eureka slough and provide a boat launch. (Possibly provide only non-motorized boats and cooperate with Target to build the launch).
- Improve and enhance hunter opportunities and access at White Slough, such as a launch for non-motorized boats.
- Improve and enhance hunter opportunities and access at Table Bluff, such as a bridge across the slough.

Humboldt Bay NWR Hunting rules and regulations

- Consider a HBNWR season hunting pass.
- Would like to see an annual use pass for hunting and other consumptive uses.
- Have a refuge hunting season pass instead of day pass and charge $35-$50 for the pass.
- (need a) Better spatial division between hunting vs. non-hunting.
- Should have waterfowl hunting on Mad River Slough and nearby islands (this area has traditionally been hunted, especially by physically fit hunters).
- Refuges should be user friendly (for consumptive users, ex. Hunting [waterfowl] and fishing [clamming, crabbing, trolling]).
- (it is) not logical to use the excuse of bird disturbance for no access to the lower marsh for birder(s).
- (should) Hold Salmon Creek Unit lottery draw the night before (for hunt program).
- Make it so that a representative from the whole party could submit a group card for the lottery the night before, with a morning sweat line.
- Draw for both hunt days on one evening, such as Friday night for both Saturday and Tuesday hunts.
- Clarify legal access and hunting use at Jacoby Creek Unit.
- Provide walk on, free-roam hunting at Jacoby Creek Unit.
- Find out if launching behind Target is legal.
- Facilitate and improve hunting opportunities.
- Improve hunter access at existing areas.
- Consider controlled hunting access at Hookton Slough (i.e. for non-motorized boats only).
- Do not exclude hunter use at Hookton due to perceived user group conflict.
- Manage controlled hunt of Teal Island and Hookton Slough through access at Hookton and regulated use (i.e. non-motorized boats).
- Increase refuge area available for hunting access.
- Consider allowing faxed or mailed cards for evening draw (to) accommodate hunters from out of area.
- Update sport hunting decision document package (i.e., update land status, Aleutian cackling geese and other species status, and percentage of land for hunting).

Humboldt Bay NWR Arguments to Limit Hunting/Fishing

- A person who lives 3 miles away would like to see hunting stopped. He hears shots all the way up the valley.
- Hunting and environmental education are mutually exclusive.
- Hunting devalues the asset that the refuge is.
- Should decrease hunt opportunities to allow other uses to increase.
- Hunting is not a valid management of migratory bird (populations), alternatives include compensating farmers, grass selection and developing more refuges.
- Would like to see the refuge as an actual refuge from hunting and harassment (no hunting should be allowed).
- Give wildlife a safe haven (on the refuge).
- Focus more on environmental education and less on hunting.
- Increase priority of education and observation vs. hunting.

Humboldt Bay NWR Environmental Education and Interpretation

Humboldt Bay NWR Environmental Education

- Offer salt marsh focused environmental education.
- Have an area to dip net and explore the salt marsh, brackish marsh and fresh marsh.
- Highlight similarities and differences of organisms and habitats.
- Write up each field trip program and gather teacher feedback.
- Refuge should provide materials to sample invertebrates (ex. Dip nets, kick nets) and a key to invertebrates (ex. Stoneflies, mayflies, damselflies, dragonflies).
- (offer) Natural history, natural resources, habitat, flora/fauna, education/interpretation – (Emphasize interconnectedness).
- Educate the public on the flora and fauna to inform them about the whole ecosystem.
- (the refuge) Should have a hunting information kiosk in the visitors center
- Focus on environmental education.

Humboldt Bay NWR Interpretation

- Have more interpretation about what management is going on at the refuge.
- (offer) Natural history, natural resources, habitat, flora/fauna, education/interpretation – (Emphasize interconnectedness).
- Help the public understand through interpretation, how hunter groups have helped the refuge and wildlife through financial contributions.
- (should offer) Interpretation about hunters targeting neck marked geese.
- Expand the interpretation on vegetation types and habitats in the visitors center.
- Nothing in the visitors center is about hunting.

Humboldt Bay NWR Community Outreach

- Increase understanding of volunteer program opportunities.
- (should have) Improved coordination with state wardens.
- (should have) Coordination with Manila Community Services District (MCSD).
- (should have) Coordination with the Friends of the Dunes purchase of the Stamps property.
- Educate Manila community (about) rare and important species.
- Educate public about access possibilities at Ma-le'l.
- (the) Refuge should educate public about how duck stamps/hunting/fishing taxes fund conservation of wildlife.
- Educate non-hunters about what hunters do besides hunt (ie. Fund conservation [for] refuges).
- Have a forum where students working on the refuge present their research findings.
- Dominic should give a talk on his research and others.
- Do outreach about existing partnerships (ie. Agriculture community and Aleutian goose working group.
- Make research from Humboldt State University, etc. available such as online and in a research library.
- Incorporate more research at the junior high and high school levels.
- Identify projects (that) kids would be excited to research.
- Establish relationship with K-12 schools to develop fundable programs.
- Create boating programs and water quality studies with kids in mind.

Humboldt Bay NWR Website

- Have vegetation maps on (the refuge) website showing different vegetation types.
- (should develop a) Newsletter to communicate research and update the website with research results.

Humboldt Bay NWR Wildlife Observation and Photography

- Create a less visible photoblind, such as a pit blind.
- Create additional photoblind(s) for other light or other scenery.
- More emphasis should be placed on wildlife observation.

Humboldt Bay NWR Policy/Law Enforcement Comments

- (should have) More law enforcement on the Salmon Creek unit.
- (there are) Too many dogs off leash in the parking lot with no enforcement.
- At hunting check stations have more regulations about bag limits and have that information discussed every Saturday before the hunt.
- (should install a) Security, surveillance camera at the Hookton Slough Unit parking lot.
- Hire refuge law enforcement.
- Charge everyone a daily entrance fee (ex. Birdwatchers, walkers), (but) let a hunting and fishing license be a waiver.
- (there should be) No entrance fee. Keep something free for people to enjoy (No entrance fee makes the refuge accessible to people of all income levels).
- Educate (the) public to keep dogs on leash and allow dogs in the Ma-le'l Dunes unit.
- Refuge should not present duck stamp/hunting/fishing taxes as the only funding of conservation (refuge is supported by taxes from public, donations as well as duck stamps).

Humboldt Bay NWR Non-Wildlife Dependent Recreation

- Create kayak access site at Table Bluff.
- Establish a paddle in access site for overnight (camping) use.
- Establish a 2-3 week day camp for kids (see Maggy H.).
- Develop kayak access at Ma-le'l.
- More kayak access on S areas (Table Bluff Unit).
- Consider dogs on leashes as seasonally appropriate on Hookton or another Salmon creek unit.
- Provide a doggy bag station (re-use plastic newspaper bags).
- Maintain quality of kayak launch and restrooms at Hookton (unit).
- Would like to see dog training (field trials for hunting dogs).
- Consider mosquito management and (management's impact) on neighbors.
- (want to know) What will be done to control (exclude) dog access at the Ma-le'l Unit.

Humboldt Bay NWR Signage

- Can not read property line signs (ex. Jacoby Creek, Eureka, Wiggins tract [currently it is poorly marked]).
- Improve signs on the refuge property.
- Should mark (sign) foot access corridors for the Jacoby Creek Unit and other parts of the refuge.
- Put up a "No free roam" (hunting) sign in the Salmon Creek Unit hunting area
- Blinds need to be re-signed.

Humboldt Bay NWR Cultural Resources Management

- Restore the historic Ranch House and Barn as a part of the heritage of Humboldt County.
- Be sure all cultural resources are considered.
- Make sure the CCP complies with the National Historic Preservation Act.
- Make preservation of the hunting shack at the Jacoby Creek Unit a high priority as well as the McBride barn (including the historic landscaping).
- The Jacoby Creek Unit hunting shack was found to be a significant historic property under the SHPO criteria in 1990.
- Be cautious about expanding wetlands to the detriment of historic properties.
- Protect historic sites at the Ma-le'l Unit.
- Protect shell midden sites at Salmon Creek Unit (i.e. sites near railroad tracks and Arrowhead Point).
- Make sure that all cultural resources are considered (ie. protected and accessible to the Wiyot for traditional uses).

Humboldt Bay NWR General comments

- (there is) More money to be made off of eco-tourism than will be made off of hunting.
- Promote more ecotourism on refuge, (which will) support the local economy.
- Birdwatchers/photographers do not take wildlife.
- Photographers do take wildlife pictures.
- Hunters, photographers and birdwatchers should work together.
- (the speaker is) Concerned about overpopulation of deer.
- Consider contaminants from old dump site on Table Bluff with respect to management of (the) Hookton Slough west end.
- (the speaker expressed) Concern over restricted access at the Ma-le'l Dunes Unit due to presumed impacts.
- Appreciate the building improvements.
- Enhance existing property.
- Keep doing what you are doing.

Coordination with others

- Develop partnerships.
- Long term plans (should) reflect global warming issues.
- Consider efficiency of our own management in regards to global warming.
- Acquire and enhance property.
- Should acquire land at the mouth of the Elk River at the old rendering plant. acreage (land between 101 & Tompkins Hill Road).
- Management of Eureka Slough Unit (coordination with Harbor District Mitigation sites, i.e. Park St. Marsh).
- Coordination with the City of Eureka. Educate City on the value of their sloughs. Their sloughs are an extension of the Unit.
- Work with existing Ecosystem-based Management program to be sure refuge system and goals are incorporated.

Facilities/infrastructure

- Please keep Hookton boat dock and trail open.

Staffing

- Keep the refuge open on Sundays.
- More staff would be good (volunteers sometimes can not answer questions or provide misinformation).

Summary of HBNWRC CCP Issues Workbook Comments Received During the Open Comment Period from January 29 Through March 15, 2007

In total, 14 completed issues workbooks were returned during the open comment period.

A summary of entries into the issues workbooks follows:

1. What activities do you engage in on Humboldt Bay Refuge or plan to in the near future?

- Hunting (8 comments)
- Wildlife observation (6 comments)
- Walking/hiking (5 comments)
- Fishing (4 comments)
- Photography (3 comments)
- Kayaking (1 comment)
- Environmental education (1 comment)
- Aleutian goose management (1 comment)
- Salmon Creek fisheries (1 comment)
- Visitor education (1 comment)

2. What things do you value most about the refuge?

- Access to hunting/fishing (5 comments)
- Wildlife viewing (3 comments)
- Public access (3 comments)
- Wetlands (2 comments)
- Scenic beauty (2 comments)
- Knowing there is habitat for so many species of flora and fauna (1 comment)
- Openness (1 comment)
- Solitude (1 comment)
- Relative (given hunting noise) quiet and sounds of birds (1 comment)
- Visibility/tourism (1 comment)
- Staff (1 comment)
- Nothing, it takes away publicly accessible land (1 comment)
- It is close to home (1 comment)

3. In a sentence or two, describe your future vision for the refuge. You may want to list a vision for wildlife, habitats, visitor services or other aspects of the refuge

- More walking trails available, more native plants, wildlife viewing areas and activities (other than hunting) promoted
- The refuge should not cause problems for neighboring properties (ex. drainage or lack of feed for geese)
- A refuge managed for hunting and maximizing hunting opportunities
- Continued limitation on hunting, closing portion of Teal Island to hunting (too close to the Hookton Trail), continued free access to the refuge, another hiking trail or two, and extended hours
- Multi-purpose habitat with lots of restoration potential and all current uses should be maintained
- To see better understanding between hunters and non-hunters and for non-hunters to be educated about how hunters financially support refuges
- Properly managed for opportunities for everyone to hunt and fish
- To see it managed for additional opportunities for hunting
- When waterfowl are doing good the refuge should be flexible to accommodate more hunter opportunities and areas around the refuge should not be closed to hunting
- Allow hunting without regulations that favor closing additional areas
- The refuge should stop buying public lands and limiting use on those lands
- The refuge should be for wildlife, especially birds, and more trails on the outer dikes throughout the refuge. Some diked areas should be restored to salt marsh
- Educate people about sources of funding for refuges and how to cooperate to benefit wildlife and habitat
- The refuge should stay the way it is, but have more chances to hunt

4. What do you consider the most important problems facing the refuge today? (List up to 3 in order of importance)

- Conflicts between hunters and other refuge users (2 comments)
- Staff using personal vision to manage the refuge (2 comments)
- Methods of allowing hunting (the draw) (2 comments)
- Health of eelgrass beds (1 comment)
- Pollution in Humboldt Bay (1 comment)
- Enforcing refuge rules (e.g., ATV use on Dunes) (1 comment)
- Limited access to the Salmon Creek Unit for 2 days per week (want more access) (1 comment)
- Lack of clarity regarding huntable areas and CDFG hunting regulations (1 comment)
- Conflict between hunting and nature conservation (1 comment)
- Aleutian goose management (1 comment)
- Dike failure (1 comment)
- Lack of funding (1 comment)
- Bureaucracy trying to close it down, to prevent public enjoyment (1 comment)
- (too many) Controlling staff at the refuge (1 comment)
- Only being able to hunt 2 days per week (1 comment)
- No trespassing signs in the sloughs (1 comment)
- Using the refuge to provide hunting opportunities (1 comment)
- Equal charges for refuge users, currently only hunters pay $5/day (1 comment)
- Too many hunters in a small area (1 comment)
- How to limit its expansion (1 comment)
- Sea level rise will impact refuge resources, making dike maintenance key (increase width and strength) (1 comment)
- Restoration of habitats to increase biodiversity (1 comment)
- People's attitudes about how things should be done on refuges (1 comment)
- Need more habitat (1 comment)
- Water resources should be managed better (1 comment)

5. What technical services would you like the refuge staff to provide? (check if appropriate)

- Management to benefit wildlife/fisheries (12 comments)
- Wetland management (6 comments)
- Control of invasive and non-native species (4 comments)
- Enhanced educational services (4 comments)
- Habitat enhancement on private lands (3 comments)
- Volunteer opportunities (3 comments)
- Enhanced visitor services (3 comments)
- Need more law enforcement, there is none (2 comments)
- Education on such topics as a lecture the human and natural history of the lands that are now part of the Complex (Dune walks are good, but would like to know more about the wetland units) (1 comment)
- Provide more hunt opportunities (1 comment)
- Manage more areas for waterfowl (flooded) (1 comment)
- Maintaining trails for bird watching (1 comment)

6. Please indicate here any additional comments you wish to make on values, vision, or the Service's role.

- Hunting seems to be promoted over other uses on the refuge (1 comment)
- Gunfire is not enjoyable for non-hunters visiting the refuge (1 comment)
- Limit hunting times at the refuge so that other users can enjoy the natural resources (1 comment)
- Be pro-hunting (2 comments)
- With so little natural habitat left for wildlife, the refuge should resist pressure from hunters to open more areas to hunting (1 comment)
- Excellent staff (1 comment)
- Current hours of operation are a great benefit to visitors (1 comment)
- Should balance salt marsh conversion with goose habitat improvements (1 comment)
- Hunting areas should not be closed down by the refuge (1 comment)
- Concentrate on what attracts waterfowl (1 comment)

- There should be more interactions with local schools including the College of the Redwoods, in particular involving students in studies on the refuge as a way to teach them about refuge habitats (1 comment)
- Hunting season passes should be available (1 comment)
- Would like to seem more photo blinds on the refuge (1 comment)
- Add an additional hunting day or extend hunting from 3 pm to sunset (1 comment)

7. What role would you like the Complex to play in the conservation of natural areas and wildlife, regionally in Humboldt County?

- More people should be educated about the benefits and taught about the refuge's value (through refuge visitor programs) (2 comments)
- A minimal role specifically aimed at enhancing waterfowl habitat and populations for hunting (1 comment)
- Minimal role (1 comment)
- Continue to work with CDFG, Loleta Tribe, and Humboldt County on issues related to land use, conversions and restoration (1 comment)
- Would like to see the refuge expand beyond current boundaries to acquire additional wetlands (1 comment)
- Less natural, protected areas and more public access (1 comment)
- Manage these areas for activities that really affect the complex, and do not remove areas from hunting (1 comment)
- If purchasing more areas, the huntable area should be expanded (1 comment)
- Open more refuge lands to hunting (1 comment)
- Showing leadership on estuarine restoration plans and projects around the bay (1 comment)
- As a care taker and enhancer with the help of the public (1 comment)

Fish, Wildlife, Plants and Their Habitats

1. Are any of the following issues a major concern to you on the refuge? If so, please check (or number in priority order) your top choices.

- Haying or grazing (6 comments)
- Aleutian cackling goose management (5 comments)
- Refuge in holdings and boundary issues (5 comments)
- Water rights and related issues (4 comments)
- Lack of active management to improve wildlife habitat (3 comments)
- Fish habitat restoration (3 comments)
- Control of invasive plant species (1 comment)
- Water quality (1 comment)
- Dune and salt marsh conservation (1 comment)
- Endangered and rare plant conservation (1 comment)
- Lead bullets and sinkers, for fishing, should not be allowed (1 comment)
- Access to lands (1 comment)

2. If possible, please provide additional details on why you selected the above choices. In particular we would be interested to know specific locations of concern.

- Haying and grazing is good to allow new growth of grasses and support waterfowl (2 comments)
- Would like the Island on Mad River Slough, which are now part of Ma-le'l Dunes to remain open to hunting (2 comments)
- Grow grain instead of grass (2 comments)
- The refuge should not keep closing areas to hunting (2 comments)
- Hunting of Aleutian cackling geese should be allowed on farmer's lands to drive geese to wildlife areas (1 comment)
- Production of Aleutian cackling geese feed on the refuge takes grazing pressure off my nearby lands (1 comment)
- Maintaining drainage on the refuge effects drainage on nearby land (1 comment)
- Get the signs out of the waters in Jacoby Creek and Hookton Slough and Mad River Slough (1 comment)
- Remove boundary signs from north bay and south bay tidal flats (1 comment)
- Walking on trails does not feel safe when hunting is occurring (1 comment)

- Would like to have hunter access to Hookton Slough at the boat dock off Toroni Rd. and would like Jacoby Creek to remain open to foot traffic via Jacoby Creek itself (1 comment)
- Haying and grazing should be expanded (1 comment)
- Controlling invasive plants, particularly in salt marshes around Humboldt Bay, is a huge issue (1 comment)
- Water quality may become an issue when the Salmon Creek restoration is complete especially relative to fish passage and fish habitat (1 comment)

3. Please include here any additional comments on fish and wildlife habitat issues and concerns.

- Hunting should be restricted to birds that are numerous and will actually be eaten (ex. mallards, Canadian geese) (1 comment)
- Grown grain instead of grass as it attracts more waterfowl (1 comment)
- Everyone pays (an) equal share for uses (1 comment)
- Managing access to foot or boat traffic is needed, but closing areas to trespass is wrong (1 comment)
- Stop buying up public lands (1 comment)
- Trails have improved greatly over the past 10 years (1 comment)
- Improve the website and keep it updated at least every 3 months (1 comment)

Recreation, Education, and Access

1. Are any of the current activities, or the current levels of use on the refuge a concern to you?

- Would like to see increased hunting opportunities on the refuge (2 comments)
- The refuge should manage short grass habitat with cattle, with grazing only allowed during the right time of year to provide geese with the most feed possible (1 comment)
- To be consistent with other refuges you should allow at least 3 hunt days per week (1 comment)
- Need more use days (1 comment)
- Free bird watching in inequitable, other refuges charge for day use (1 comment)
- There is not enough duck hunting (1 comment)
- Hunting of waterfowl should not be allowed on the refuge (1 comment)
- Hunters should have to declare their harvest at the end of the day, and staff should be trained to know what they are looking at (bird identification) (1 comment)
- Should have a fee for bird watching (1 comment)

2. Do current refuge recreational facilities meet your needs (trails, parking, signs, etc.)? Please explain.

- There should be more trails for non-hunters (1 comment)
- Would like to see a public boat ramp at the parking lot/dock off Hookton Road, to allow hunter access to Hookton Slough and Teal Island (1 comment)
- Trails should be longer (1 comment)
- There are too many signs and closed areas (1 comment)
- Yes (2 comments)
- Yes, but add funding for regular maintenance of the Hookton Road and parking area, particularly the entrance to Hookton parking (1 comment)
- Yes, but more trails would be nice (1 comment)

3. Are any of the following visitor service and public use issues a major concern to you on the refuge? If so, please check (or number in priority order) your top choices.

- Access or trespass (4 comments)
- Illegal hunting (3 comments)
- Lack of wildlife related visitor services (ex. education, information, hunting) (3 comments)
- Cultural/historic resource preservation (ex. maintain barn at HQ) (2 comments)
- Lack of wildlife related visitor services on the refuge (2 comments)
- Possible conflicts between public uses/facilities and wildlife/habitat values (1 comment)
- Walkers scaring birds (1 comment)
- Bird watchers and the general public should pay or buy some type of pass or bird stamp, or should have a fishing license (1 comment)

4. Please indicate here any additional comments on recreation, education, and public access.

- Hunting should be allowed in Hookton Slough/Teal Island and Mad River Slough 7 days per week to be consistent with CDFG code (2 comments)
- Dog walking should not be banned (1 comment)
- Do not block public views of the North Fields of the Salmon Creek Unit, so that people (driving by) can see deer and birds and understand that the land is a refuge (1 comment)
- Would like to see a newsletter or website that would explain projects ongoing at the refuge (e.g., Aleutian cackling geese grass work, Salmon Creek project, etc.) (1 comment)
- Need more of it (1 comment)
- Manage Salmon Creek to increase hunter opportunities (1 comment)
- CDFG hunting codes are adequate and the Federal government should not bring in new laws (1 comment)
- Should encourage more hunting (1 comment)

5. Castle Rock NWR is not currently open to public visitation, but are there any Visitor Services that you feel should be provided nearby?

- Public visitation should be limited on the refuge (1 comment)
- This is a good idea and should be left untouched (1 comment)
- Open it to hunting (1 comment)
- Content with it remaining a true refuge for seabirds (1 comment)
- Set up a live feed from Castle Rock to the internet webcam so that people can observe the birds (1 comment)

For public comments received on the January 2009 Draft Comprehensive Conservation Plan and Environmental Assessment, see Appendix R.

Appendix N: Humboldt Bay National Wildlife Refuge Complex History

Humboldt Bay NWR Complex History

1969 Humboldt Bay NWR proposed.

1971 Humboldt Bay NWR established.

1974 Humboldt Bay NWR added to San Francisco Bay NWR Complex.

1974 The Nature Conservancy (TNC) purchases easement on Lanphere Dunes.

1979 FWS purchases Castle Rock from TNC to establish Castle Rock NWR.

1982 Friends of the Dunes (FOD) established.

1985–1988 Lanphere Dunes expansion and office built.

1988 FWS purchases McBride Ranch (now Salmon Creek Unit); triples Refuge acreage.

1989 Humboldt Bay NWR Management Plan and Environmental Assessment (EA) approved.

1993 Humboldt Bay NWR excavates western most portion of historic Salmon Creek channel.

1997 National Wildlife Refuge System Improvement Act clarifies refuge mission.

1997 Humboldt Bay NWR Complex separates from San Francisco Bay NWR Complex management.

1997 TNC donates Lanphere Dunes to Humboldt Bay NWR Complex.

2001 Added Deputy Project Leader position; Refuge Manager Richard J. Guadagno killed on Flight 93 on 9/11/01.

2002 Refuge Office and Visitor Center construction completed, Aleutian cackling geese begin staging in Humboldt County grasslands in large numbers.

2002 Richard J. Guadagno Headquarters and Visitor Center dedicated in May.

2003 Interpretive dioramas in Visitor Center unveiled during Refuge Centennial Celebration.

2004 Moved old hunt cabin/check-station near McBride Barn and built new hunt check-station and bunkhouse.

2005 The 160-acre Ma-le'l Dunes Unit (aka. former Buggy Club), added to Refuge with assistance of California Coastal Conservancy and Center for Natural Lands Management.

2005 Formation of Friends of Humboldt Bay NWR to support the entire Refuge.

2006 Lower Salmon Creek Delta Restoration begins with assistance of Pacific Coast Wetlands Wildlife and Restoration Association, CDFG, and Arcata Fish and Wildlife Office (AFWO). Severe winter storm damages perimeter dike on Salmon Creek Unit, leading to decision to armor dike with riprap to protect public and private property.

2006 Remote cameras deployed at Castle Rock NWR in collaborative project with Humboldt State University, AFWO, National Park Service, and US Coast Guard to gather baseline data on nesting seabirds.

2006 Begin data gathering process including vegetation mapping of entire refuge, begin pilot study on methods of *Spartina densiflora* control.

2007 Lanphere Dunes Unit office expanded, new tide gate installed in Salmon Creek Overflow.

2008 Replace Salmon Creek tide gate.

Appendix O: List of Preparers

List of Preparers

Dominic Bachman: previously with the U.S. Fish and Wildlife Service, Humboldt Bay NWRC

David Bergendorf: previously with the U.S. Fish and Wildlife Service, Pacific Southwest Region

Sean Brophy: Visitor Services Assistant, U.S. Fish and Wildlife Service, Humboldt Bay NWRC

Patricia M. Clifford: Natural Resource Specialist, previously with the U.S. Fish and Wildlife Service, Humboldt Bay NWRC

Deborah Jaques: Consultant, Pacific Eco Logic

Emily Jennings: previously with the U.S. Fish and Wildlife Service, Humboldt Bay NWRC

Amy Kocourek: previously with the U.S. Fish and Wildlife Service, Humboldt Bay NWRC

Steven F. Lewis: U.S. Fish and Wildlife Service, Humboldt Bay NWRC

Alexandra Morton: Natural Resource Specialist, U.S. Fish and Wildlife Service, Pacific Southwest Region

Eric T. Nelson: Project Leader, U.S. Fish and Wildlife Service, Humboldt Bay NWRC

Sandy Osborn: National Wildlife Refuge Planner, U.S. Fish and Wildlife Service, Pacific Southwest Region

Scott Owen: U.S. Fish and Wildlife Service, Humboldt Bay NWRC

Andrea Pickart: Ecologist, U.S. Fish and Wildlife Service, Humboldt Bay NWRC

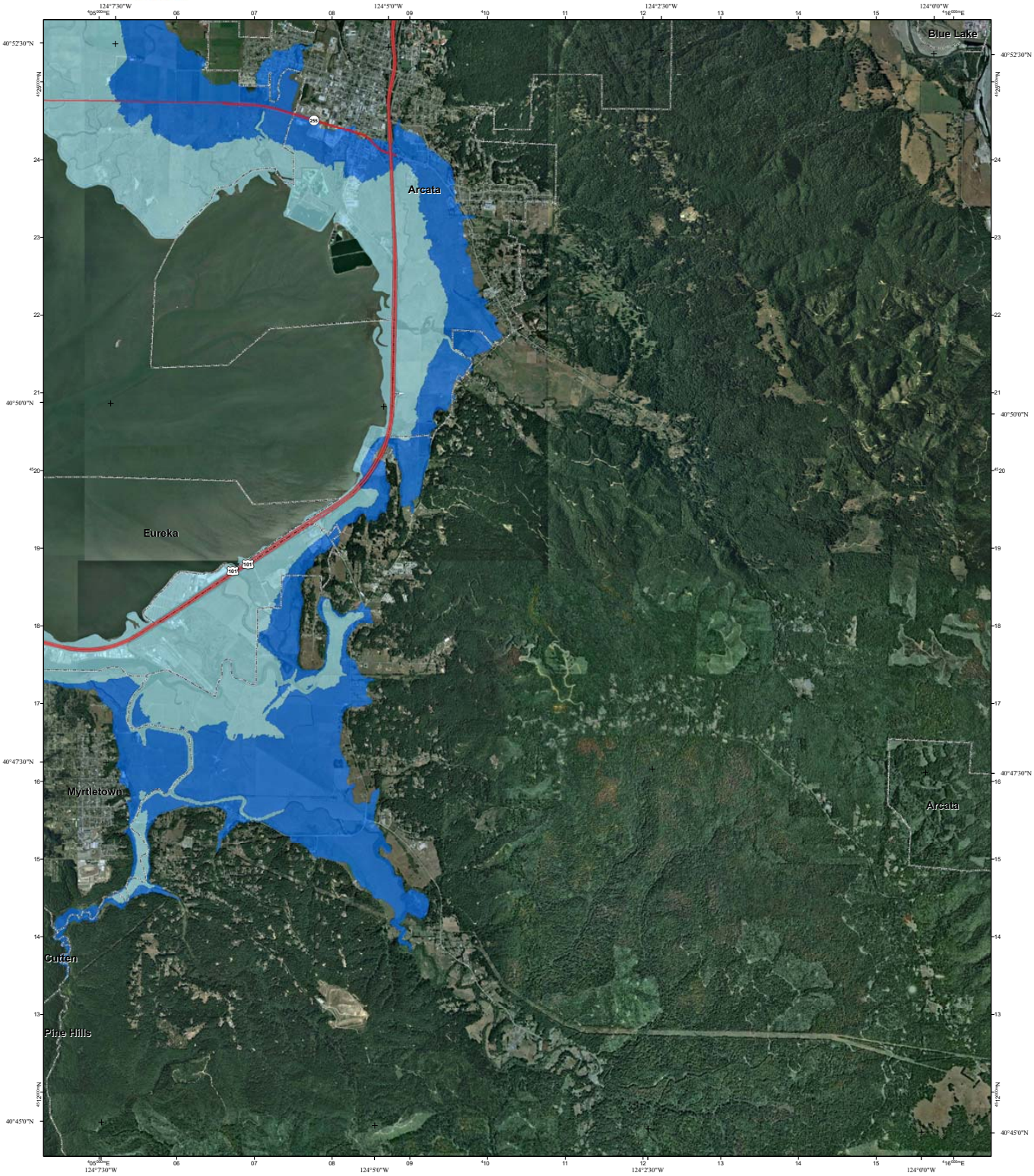
Anan Raymond: Regional Archaeologist Region 1+Region 8 Cultural Resource Team, U.S. Fish and Wildlife Service, Region 1

Richard Smith: Natural Resource Planner, U.S. Fish and Wildlife Service, Pacific Southwest Region

Shannon Smith: Deputy Refuge Manager, previously with the U.S. Fish and Wildlife Service, Humboldt Bay NWRC

Appendix P: Coastal Flood Hazard Maps

California Flood Risk: Sea Level Rise
Arcata South Quadrangle



Interstate
US Highway
State Highway
County Highway

Current Coastal Base Flood (approximate 100-year flood extent)
Sea Level Rise Scenario Coastal Base Flood + 1.4 meters (55 inches)
Landward Limit of Erosion High Hazard Zone in 2100

Created by the Pacific Institute, Oakland, California, 2009.

This information is being made available for informational purposes only. Users of this information agree by their use to hold blameless the State of California, and its respective officers, employees, agents, contractors, and subcontractors for any liability associated with its use in any form. This work shall not be used to assess actual coastal hazards, insurance requirements, or property values and specifically shall not be used in lieu of Flood Insurance Studies and Flood Insurance Rate Maps issued by the Federal Emergency Management Agency (FEMA).

Data Sources: US Geological Survey, Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Coastal ServicesCenter (CSC), Scripps Institution of Oceanography, Phillip Williams and Associates, Inc. (PWA), US Department of Agriculture (USDA), National Aeronautics and Space Administration (NASA). Imagery from ESRI and i-cubed.

0 0.25 0.5 1 1.5 2
Miles

0 0.5 1 2 3
Kilometers

Grid coordinates:
UTM Zone 10N meters
NAD83 GCS degrees

Project funded by the California Energy Commission's Public Interest Energy Research Program, CalTrans, and the California Ocean Protection Council

Adjoining Quadrangles:

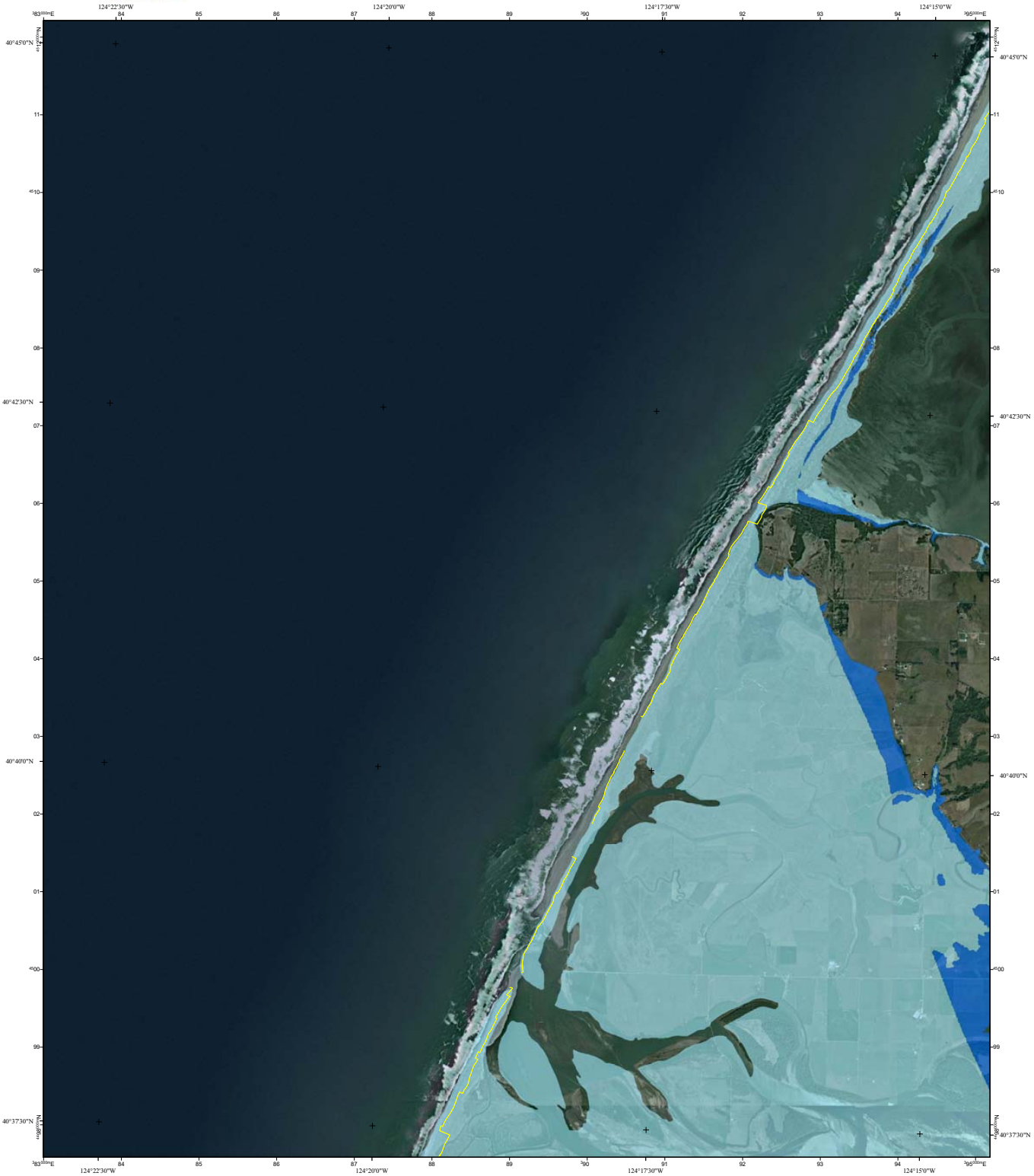
1	2	3
4		5
6	7	8

1: Tyee City
2: Arcata North
3: *not printed*
4: Eureka
5: *not printed*
6: Fields Landing
7: *not printed*
8: *not printed*

Map extents match USGS 7.5 minute topographic maps

PACIFIC INSTITUTE

California Flood Risk: Sea Level Rise
Cannibal Island Quadrangle



Interstate
US Highway
State Highway
County Highway

Current Coastal Base Flood (approximate 100-year flood extent)
Sea Level Rise Scenario Coastal Base Flood + 1.4 meters (55 inches)
Landward Limit of Erosion High Hazard Zone in 2100

Created by the Pacific Institute, Oakland, California, 2009.

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Data Sources: US Geological Survey, Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Coastal ServicesCenter (CSC), Scripps Institution of Oceanography, Phillip Williams and Associates, Inc. (PWA), US Department of Agriculture (USDA), National Aeronautics and Space Administration (NASA). Imagery from ESRI and i-cubed.

0 0.25 0.5 1 1.5 2
Miles

0 0.5 1 2 3
Kilometers

Project funded by the California Energy Commission's Public Interest Energy Research Program, CalTrans, and the California Ocean Protection Council

Grid coordinates:
UTM Zone 10N meters
NAD83 GCS degrees

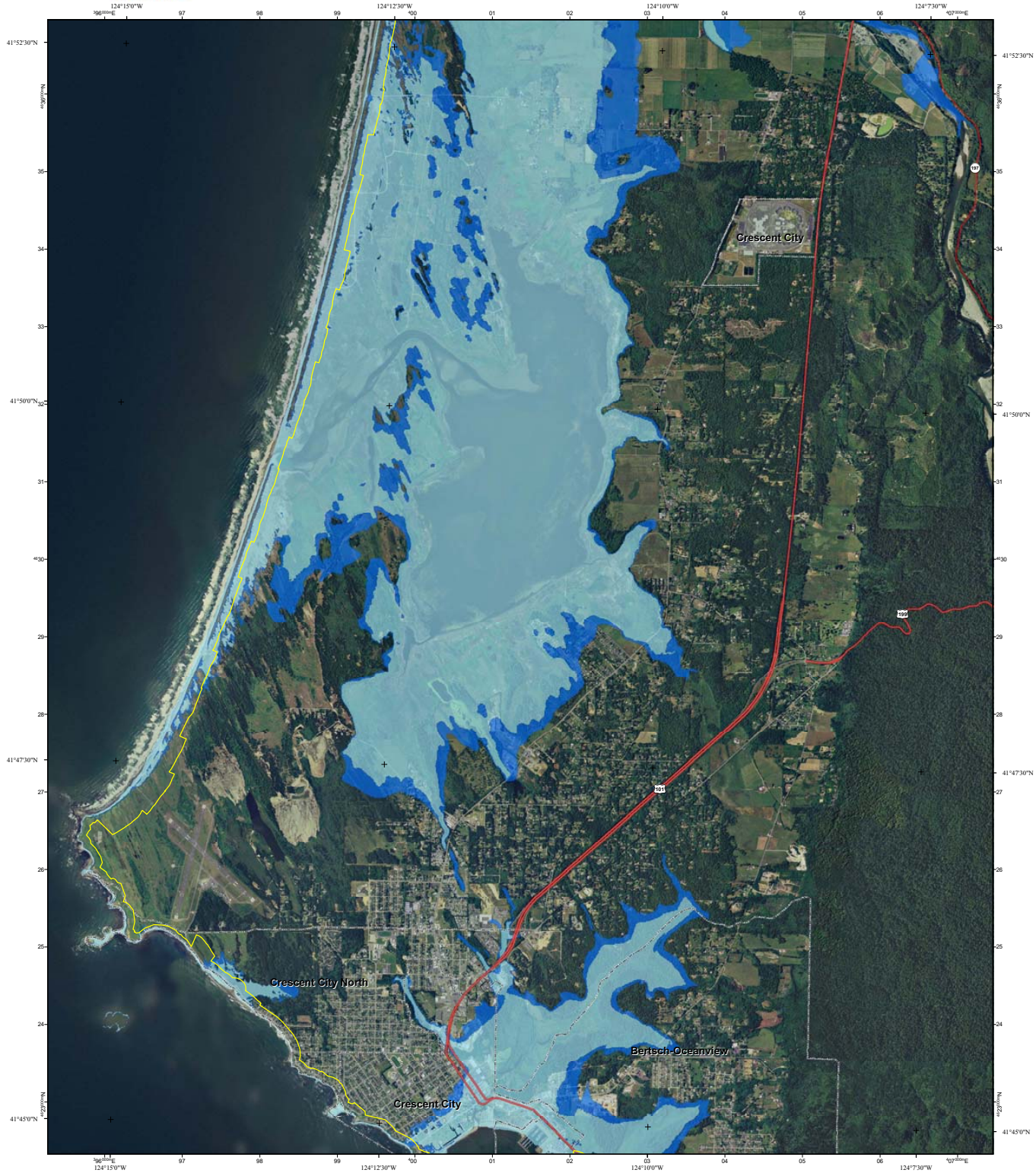
Adjoining Quadrangles:

1	2	3
4		5
6	7	8

1: *not printed*
2: *not printed*
3: Eureka
4: *not printed*
5: Fields Landing
6: Ferndale OE W
7: Ferndale
8: Fortuna

Map extents match USGS 7.5 minute topographic maps

California Flood Risk: Sea Level Rise
Crescent City Quadrangle



Interstate
US Highway
State Highway
County Highway

Current Coastal Base Flood (approximate 100-year flood extent)
Sea Level Rise Scenario Coastal Base Flood + 1.4 meters (55 inches)
Landward Limit of Erosion High Hazard Zone in 2100

0 0.25 0.5 1 1.5 2
Miles

0 0.5 1 2 3
Kilometers

Adjoining Quadrangles:

1	2	3
4		5
6	7	8

1: *not printed*
2: Smith River
3: *not printed*
4: Crescent City OE W
5: Hiouchi
6: *not printed*
7: Sister Rocks
8: Childs Hill

Map extents match USGS 7.5 minute topographic maps

Created by the Pacific Institute, Oakland, California, 2009.

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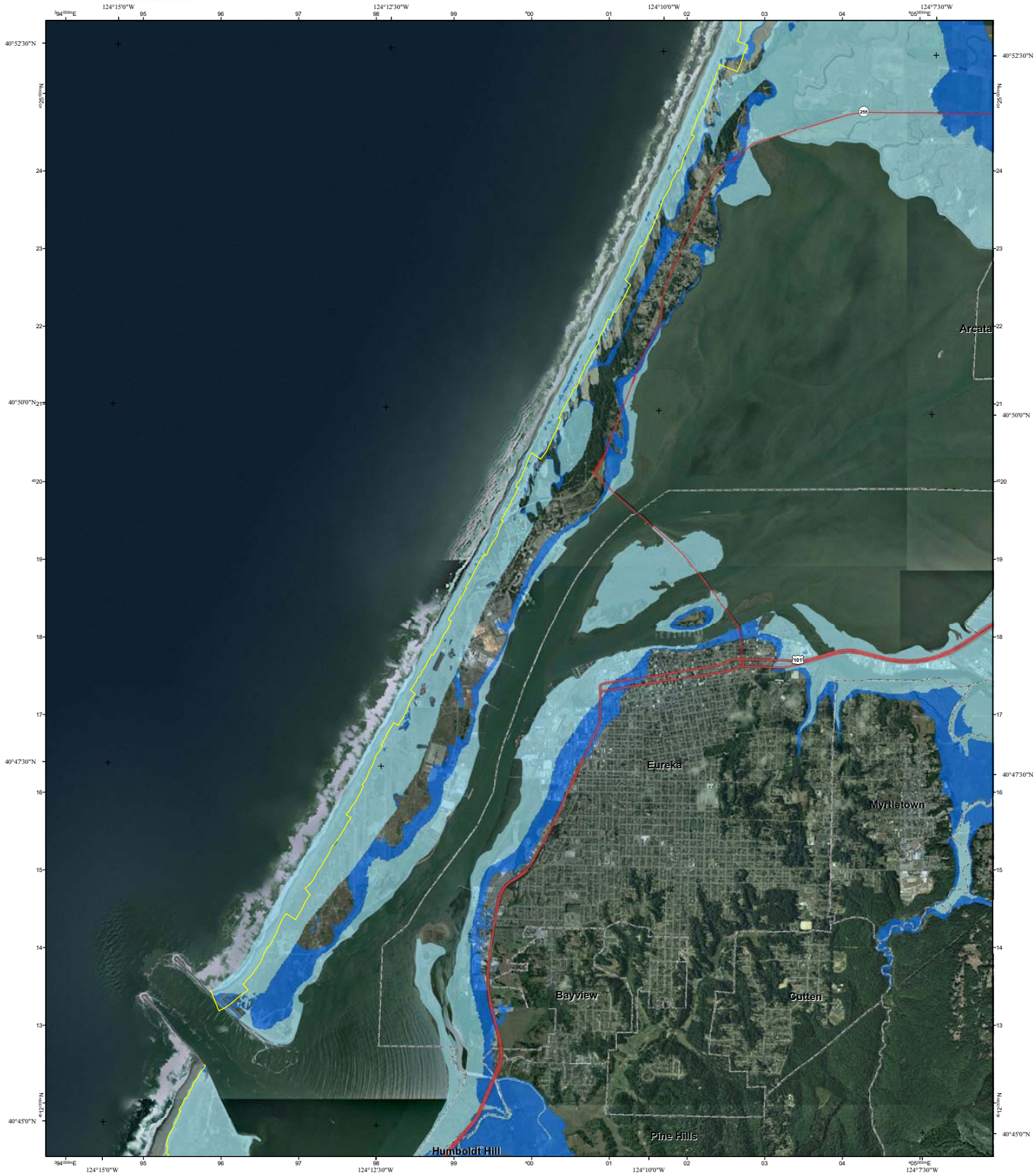
Data Sources: US Geological Survey, Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Coastal ServicesCenter (CSC), Scripps Institution of Oceanography, Philip Williams and Associates, Inc. (PWA), US Department of Agriculture (USDA), National Aeronautics and Space Administration (NASA). Imagery from ESRI and i-cubed.

Project funded by the California Energy Commission's Public Interest Energy Research Program, CalTrans, and the California Ocean Protection Council

Grid coordinates:
UTM Zone 10N meters
NAD83 GCS degrees

PACIFIC INSTITUTE

California Flood Risk: Sea Level Rise
Eureka Quadrangle



Interstate
US Highway
State Highway
County Highway
Current Coastal Base Flood (approximate 100-year flood extent)
Sea Level Rise Scenario Coastal Base Flood + 1.4 meters (55 inches)
Landward Limit of Erosion High Hazard Zone in 2100

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0 0.25 0.5 1 1.5 2 Miles

0 0.5 1 2 3 Kilometers

Grid coordinates:
UTM Zone 10N meters
NAD83 GCS degrees

Project funded by the California Energy Commission's Public Interest Energy Research Program, CalTrans, and the California Ocean Protection Council

Adjoining Quadrangles:

1	2	3
4		5
6	7	8

1: *not printed*
2: Tyee City
3: Arcata North
4: *not printed*
5: Arcata South
6: Cannibal Island
7: Fields Landing
8: *not printed*

Map extents match USGS 7.5 minute topographic maps

California Flood Risk: Sea Level Rise
Fields Landing Quadrangle

Interstate
US Highway
State Highway
County Highway

Current Coastal Base Flood (approximate 100-year flood extent)
Sea Level Rise Scenario Coastal Base Flood + 1.4 meters (55 inches)
Landward Limit of Erosion High Hazard Zone in 2100

Created by the Pacific Institute, Oakland, California, 2009.

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Data Sources: US Geological Survey, Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Coastal ServicesCenter (CSC), Scripps Institution of Oceanography, Phillip Williams and Associates, Inc. (PWA), US Department of Agriculture (USDA), National Aeronautics and Space Administration (NASA). Imagery from ESRI and i-cubed.

0 0.25 0.5 1 1.5 2
Miles

0 0.5 1 2 3
Kilometers

Grid coordinates:
UTM Zone 10N meters
NAD83 GCS degrees

Project funded by the California Energy Commission's Public Interest Energy Research Program, CalTrans, and the California Ocean Protection Council

Adjoining Quadrangles:

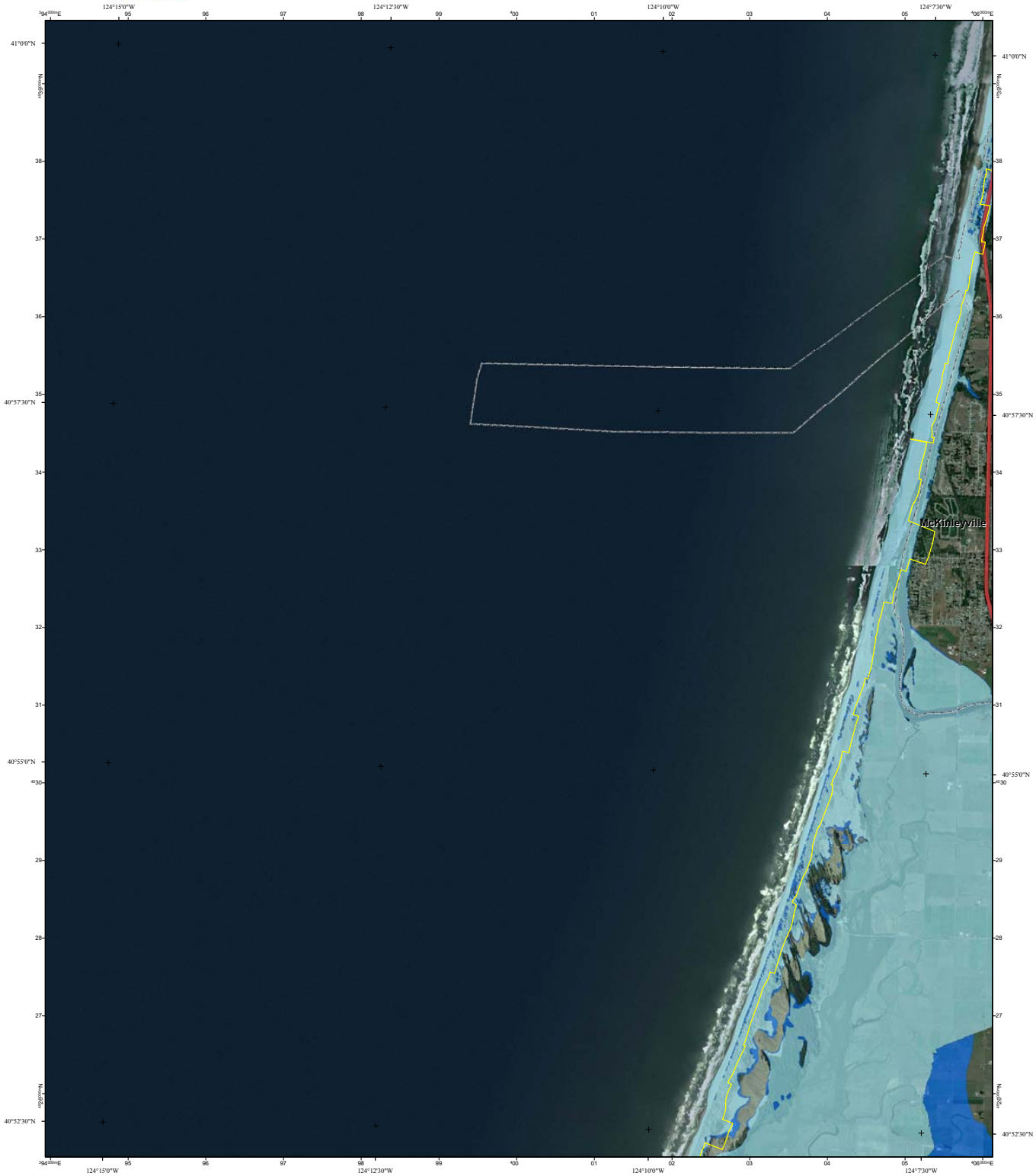
1	2	3
4		5
6	7	8

1: *not printed*
2: Eureka
3: Arcata South
4: Cannibal Island
5: *not printed*
6: Ferndale
7: Fortuna
8: *not printed*

Map extents match USGS 7.5 minute topographic maps

PACIFIC INSTITUTE

California Flood Risk: Sea Level Rise
Tyee City Quadrangle



Interstate
US Highway
State Highway
County Highway
Current Coastal Base Flood (approximate 100-year flood extent)
Sea Level Rise Scenario Coastal Base Flood + 1.4 meters (55 inches)
Landward Limit of Erosion High Hazard Zone in 2100

0 0.25 0.5 1 1.5 2
Miles

0 0.5 1 2 3
Kilometers

Grid coordinates:
UTM Zone 10N meters
NAD83 GCS degrees

Adjoining Quadrangles:

1	2	3
4		5
6	7	8

1: *not printed*
2: Trinidad
3: Crannell
4: *not printed*
5: Arcata North
6: *not printed*
7: Eureka
8: Arcata South

Map extents match USGS 7.5 minute topographic maps

Created by the Pacific Institute, Oakland, California, 2009.

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Data Sources: US Geological Survey, Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Coastal ServicesCenter (CSC), Scripps Institution of Oceanography, Phillip Williams and Associates, Inc. (PWA), US Department of Agriculture (USDA), National Aeronautics and Space Administration (NASA). Imagery from ESRI and i-cubed.

Project funded by the California Energy Commission's Public Interest Energy Research Program, CalTrans, and the California Ocean Protection Council

Appendix Q: Compliance with the Federal Coastal Zone Management Act

STATE OF CALIFORNIA – NATURAL RESOURCES AGENCY ARNOLD SCHWARZENEGGER, GOVERNOR

CALIFORNIA COASTAL COMMISSION

45 FREMONT, SUITE 2000
SAN FRANCISCO, CA 94105-2219
VOICE (415) 904-5200
FAX (415) 904-5400
TDD (415) 597-5885

July 20, 2009

Eric Nelson
Project Leader
Humboldt Bay National Wildlife Refuge Complex
U.S. Fish and Wildlife Service
P.O. Box 576
Loleta, CA 95551

Subject: Negative Determination ND-031-09 (Final Comprehensive Conservation Plan, Humboldt Bay National Wildlife Refuge, Humboldt Co.)

Dear Mr. Nelson:

The Coastal Commission staff has reviewed the above-referenced negative determination. The U.S. Fish and Wildlife Service ("Service") proposes to implement the Final Comprehensive Conservation Plan ("CCP") for the Humboldt Bay National Wildlife Refuge Complex ("Refuge"). The CCP provides the goals, objectives, and strategies that are proposed to guide Refuge management for a 15-year period. Implementation of the CCP will provide for enhancement, restoration, and management of diverse wetland and upland habitats on the Refuge, and provide for the priority public uses on the Refuge that were established by Congress: wildlife observation and photography, environmental education and interpretation, hunting, and fishing. The Service states that the CCP is intended to provide a balance between protecting sensitive coastal resources and providing the public with an opportunity to enjoy and understand the significance of those resources.

The CCP includes programmatic-level descriptions of projects proposed for implementation on the Refuge over the next 15 years. The subject negative determination for the CCP includes a commitment by the Service to coordinate with the Commission to determine which future CCP projects will require individual consistency or negative determinations. While proposed CCP projects may affect coastal resources, the extent of these effects, if any, cannot be fully determined until subsequent, more detailed project planning is completed. As individual project planning is completed, the Service will contact the Commission staff to determine the need for federal consistency review. However, one specific project – Phase II of the Salmon Creek Restoration Project – is analyzed in detail in the CCP and the Service has determined that it will not affect coastal resources.

The Service has identified the following CCP projects that may require consistency review:

ND-031-09 (U.S. Fish and Wildlife Service)
Page 2

- Future Salmon Creek restoration work not analyzed in the January 2009 Draft CCP/EA.
- Proposed draft change in hunting regulations.
- Draft MOA with State Lands Commission for hunting/law enforcement jurisdiction over tidelands.
- Draft plans for creating sand dune blow-out simulations to mimic natural disturbance at Lanphere Unit and/or Ma-le'l Dunes Unit.
- Draft plans to de-channelize Chism Creek at White Slough Unit.
- Conversion of Salmon Creek Unit into environmental education outdoor classroom or any draft plans for a new facility.
- Draft EIS for wilderness designation of Castle Rock NWR
- Any significant dredge or fill activities (>100 cubic yards).

In addition, although not a part of the CCP, the Service states in the subject negative determination that any proposal for visitor use fees for access on the Refuge would be subject to federal consistency coordination with the Commission.

Phase II of the Salmon Creek Restoration Project involves excavating an estimated 35,000 cubic yards of soil and restoring approximately 1,500 linear feet of Salmon Creek into a meandering channel. This will result in the restoration of approximately 100 acres of tidally-influenced salt marsh habitat. In January 2006 the Commission's Executive Director concurred with Phase I of the Salmon Creek project (ND-111-05), which included installation and repair of tide gates and excavation of sediment to restore channels and improve tidal circulation. The Phase I project was found to be similar to Service restoration projects undertaken on the Refuge and previously concurred with by the Commission in CD-040-91 and CD-033-92. The proposed Phase II work will continue the ongoing efforts by the Service to restore and enhance tidal wetland and estuarine habitat in the lower Salmon Creek area of the Refuge and will not adversely affect coastal resources.

The CCP provides for continuing public access and recreation at various locations throughout the Refuge, including non-motorized boating in the open waters of Hookton and Mad River Sloughs and south Humboldt Bay, consistent with existing regulations. Access to sand dunes and beach areas would continue on the Ma-le'l Dunes, Lanphere, and Table Bluff Units of the Refuge. The offshore Castle Rock NWR would continue to be closed to the public to preserve seabird nesting colonies and environmentally sensitive habitat, and is recommended for wilderness designation.

Existing aquaculture operations on the Mad River Slough and fishing within the open waters of the Humboldt Bay would continue during the 15-year period of the CCP. The Service would continue to allow cattle grazing and/or haying on the Refuge, through cooperative land

management agreements with local ranchers in order to maintain short-grass pasture habitat for migratory birds. Restoration and enhancement of tidal and freshwater wetland habitats at various locations in the Refuge would occur. The Service would continue to manage the Refuge floodplain land in a manner consistent with local, state, and federal flood management, erosion control, and water quality guidelines and objectives. The CCP provides direction to the Service for ensuring project compliance with all applicable laws related to protection of cultural resources, including coordination with the State Historic Preservation Officer.

The Service concludes by stating in its negative determination that:

> *. . . to ensure that the CCP is implemented over the next 15 years consistent with the California Coastal Management Program, the Service is committed to meeting with Commission staff to discuss how project implementation and mitigation measures on the aforementioned projects will ensure protection of sensitive coastal resources. The Service also commits to submitting additional consistency and/or negative determinations to the Commission for any future CCP projects that have the potential to adversely affect coastal zone resources. These commitments will be incorporated into the Final CCP/EA decision document.*

The Commission staff **agrees** that with the commitment for additional consistency review of future development projects, implementation of the Comprehensive Conservation Plan for the Humboldt Bay National Wildlife Refuge Complex will not adversely affect coastal resources. We therefore **concur** with your negative determination made pursuant to 15 CFR 930.35 of the NOAA implementing regulations. Please contact Larry Simon at (415) 904-5288 should you have any questions regarding this matter.

Sincerely,

(for) PETER M. DOUGLAS
Executive Director

cc: CCC – North Coast District
California Department of Water Resources
Governor's Washington, D.C., Office
Sandy Osborn, USFWS – Sacramento

REC'D JUL 15 2009

STATE OF CALIFORNIA -- THE RESOURCES AGENCY

Arnold Schwarzenegger, *Governor*

CALIFORNIA COASTAL COMMISSION
45 FREMONT STREET, SUITE 2000
SAN FRANCISCO, CA 94105-2219
VOICE AND TDD (415) 904-5200

July 14, 2009

Eric Nelson
Project Leader
Humboldt Bay National Wildlife Refuge Complex
P.O. Box 576
Loleta, CA 95551

Subject: Negative Determination ND-031-09 (Final Comprehensive Conservation Plan, Humboldt Bay National Wildlife Refuge Complex, Humboldt Co.)

Dear Mr. Nelson:

Pursuant to 15 CFR Section 930.41(b), I am hereby requesting the automatic 15-day extension to the 60-day time limit for Commission review of the above-referenced negative determination. This will extend our deadline from July 20, 2009, to August 4, 2009, and allow us time to complete our review of the proposed project. Thank you for your cooperation and please contact me at (415) 904-5288 should you have any questions regarding this matter.

Sincerely,

Larry Simon

Larry Simon
Federal Consistency Coordinator

cc: Sandy Osborn, USFWS Sacramento

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Humboldt Bay National Wildlife Refuge Complex
P.O. Box 576, 1020 Ranch Road
Loleta, California 95551
(707) 733-5406 Phone
(707) 733-1946 Facsimile

May 20, 2009

To: Peter Douglas, Executive Director
Attention: Larry Simon, Federal Consistency Supervisor
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, California 94105-2219

Dear Mr. Douglas:

In accordance with the Federal Coastal Zone Management Act of 1972 as amended, Section 307c (1), the U.S. Fish and Wildlife Service (Service) requests that the California Coastal Commission concur with our determination that the approval of the Humboldt Bay National Wildlife Refuge (NWR) Complex Final Comprehensive Conservation Plan (CCP) will not affect land or water use or natural resources of the coastal zone and therefore does not require a consistency determination. In addition, the Service requests that the Commission concur with our determination that Phase II of the Salmon Creek Restoration project will have no adverse affect on coastal resources.

As defined in Section 304 of the Act, the term "coastal zone" does not include "lands the use of which is by law subject solely to the discretion of or which is held in trust by the Federal government." The Humboldt Bay NWR fee title lands are wholly owned and operated by the U.S. Fish and Wildlife Service, Department of the Interior, and therefore, are excluded from the coastal zone. However, the Service recognizes that actions outside the coastal zone may affect land or water uses or natural resources along the coast and therefore are subject to the provisions of the Act.

In February 2009, we provided to your office the Humboldt Bay National Wildlife Refuge (NWR) Complex Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA), dated January 2009 (enclosed), which includes programmatic-level descriptions of proposed, future projects that will require future coordination with the Commission. In response to our inquiry, on May 5, 2009, the Federal Consistency Coordinator of your office indicated that, at this time, a negative determination would be appropriate for a long-term management plan such as the CCP for the Humboldt Bay NWR Complex and that future coordination with the Commission and consistency or negative determinations will be required for site specific projects that may affect coastal resources.

Also included in this programmatic Draft CCP/EA is a specific project, Phase II of the Salmon Creek Restoration project that the Service proposes to implement upon signature of the decision document (scheduled for July 2009). The Service requests that the Commission concurs with our determination that Phase II of the Salmon Creek Restoration project will have no adverse affect on coastal resources. The basis for our determination is the analysis in Appendix E of the January 2009 Draft CCP/EA, which

1

concludes that while there may be some temporary, localized adverse effects during construction, the resulting effect of Phase II will be beneficial to coastal resources.

Future actions to implement the CCP may affect natural resources; however, the extent of these effects, if any, cannot be fully determined until subsequent, more detailed project planning (step-down planning) has been completed. Once this step-down planning has been completed, individual projects or groups of projects will be evaluated for consistency with the California Coastal Management Program in coordination with the Commission's staff.

The Service commits to ongoing coordination with the Commission staff to identify those projects or actions in the Draft CCP/EA that: (1) will require further coordination between the Service and Commission staff, and (2) will require review and future consistency or negative determinations. Individual projects or actions included in the CCP that may require additional Commission review are listed below. The Service requests that the Commission indicate to the Service which of these projects or actions may raise concerns regarding Coastal Act policies.

Future projects included in the CCP that may require future Commission review and compliance [page numbers referenced are those in the January 2009 Draft CCP/EA]:

1. Future Salmon Creek Restoration work *not* analyzed in the January 2009 Draft CCP/EA – Salmon Creek Unit
2. Draft plans for non-motorized boat launch [strategy 5.1.8, page 111] - Ma-le'l Dunes Unit
3. Proposed draft change in hunting regulations [Appendix C]
4. Draft MOA with State Lands Commission for hunting/law enforcement jurisdiction over tidelands [strategy 5.4.14, page 115]
5. Draft plans for creating sand dune blow-out simulations to mimic natural disturbance [strategy 2.1.2, page 102] – Lanphere Unit and/or Ma-le'l Dunes Unit
6. Draft plans to de-channelize Chism Creek [strategy 1.3.16, page 99] – White Slough Unit
7. Conversion of Salmon Creek Unit barn into Environmental Education outdoor classroom or any draft plans for a new facility [strategy 6.1.11, page 116]
8. Draft EIS for wilderness designation of Castle Rock NWR [page 118]
9. Any significant dredge or fill activities (>100 cubic yards)

In addition, although not a part of this CCP, any proposal of visitor use fees for access anywhere on Complex would be subject to coordination with the Commission staff.

Refuge Complex Location

The Service's Humboldt Bay NWR Complex includes Humboldt Bay NWR in Humboldt County and Castle Rock NWR in Del Norte County. Humboldt Bay NWR is located in the vicinity of Eureka and Arcata with refuge units distributed around Humboldt Bay, the largest bay between San Francisco Bay and Coos Bay, Oregon. Humboldt Bay NWR includes 3,379 acres owned in fee-title, which are within the 9,502-acre approved refuge boundary. The Castle Rock NWR is a 14-acre island, less than a mile offshore from Crescent City, California.

Refuge Complex History and CCP Overview

The Draft CCP/EA includes refuge purposes (section 1.3.3, pages 2-3), a history of Humboldt Bay NWR (section 1.6.4, page 9), a history of Castle Rock NWR (section 1.6.8, page 15), and an overview of the CCP process (chapter 2, page 21).

Preferred Alternative for the Humboldt Bay and Castle Rock NWRs
Following review and analysis of public and agency comments on the Draft CCP/EA, a Final CCP will be prepared. The preferred alternative for managing both of the Refuges is Alternative C in the EA, which is described in more detail in the CCP. The Goals and Objectives to be implemented under the preferred alternative C are presented in the Draft CCP/EA (chapter 5); Goals and Objectives for Humboldt Bay NWR begin on page 95; Goals and Objectives for Castle Rock NWR begin on page 118. Key management actions or "strategies" to implement these Goals and Objectives are also outlined in the Draft CCP/EA after each of the Goals and Objectives.

For Humboldt Bay NWR, management actions or strategies are grouped first by Goals 1 through 6, then listed under 10 habitat types: Salmon Creek Delta Restoration, Salt Marsh Habitat, Freshwater and Brackish Marsh Habitat, Riparian Swamp Habitat, Eelgrass and Mudflat Habitat, Floodplain Management, Dune Mat/Foredune Grassland Habitat, Dune Swale Habitat, Dune Riparian/Swamp Habitat, Coniferous Dune Forest Habitat (beginning on page 95). For Castle Rock NWR, all management actions or strategies are organized under 2 Goals (beginning on page 118).

For detailed information regarding the alternatives and an analysis of potential environmental effects, please refer to the environmental assessment (EA), included as Appendix E to the Draft CCP/EA.

Basis for the Negative Determination
The Service has determined that the proposed activity, approval of the Final Comprehensive Conservation Plan for the Humboldt Bay NWR Complex, would not affect coastal use or resources. The basis for our determination is the analysis in Appendix E of the January 2009 Draft CCP/EA. Mitigation measures have been incorporated into the CCP to avoid and minimize impacts to the environment, including coastal resources. These measures address the following coastal resources planning and management policies of the California Coastal Act:

Article 2, Public Access:
Section 30210 – Consistent with Section 30210, the public use proposals included in the preferred alternative in the CCP for the Humboldt Bay NWR Complex is intended to provide a balance between protecting sensitive coastal resources and providing the public with an opportunity to enjoy and understand the significance of these resources. The potential effects of the proposed uses have been evaluated in the Draft CCP/EA and have been determined to be consistent with Refuge purposes. The basis for this determination is provided for each type of use in individual Compatibility Determinations, which are included in Appendix F of the Draft CCP/EA. The Improvement Act states "…the Secretary shall not initiate or permit a new use of a Refuge or expand, renew, or extend an existing use of a Refuge, unless the Secretary has determined that the use is a compatible use and that the use is not inconsistent with public safety."

Sections 30213 and 30214(a) (1) and (2) – The public uses proposed within the preferred alternatives would be provided in various locations throughout the Refuge. Access to sand dunes and beach areas are on Ma-le'l Dunes, Lanphere, and Table Bluff Units. Access to the Bay and other tidally influenced lands is also provided on other Refuge units.

Article 3, Recreation:
Section 30220-30222 –The Refuge supports a variety of recreational uses. Wildlife observation and photography, environmental education/interpretation, waterfowl hunting and recreational non-motorized boating are the principal public uses of the Humboldt Bay NWR. The preferred alternative for the Humboldt Bay NWR proposes to continue to allow these uses at various locations throughout the Refuge, including non-motorized boating in the Refuge's open waters of the Hookton and Mad River Sloughs, and south Humboldt Bay consistent with existing regulations.

Castle Rock NWR is closed to the public to preserve one of the two most important seabird nesting colonies on the Pacific coastline. Like many other "seabird islands" within the Refuge System, Castle Rock is so rich with sensitive wildlife species and fragile habitat that it cannot accommodate direct public access and still fulfill the purposes for which it was established. Kayaking, jet skiing, and other recreational boating occur in the waters around Castle Rock NWR, but landing is not permitted. The preferred alternative for the Castle Rock NWR includes the proposal to continue to prohibit public access to Castle Rock and recommendation for wilderness designation. The Wilderness Review for Castle Rock is included in Appendix G of the Draft CCP/EA.

Section 30222.5 – "Oceanfront land that is suitable for coastal dependent aquaculture shall be protected for that use, and proposals for aquaculture facilities located on those sites shall be given priority, except over other coastal dependent developments or uses." Oyster culture and non-motorized boating are existing uses on Mad River Slough. The addition of a non-motorized boat launch was considered during the scoping phase of developing the CCP, but it is not included in our preferred alternative due to the potential for exceeding water quality thresholds for aquaculture. A more detailed discussion is provided in the Draft CCP/EA (pages 89, 110).

Section 30224 – Although Section 30224 encourages increasing recreational boating use of coastal waters by increasing public launching facilities, non-motorized boating currently on Mad River Slough is not a coastal dependent activity and would not be prioritized above aquaculture (under section 30222.5). Therefore, in this case, we determined that increasing recreational boating would not be prioritized over the existing aquaculture on Mad River Slough. The addition of a non-motorized boat launch was considered during the scoping phase of developing the CCP, but it is not included in our preferred alternative due to the potential for exceeding water quality thresholds for aquaculture.

Article 4, Marine Environment:
Section 30230 – The preferred alternative includes proposals to enhance and restore tidal influence to Salmon Creek Unit and various other areas of the Refuge in an effort to improve habitat quality for Federally-protected salmonids and tidewater goby, and a full range of marine organisms, as well as an array of migratory and resident birds.

Section 30233 – Phase II of the Salmon Creek Restoration project involves excavating and restoring approximately 1,500 linear feet of Salmon Creek into a meandering channel. The volume of excavated soil is estimated at 35,000 cubic yards. Any adverse effects to the existing tidelands as result of this activity would be compensated for by the restoration of approximately 100 acres of tidally influenced salt marsh habitat in the South Bay and improvement of habitat quality described above. The Refuge is working with the Corps of Engineers to comply with the requirements of the Clean Water Act for the proposed dredging and filling activities under the Corps' jurisdiction. Other filling and dredging proposals related to salt marsh or dune restoration work in the CCP will be further defined during step-down planning and future coordination with Commission staff. See Objective 1.1, page 95 and pages E-71-E-72 for more information on Phase II of Salmon Creek Restoration project.)

Section 30234.5 – As stated previously, fishing within the open waters of the Bay would continue to be permitted within the Refuge boundaries under the preferred alternative. The Salmon Creek Restoration project that restores tidal influence on Salmon and Cattail Creeks in the South Bay is expected to improve habitat for fisheries. Regarding jurisdiction over open waters, the State Lands Commission has determined that all tide and submerged lands, as well as navigable rivers and sloughs, are impressed with the Common Law Public Trust. Most of the bed of Hookton Slough is located within the lands that the State acquired. Any state interest in the project area has been legislatively granted to the Humboldt Bay Harbor, Recreation, and Conservation District (HBHRC District) pursuant to Chapter 1283, Statutes

of 1970, as amended, with minerals reserved to the State. The HBHRC District has indicated that their management boundary extends to "mean higher high water". That is, the CCP and the management documents in the CCP appendix pertain to areas of Hookton Slough and other waterways within the Refuge boundary that are above the elevation of mean higher high water (3.15 feet above mean sea level or 7.06 feet NGVD); the CCP does not apply to waterways and areas below 7.06 feet NGVD. (See section 4.1.9, page 90 for more information on jurisdiction over tidally influenced lands and sloughs.)

Section 30236 – The preferred alternative includes alteration the floodplain of Salmon and Cattail Creeks as described above to restore tidal and freshwater wetlands within the Humboldt Bay NWR. With the preferred alternative, the Refuge would continue to manage the Refuge floodplain land in a manner consistent with local, State, and
Federal guidelines; and flood management, sediment, and erosion control and water quality objectives. And, with partners such as HBHRC District, the Refuge would develop or continue a long-term water quality monitoring program to document effects of sediment flushing from Salmon Creek on eelgrass beds in southern Humboldt Bay. (See page 101 for more information on floodplain management.)

Article 5, Land Resources:
Section 30240 – The goals and objectives established in the CCP for the Humboldt Bay and Castle Rock NWRs are intended to protect and, where necessary, enhance and/or restore environmentally sensitive resources. During step-down planning for individual projects, specific measures to ensure the protection of these resources would be incorporated into the final project design. (See page 102, Goal 2, for more information about protecting sensitive dune habitats on Humboldt Bay NWR and pages 118-199 about protecting sensitive habitats on Castle Rock NWR.)

Section 30241-30243 – The Humboldt Bay NWR would continue to allow cattle grazing and/or haying on the Refuge, through cooperative land management agreements with local ranchers, to maintain short-grass pasture habitat for migratory birds. Pasture soil pH would continue to be monitored every 3 to 5 years, and lime would be added as needed. (See pages 88 and 99 for more information about maintaining agricultural production and minimizing conflicts with neighboring private lands.)

Section 30244 – The Final CCP provides direction to the Refuge Manager for ensuring compliance with all applicable laws related to cultural resources, including coordination with the State Historic Preservation Officer. (See Goal 6, beginning on page 115 for more information about cultural resources management.)

Article 6, Development:
Section 30251 – The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance.

In conclusion, as a 15-year (programmatic) document, many of the actions proposed for implementation in the CCP for the preferred alternative have not yet undergone detailed planning, which precludes a complete analysis of their potential effects to the coastal zone at this time. For restoration projects and any public use proposals in the CCP involving construction, grading, or extensive fill soil, the Service will prepare step-down plans and a site-specific NEPA review. Any project with the potential for effects beyond those analyzed in the CCP/EA, or any actions not previously assessed, would be subject to a separate NEPA review and evaluation. The purpose of this additional review would be to assess project-specific effects to resources and to ensure that appropriate actions and/or mitigation measures are implemented where required.

In addition, to ensure that the CCP is implemented over the next 15 years consistent with the California Coastal Management Program, the Service is committed to meeting with Commission staff to discuss

how project implementation and mitigation measures on the aforementioned projects will ensure protection of sensitive coastal resources. The Service also commits to submitting additional consistency and/or negative determinations to the Commission for any future CCP projects that have the potential to adversely affect coastal zone resources. These commitments will be incorporated into the Final CCP/EA decision document.

If you need additional information, or if you have any questions, please do not hesitate to contact me or Refuge Planner, Sandy Osborn, at (916) 414-6503, or email, sandy_osborn@fws.gov.

Sincerely,

Eric T. Nelson
Project Leader

Enclosure

TAKE PRIDE IN AMERICA

6

Appendix R: Responses to Comments on the January 2009 Draft Comprehensive Conservation Plan and Environmental Assessment

Responses to Comments on the January 2009 Draft Comprehensive Conservation Plan and Environmental Assessment

1.0 Introduction

This appendix contains a detailed summary of all comments received in response to the Humboldt Bay National Wildlife Refuge Complex Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) during the 45-day public comment period. Public comments on the Draft CCP/EA were accepted from February 6, 2009, through March 23, 2009.

All comments were reviewed and organized to facilitate an objective analysis, management, and presentation of the comments (see section 2.0 of this appendix). For the purposes of this appendix, the word "letter" is generally used throughout this appendix to refer to any comment received, whether by letter, facsimile, electronic mail, comment sheet, or verbally. A database was created to help analyze the subject matter and extent of the range of comments received. Responses by the Refuge management are included in section 3.0. The names and affiliations of all people who commented are listed in section 4.0. An explanation and summary of the changes made between the draft and the final versions of the Comprehensive Conservation Plan and Environmental Assessment is presented in section 5.0. In cases where a letter indicated a minor typographical or editorial error in the Draft CCP/EA, the change was made in the final CCP/EA, but no response is included in this summary.

2.0 Quantitative Analysis of Comments Received

2.1 Summary of Comments Received on the Draft CCP/EA and the Response Process

The Service received a total of 35 comment letters (via letter, facsimile, e-mail, comment card) on the Draft CCP/EA during the comment period.

2.1.1 Public Meetings

To facilitate public review and comment on the Draft CCP/EA, the Refuge hosted three public meetings held on March 3, 4 and 5, 2009, in Humboldt and Del Norte counties to receive public comment on the Draft CCP/EA (see Table S-1). Refuge and Regional Planning staff made presentations and provided time for questions and comments at each of the meetings. Maps showing the various refuge management alternatives were also displayed in the meeting room to facilitate dialogue. Paper and electronic copies (CDs) of the Draft CCP/EA were also available for the public to review and take with them.

At the meetings, the public was invited to provide comments on the content of the Draft CCP/EA. Comment sheets were distributed and paper flip charts were provided to record comments. The Service encouraged members of the public attending the meetings to submit written comments by the close of the comment period, March 23, 2009. The public meetings were attended by Refuge and Pacific Southwest Region staff, a state agency representative, representatives of non-governmental or non-profit organizations, students from the nearby university, and other members of the general public. Meetings were held as shown in Table R-1.

Table R-1. Date, Location and Attendance at Public Meetings on the Draft CCP/EA

Date	*Location*	*Attendance*
March 3, 2009, 5:00pm	Loleta, California	13
March 4, 2009, 3:30pm	Crescent City, California	5
March 5, 2009, 11:00am	Loleta, California	2

2.1.2 Affiliations

Table R-2 provides a summary of the affiliations of those who commented on the Draft CCP/EA. Names and affiliations of the commenters are listed in section 4.0. Many of the comments received had letterhead and signatures from various agencies, organizations, and businesses; however, when the entity was not specifically represented in the comment, the comment was left in the general public affiliation type.

Table R-2. Commenter Affiliation

Affiliation Type	*Number Of Letters Received*
State Agencies	7
Local Agencies	1
Organizations	12
General Public	14*
TOTAL	**34**

** One commenter submitted two separate comment forms.*

2.1.3 Comment Media

Comments were received in a variety of formats during this process, including letters (and postcards), e-mails, facsimiles (faxes), and comment cards distributed by refuge staff (primarily at public meetings) to facilitate the comment process. Comments or questions recorded during the three public meetings that were pertinent to the Draft CCP/EA have also been included in this summary. During the comment period, the Draft CCP/EA was available for review at the Refuge Complex's Richard J. Guadagno Headquarters and Visitor Center as well as at the following local libraries: Arcata Library, College of the Redwoods Library, Del Norte County Library, Fortuna Library, and Humboldt County Library, Humboldt Sate University Library. The Draft CCP/EA was also available at the Service's Conservation Library in Shepherdstown, West Virginia.

The distribution of comment media type is summarized below in Table R-3. If an individual submitted a comment letter using more than one type media, then it was counted as a single entry in Table R-3. For example, if an individual e-mailed a comment letter and sent the same letter via fax, it was counted as one entry in this analysis. In one case, one commenter submitted two separate comment forms. The Refuge management considered all comments received as part of the decision-making process.

Table R-3. Type of Comment Media Used

Type of Media	*Number Received*
Letter	5
E-mail	22
Facsimile (fax)	2
Comment form	6*
TOTAL	**35**

** One commenter submitted two separate comment forms.*

2.2 Quantitative Summary of Comments Received

Section 3.0 of this Appendix presents a summary of specific comments received, followed by the Service's responses. However, it is first useful to present a general summary of the nature of comments received, based on issue type. The information presented in this section includes a relatively quantitative analysis of the information received and analyzed. Comments were identified within the letters, e-mail, facsimiles (fax), comment forms, and flip chart comments. If an individual made the same comment more than once or in more than one type of media, it was counted as one comment in this analysis. Refuge staff have read and reviewed every letter received during the comment process and the information contained in those comments was used to help develop the CCP/Final EA and refine the Preferred Alternative.

Table R-4 contains a list of issues or comment categories that were specifically mentioned in the comments received. It is important to note that comment letters may have contained more than one issue. A single comment letter typically included multiple comments on multiple issues. For this analysis, each of these comments was placed into one of the comment categories. However, the total number of comments in each issue area could vary depending upon how the comment is classified.

After reviewing the comments, 146 comments were grouped within the comment categories in Table R-4. Many of these issues were also identified during the CCP scoping process. Of the 134 comments on Humboldt Bay NWR, the most dealt with special status species designations (28 or ~21%). Of the 28 comments on special status species, 26 comments were from one comment letter; of the 26, 21 of the comments were revisions to the species status or information in the appendices, which could have been grouped into a single comment. Other issues receiving more than the average number of comments were: cultural resources (16 comments) and climate change/sea level rise (11 comments). Of the 12 comments about Castle Rock NWR, 4 of the 12 comments dealt with Aleutian cackling geese.

Table R-4. Humboldt Bay NWR Comments Concerning Specific Issues

Comment Category	*Number of Comments*
Biological Resources Management/Habitat	
Climate change	11
Water quality	10
Special status species	28
Aleutian cackling geese (ACG)	2
Invasive species management	5
Visitor Services	
Hunting-general	8
Hunting-regulations/jurisdiction	7
Hunting-facilities/infrastructure	3
Access	7
Other	2
Cultural Resources	
Cultural resources-management	3
Cultural resources-education	2
Cultural resources-coordination	1
Cultural resources-other	12

Comment Category	*Number of Comments*
Other	
Environmental justice	7
Corrections to CCP	7
Boundary expansion	3
Law enforcement	1
Mosquito abatement	2
Restoration	5
Miscellaneous	8
TOTAL	**134**

Table R-5. Castle Rock NWR Comments Concerning Specific Issues

Comment Category	*Number of Comments*
Biological Resources Management/Habitat Protection	
Aleutian cackling geese (ACG)	4
Wilderness designation	2
Monitoring	2
Corrections to CCP text	1
Special status species	1
Visitor Services – Community Outreach	
Environmental education	2
TOTAL	**12**

3.0 Summary of Comments and Refuge Responses

This section provides a summary of the individual comments received on the Draft CCP/EA, followed by the Service's responses to those comments. To manage and consolidate the responses to the comments, the comments were organized into 10 general topic areas (A. through J.), many of which are categories identified in Table R-4. Most comments applied to Humboldt Bay NWR (Castle Rock NWR is closed to the public). Except for topic area I. Castle Rock NWR, the topic areas apply to Humboldt Bay NWR and include:

A. Climate change/sea level rise/boundary expansion
B. Hunting
C. Access at Jacoby Creek
D. Habitat management
E. Water quality
F. Special status species
G. Cultural resources
H. Environmental justice
I. Castle Rock NWR
J. Miscellaneous

In many cases, the comment text is a quote from a particular letter; in some cases, very similar comments were paraphrased to make them more concise. Every effort was made to present all substantive comments in this summary. The specific comments presented here are a representative sample of all of the comments

received. A comment that addressed several issues was sometimes grouped into a single topic area, in the section to which it was most closely related. Therefore, there is some overlap between topics. The Service response is included following the comment or each group of comments if the same response applies. Comment number designations (shown in brackets for tracking purposes, e.g., [22]) are used by the Service's to reference the comment to the comment letter received. As presented below by topic area, the comment number designations are not consecutive. A copy of the original comments received on the Draft CCP/EA is maintained on file at the Service's Refuge Planning office, Pacific Southwest Region, in Sacramento, California. The comment responses have been developed by the Service's management at the Refuge Complex.

A. Climate Change/Sea-Level Rise/Boundary Expansion.

A1
Comment [14,22,5]: Climate change and sea level rise will affect the Service's management of the refuge and refuge boundary expansion. Given the likely rise in sea level, consider expanding the Refuge boundaries to accommodate future acquisitions of valuable wetland landscapes.

Response [14,22,5]: The Service is working with partners to understand the effects of climate change and sea level rise on fish, wildlife, and their habitats. We recognize that much of the land within the current approved refuge boundary is within the zone of impact for projected sea level rise. In the future, the Refuge staff will evaluate opportunities to expand the approved boundary to increase the resilience of wildlife and their habitats as they adapt to changes in climate.

A2
Comment [6,22,47]: The approved boundary of the Lanphere Dunes Unit should be larger. Sea level rise is likely to erode some of the existing property and require expansion simply to continue to provide the same level of habitat conservation effectiveness. Dunes are projected to erode nearly 600 meters by 2100. The current refuge boundary is insufficient for acquiring optimum parcels from willing sellers, to protect lands "…at a very high level appropriate to such a public treasure" or to provide appropriate buffers against incompatible uses.

Response [6,22,47]: The Service will continue to seek appropriate lands that would buffer Refuge lands and increase the resilience of wildlife and their habitats as they adapt to changes in climate and other stressors.

A3
Comment [22,45,5]: The Draft CCP/EA fails to address the threats that climate change/sea level rise pose to the Complex. In the final CCP, address the cumulative impacts with respect to management and refuge boundary expansion, potential habitat loss, harm to sensitive species, and loss of key public recreational opportunities.

Response [22,45,5]: Climate change is addressed in sections 3.1.2, 3.1.3, and 3.6.3 of the CCP. CCP management strategies 2.2.5, 2.2.6, 2.4.4-2.4.7, 3.3.3, and 4.1.3 were developed to help address climate change. Also, Coastal Flood Hazard Analysis maps were added in a new appendix that shows the extent of a sea level rise scenario of base flood elevation plus 1.4 meters. Text references to Appendix P were added in the sections on climate change and sea level rise for Humboldt Bay NWR (3.1.2) and Castle Rock NWR (3.6.3). See also CCP sections 4.1.1 and 3.6.3.

Information about how the Service is working with partners to reduce the impacts of climate change on fish, wildlife, plants and their habitats can be found at: http://www.fws.gov/home/climatechange/ New America Foundation's Climate Policy Program is tracking state climate change action plans. PDF versions of the completed plans are available at: http://www.newamerica.net/programs/climate/building_blocks/action_plans Sea Level Affecting Marshes Model (SLAMM) information can be found at: http://www.fws.gov/home/climatechange/

A reference was also added to the CCP section 3.1.2 to the last link.

While the Service agrees that climate change will affect the refuge resources and management, it would be speculative and outside of the scope of this 15-year management plan to describe potential cumulative effects of climate change in the CCP beyond the new information and references added to the CCP (see responses A1, A2, and A3). The Service will continue to evaluate opportunities to expand the approved boundary to increase the resilience of wildlife and their habitats as they adapt to changes in climate and other stressors.

A4
Comment [13]: The Service should look into expanding the refuge boundaries to include future acquisition of former tidelands east of Highway 101 in the South Bay.

Response [13]: The Service will continue to evaluate opportunities to expand the approved boundary to increase the resilience of wildlife and their habitats as they adapt to changes in climate and other stressors.

A5
Comment [15]: The Service should consider the effect that the closed Humboldt County landfill on Hookton Road has on the refuge and consider acquiring this property.

Response [15]: Comment noted. The Refuge will consider this suggestion. The Refuge has specific concerns about contaminant hazards and liability for remediation. Unless the county landfill lands could be proven to be completely remediated, the Service would not likely pursue acquisition of that property. See also response A4.

A6
Comment [8]: I agree with the policy of the Service obtaining only that "interest" in lands necessary to satisfy agency objectives.

Response [8]: Comment noted.

A7
Comment [24]: Climate change and resultant sea level rise must be considered when planning any structures on the coast (e.g., Refuge's environmental center). Until a better understanding is reached… consider delaying much further development on the refuge.

Response [24]: Comment noted. Climate change is addressed in sections 3.1.2, 4.1.1 and 3.6.3. See also the response to comment A3. When more detailed planning of the proposed environmental center begins, its location will be determined only after thorough evaluation of sea level rise scenarios and models to ensure that it would not be located in an area at risk for flooding due to sea level rise.

A8
Comment [23]: Additional work is needed to evaluate the costs and values of natural ecosystems [with respect to the effects of climate change on natural ecosystems].

Response [23]: Comment noted. The purpose of the EA (Appendix E) is to provide an analysis of the environmental effects (beneficial and adverse) of implementing the management actions proposed in the CCP.

A9
Comment [25]: Protecting the inner walls of (at least some) of your dikes seems a worthwhile goal to consider]; to be able to increase [salt marsh] habitat behind the dikes.

A10
Comment [26]: The Bay's eel grass may be affected by sea level rise; it seems important that the Refuge should protect this resource. Perhaps after reading "The Impacts of Sea-Level Rise on the California Coast", present owners will wish to offer their land to the Refuge.

A11
Comment [28]: I support Alternative C for Table Bluff Unit (TBU) and habitat restoration on White Slough. However, plans for restoring to non-saline vegetation on TBU may be futile with sea level rise.

Response [25,26,28]: Comments noted.

B. Hunting.

B1 [39,40,41]
Comment: Install a type of safety ring or throw bag in a box on blinds 3, far 5, and 7 so visitors can pull themselves in if stuck [in the mud]. Add a call box at the intersection of Road 3 and the main road or other system to identify when blinds are coming in and in case of emergency. Mark shallow areas in the deeper sloughs with a T-post.

Response [39,40,41]: The Service is continually seeking ways to improve safety and appreciates suggestions to do so. The Refuge staff has considered this suggestion and plans to devise a throw rope at these locations. Text was added to the Waterfowl Hunt Plan. While the Service concurs that a call box or an electronic system would be a welcome convenience to hunters, funding is not earmarked for this purpose at this time. The Service will consider the feasibility of installing T-posts or other means of safely marking shallow areas.

B2
Comment [4,44]: Hunting is absolutely not appropriate and should not be permitted at or around the Ma-le'l Dunes Unit (MDU). Families don't want to hear gun shots while hiking in the woods. Hikers also oppose hunting in this area because pellets from the Mad River Slough channel (where hunting is proposed) might reach them while they are participating in non-hunting recreational activities at Ma-le'l Dunes.

Response [4,44]: There is no hunting proposed in the CCP for the mainland portion of the MDU where there are trails. It is possible to hear gunshots from other areas. However, it is highly unlikely that spent pellets from the Mad River Slough could fall on hiking trails on the mainland portions of MDU. Hunting has historically and legally occurred at Mad River Slough at or below mean higher high water (and is under the jurisdiction of CDFG and Humboldt Bay Harbor, Recreation, and Conservation District; see response 73).

B3
Comment [73]: Hunting, per California case law, is also a recognized public trust use of navigable waters, and any attempts to regulate it below the high water mark appropriately falls under the State Lands Commission or the California Fish and Game Commission's jurisdiction.

Response [73]: The State has legislatively granted to the Humboldt Bay Harbor, Recreation, and Conservation District (HBHRC District) management of areas within the Refuge boundary that are below the elevation of "mean higher high water", which is 3.15 feet above mean sea level (7.06 feet NGVD). Clarifying text has been added to section 4.1.9 of the CCP and Appendices C (Waterfowl Hunt Plan) and D (Sport Fishing Plan). A clarifying note was added to all applicable CCP and EA figures (maps) stating, "Note: Tide lands and waterways under the jurisdiction of the U.S. Fish and Wildlife Service include all lands and waters with an elevation greater than "mean higher high water" or 7.06 NGVD. Strategy 5.4.14 was revised to read "Work with HBHRCD, California State Lands Commission, CDFG, and the Department of the Interior's Solicitor's Office to pursue a lease or other written agreement for the management of over-water hunting in tidelands (including salt marsh, mudflats, and open water) consistent with hunting on lands within the Service's jurisdiction."

B4
Comment [76,86,95]: The salt marsh islands and exposed mudflat within the slough are actually owned by the State of California and controlled under the jurisdiction of HBHRC District and not by the Refuge. Therefore, Hookton Slough, including the salt marsh islands and exposed mudflat, is available to hunt 7 days a week under California Fish & Game Code 3681 and not [the days listed on Appendix C, page C-11]. California State Lands Commission indicates that MHHW, elevation of the tide within Hookton Slough

that falls under 7.06 feet, is governed by the HBHRC District. Regarding Appendix C, section 3. Hookton Slough Area: Clarify that CCP and the Waterfowl Hunt Plan only pertain to areas of "Hookton Slough" with an elevation greater than mean higher high water.

B5
Comment [85]: All maps should clearly depict the HBHRC District's jurisdictional boundaries. If this can not be achieved cartographically on each map, then a footnote should be added which clearly identifies the areas for which the CCP applies versus areas managed by the District. Additionally, all text in the CCP should be made fully explicit regarding this distinction." Clarify that the District's management boundary extends to "mean higher high water." Strategies 1.2.18, 1.5.7, and 1.6.8 were added, which state "Work with HBHRCD, California State Lands Commission, and DOI Solicitor's Office
to pursue a lease or other written agreement for the management of tidelands (including salt marsh, mudflats, and open water) consistent with wildlife habitat restoration on lands within the USFWS's jurisdiction."

Response [76,86,95,85]: A clarifying note was added to all applicable CCP and EA figures (maps) stating, "Note: Tide lands and waterways under the jurisdiction of the U.S. Fish and Wildlife Service include all lands and waters with an elevation greater than "mean higher high water" or 7.06 NGVD.

B6
Comment [75]: The Draft CCP proposes 25% of the refuge would be open to hunting. Most other NWRs allow hunting at a greater percentage, typically near 40%. Thus, we would encourage the Humboldt Bay NWR staff to open additional lands to hunting in the future, such as portions of Hookton Slough and White Slough. If legitimate safety issues do possibly exist with other users, we would encourage refuge staff to implement temporal closures similar to the Salmon Creek Unit or to close some areas to other uses entirely on hunt days while allowing such uses on non-hunt days.

Response [75]: Not all Refuges can support hunting on 40% of the fee title lands. The current and proposed management plans balance a number of different public uses in a relatively small area. As described in Appendix C: Waterfowl Hunt Plan, section VI., B., public uses on the Refuge, especially the Salmon Creek Unit, are zoned both temporally and spatially during the hunt season to avoid conflict and provide public safety. Hunt areas on Humboldt Bay NWR are designed with consideration for the small hunt areas, State safety constraints, and reducing conflicts with other high priority wildlife-dependent recreational uses recognized by the Refuge Improvement Act. Based on these relatively static factors, the Refuge does not anticipate opening additional areas such as the Hookton Slough Unit or White Slough Unit during the 15-year life of this CCP. Text was added to the rationale for hunting Objective 5.4. Beyond the slight increase in hunting opportunities described in the CCP, any further increase in total hunt area on the Refuge is unlikely due to the numerous hunting opportunities that already exist around Humboldt Bay, the relatively small size of the Refuge, and its proximity to Highway 101 and residential areas.

B7
Comment [30]: I support the removal of hunting in Alternative B.

Response [30]: Comment noted.

B8
Comment [12]: I like the idea of increasing visitor services and would like to see hunt opportunities increase; at the very least, these should be maintained at the current level. Hunters in this area depend on the hunting opportunities at the refuge. I would rather see an increase in entry fees over a decrease in hunting opportunities. Ideas about a yearly permit system/pass, costs were provided.

Response [12]: Comment noted. Alternative A reflects the current level of hunting; Alternative C and the CCP reflect a slight increase in hunting (see CCP Objective 5.4) and the EA provides an analysis of Alternatives A, B and C.

B9
Comment [72]: I would like…to see the hunting tradition continued for future generations.

B10
Comment [146]: Be sure that hunting continues on the Humboldt Bay NWR. In favor of a small increase in hunting shown in Alternative C.

B11
Comment [37]: In favor of maintaining historical hunting traditions legally possible.

B12
Comment [74]: We...support the opening of portions of Fernstrom-Root Island to hunting, which will help to meet continued local hunter demand for new huntable acreage…we support the inclusions of two separate youth hunting days in December and January…"

Comment [27]: I support Waterfowl Hunting Plan B and oppose Plan C, which seems more in harmony with [MBCA's] an inviolate sanctuary.

Response [72,146,37,74,27]: Comments noted.

C. Access at Jacoby Creek

C1
Comment [1]: Regarding vehicle access at Jacoby Creek- Hunters camp alongside the highway prior to the season opener and then over-hunt it, negatively impacting the roosting and feeding habits of game and non-game species.

Response [1]: The Refuge acknowledges that illegal parking and camping occur on the Highway 101 and railroad rights of way at this location to access Jacoby Creek, especially during hunting season. Camping is not allowed on the Refuge. Parking, camping and vehicle access at the Jacoby Creek Unit is prohibited without a special use permit. The Service recognizes the desire for vehicle access at Jacoby Creek, but due to safety and jurisdictional constraints and regulations, it is not allowed. Sections 4.1.9, 4.1.10, 5.4.5, 5.4.12 and 5.4.13; and Objective 5.4 for *Visitor Services – Hunting* address access enforcement. Text was added to the CCP under the rationale for Objective 5.4.

C2
Comment [35,87,42,2,3]: Regarding vehicle access at Jacoby Creek. Limiting access to "boat in" users will nearly eliminate the recreational use of Jacoby Creek because access by boat is limited during high tides. If no vehicular parking and access is provided (effectively closing Jacoby Creek to walk-in access), it will severely limit public use of Jacoby Creek. To eliminate walk-in access at Jacoby Creek will leave the northeastern part of North Bay without any reasonable access for duck hunters and bird watchers. Suggest that the Service work with both CalTrans and the Railroad Authority to enhance public access and allow parking at Jacoby Creek. If not allowed, the reasons for such a decision should be clearly stated in the CCP. Public access off Highway 101 is needed.

Response [35,87,42,2,3]: The Refuge will look for options to work with other agencies and organizations to provide safe and legal access at Jacoby Creek Unit. Currently, access is not safe or legal except by boat or special use permit. Text was added to the rationale for Objective 5.4 for *Visitor Services - Hunting*. See also the response to C1.

D. Habitat Management

D1
Comment [9]: Regarding short-grass habitat for wintering Aleutian Cackling Geese (ACG)- Is there a system in place to compensate landowners for impacts and does this system identify "key" land parcels? Is there a measure of use that could be used to compensate landowners?

Response [9]: There is no compensation system in place; direct compensation for ACG impacts is not currently available nor is it foreseen to be within the life of this CCP (15 years). However, an ACG working

group continues to explore best possible options to solve ACG management issues. This information was added to the discussion of this issue in chapter 4 of the CCP (section 4.1.3).

D2
Comment [11]: It is essential to improve or maintain the current Aleutian Cackling Goose and Pacific Black Brant habitat restoration. I am in favor of Alternative C, (second choice is Alternative A).

Response [11]: Comment noted.

D3
Comment [65]: We believe that the Integrated Pest Management (IPM) Plan should be completed prior to circulation of the CCP/EA. Failure to fully analyze the effects to a variety of plants and wildlife species does not meet the requirements under [NEPA].

Response [65]: The Service considers an IPM Plan to be a "step-down" (or detailed) plan that effectively "tiers" from the CCP. Comment noted.

Strategies 1.4.2 and 3.2.6 include the use of IPM techniques for removal and management of invasive plants. In response to comments, additional explanation about the PUP process and analysis of the potential effects of herbicides was added to the environmental consequences chapter 4 of the EA, under the resource sections for Invasive Species and Environmental Justice. Appendix 1 to the EA, conservation measure #13, details the required actions to mitigate for potentially adverse effects.

D4
Comment [66]: CIBA and its members are opposed to the use of synthetic chemical herbicides [to control invasive plants].

Response [66]: Comment noted. Invasive species are widely considered to be the greatest threat to natural areas after habitat loss. The Biological Integrity Policy (601 FW 3) specifies that the Refuge System manages non-native invasive species by the use of integrated pest management strategies, which can include mechanical, chemical, biological, and cultural techniques, as described in the CCP/EA. Pesticide use on the Refuge is in strict accordance with all regulations required under Service policy. See also response D3.

D5
Comment [67]: Herbicides have the potential to destroy plants that are browse, food, shelter, and nesting habitat. Herbicides are also considered to be the greatest contributor to worldwide decline in pollinators. Herbicide tolerance has developed in many noxious weed species. In 2000, NMFS 4(d) Rules for Pacific Salmon said that concentrations of pesticides may affect salmonid behavior and reproductive success.

Response [67]: Comment noted. See also response D3.

D6
Comment [18]: There is no discussion of invasive dune plants. Yellow bush lupine, European beach grass, and ice plant should be discussed here [pages E-11 and E-12]. Continued monitoring is necessary for these species. Their removal is discussed on page 42 for Table Bluff Unit; this removal should be common to all alternatives.

Response [18]: Information about invasive plant removal on Table Bluff Unit applies to other dune units also. Objective 2.1 and strategies for restoring Dune Mat/Foredune Grassland includes removal of yellow bush lupine, European beach grass & ice plant (among other activities). Although these plants may not be listed by name, wherever "restoration" is planned for the Dune Units it includes work to slow and/or remove these and other invasive plants. For example, in the EA, under Goal 2, both action Alternatives B & C include restoration (including removal of invasive plants).

D7
Comment [145]: Why will the Refuge remove all of the eucalyptus at once? Surely they have some habitat value.

Response [145]: The Refuge would not remove all eucalyptus at once. Mature eucalyptus trees do provide over-story structure. However, generally, stands of non-natives have lower habitat value than native plant species, as described at the end of section 3.2.4 and in section 4.1.5 in chapter 4 of the CCP. As explained in 4.1.5, the habitat values that are gained from riparian restoration plantings exceed the structural habitat values being lost by removal of the eucalyptus. The Refuge would only remove non-native trees as variable staff and funding resources permit, which generally results in a selective removal over several years. Clarifying text is added to sections 4.1.5, the rationale for Objective 1.4 in the CCP, and the description of Alternatives in the EA.

D8
Comment [97]: Chapter 5, section 2.3 discusses restoration of 33 acres of dune riparian/swamp habitat. What does this entail? Exclusion of exotics? Planting natives?

Response [97]: Restoration includes removal of forest invasive plants (e.g., European beach grass) from the dune riparian/swamp and monitoring and treating new occurrences of forest invasive plants from the dune riparian swamp. See the descriptions and analysis of Alternatives B & C in the EA (Appendix E). In response to comments and to clarify, strategy 2.3.8 was added to chapter 5 of the CCP: "To enhance dune riparian/swamp habitat, plant native dune riparian/swamp species where invasive plants were removed or gaps in native vegetation exist and are vulnerable to re-infestation by invasives, as appropriate."

D9
Comment [98]: Chapter 5, section 2.4 proposes restoring a gap in the dune forest. What does this entail? Plantings?

Response [98]: Restoration of forest margins includes removal of European beach grass, yellow bush lupine, and other invasives; planting with native coniferous forest species as needed; and removing casual human trails throughout the forest by scarifying and seeding or planting with native coniferous forest species. Clarifying text was added to strategy 2.4.2 in chapter 5 of the CCP.

D10
Comment [99]: DFG's support of the habitat modification/restoration projects in Alternative C is limited to the general concept of the proposals. The document is lacking clear descriptions of the tradeoffs made when converting habitat types. Identify management objectives and special-status species that may be affected. Extent of benefit or detriment should be described. Include a footprint of the plan and areas beyond the footprint that may be influenced by the action.

Response [99]: The tradeoffs of restoration are described in chapter 4, pages 87-92. Chapter 4 of the CCP also describes the area beyond the boundary that may influence, or be influenced by, Refuge management activities. Management goals, objectives, and strategies are found in chapter 5 of the CCP. The Plant Communities section of the EA describes how existing habitats are being restored. In the Fish and Wildlife section of the Draft EA, pages E-59-77 describe how species may be affected by Refuge actions, including special status species. The areas affected (the footprint) of these habitat restoration and enhancement areas are also shown in the maps found in the back of the EA (at the end of Appendix E).

D11
Comment [19]: The map on page 32 of the Draft CCP/EA shows 3 islands in Arcata Bay within the Refuge boundary, but there is no discussion of how these islands will be managed.

Response [19]: Although these islands in Arcata Bay are within the approved Humboldt Bay NWR boundary, these islands are not owned by the Service in fee title. Page 33 of the Draft CCP/EA notes that the Sand Islands in northern Humboldt Bay are within the Refuge boundary, although no interest in the Island's lands has been acquired by the Service; the Service does not own the land. These islands are likely at elevations below 7.06 NGVD and therefore, under the management of HBHRC District. Three of the low elevation islands are man-made of dredge spoil. Because the islands are continually eroding due to wave erosion, there are no current plans for the Refuge to acquire or manage these islands. Because they are not owned in fee title, no management actions are proposed. Clarifying text was added to the CCP section 3.2.2.

D12
Comment [31]: Explain how habitat management shown in Figure E-3 will be achieved.

Response [31]: Figure E-3 shows habitat types on Hookton Slough Unit that are described by management strategies 1.3.10, 1.3.12, 1.3.14, 3.1.15, 3.1.19, 3.1.20, and 3.2.2. Rationale and descriptions are provided in the rationale sections in chapter 5 of the CCP and in the Features Common to All Alternatives for Humboldt Bay NWR section in chapter 2 of the EA.

D13
Comment [143,144]: Will the Refuge do a grazing plan for Humboldt Bay NWR? Do the managers from different public agencies coordinate about grassland/pasture management (for example, NRCS and the RCD)?

Response [143,144]: The Refuge plans to prepare a Habitat Management Plan (HMP) that includes grazing as one tool for land management. The Service expects to complete the HMP within 4 years of the approval of the CCP. See also the CCP section 1.6.5 Current Management of Humboldt Bay NWR for more on the HMP and agricultural grassland management and chapter 5, Objective 1.3. A working group including public agencies, private landowners and ranchers regularly meets to provide a forum for coordinating and resolving issues about grassland/pasture management and Aleutian cackling geese. See also Figures E-3, E-5 and E-6 in the EA, which show short-grass pasture areas.

E. Water Quality

E1
Comment [43]: Day kayaking is inherently non-polluting when kayakers are suitably educated. Explore North Coast would be available to liaison with Humboldt Bay NWR staff and oyster farmers in addressing water quality concerns.

Response [43]: When the Refuge coordinates with oyster growers on water quality concerns related to non-motorized boating, they will also coordinate with non-motorized boating groups and/or individuals, such as kayakers that have expressed an interest. Text was added to strategy 4.1.5 in chapter 5 of the CCP; the rationale section under Wildlife Observation and Photography, page B-12, Appendix B; and the descriptions of Alternatives B and C in the Final EA.

E2
Comment [89]: Reference should be given (in section 4.1.6) to the agreement by the Service, the State Coastal Conservancy, [HBHRC District], oyster farmers and the Health Department to develop an increased water sampling plan for the Mad River Slough upon the phased development of the Ma-le'l Dunes Public Access Plan.

Response [89]: The agreement referenced in the comment to develop an increased water sampling plan was not found in the Ma-le'l Dunes Cooperative Management Area Public Access Plan (March 2008) (MD CMA Public Access Plan). The final Ma-le'l CMA Plan was being revised at the time of this printing and is expected to be finalized in the summer of 2009. However, the Plan no longer prioritizes the Mad River Slough location for boat access.

E3
Comment [91]: Comparing public use of the area from 1990 to 1994 to current usage is incongruent. No public access is currently allowed. The comparison should be made between 1990-1994 usage and the expected 8,000 people annually projected in the Ma-le'l Dunes CMA Public Access Plan and the need for a proactive approach to water quality protection.

Response [91]: Comment noted. The Service continues to be committed to maintaining water quality standards in the Mad River Slough. Clarifying text was added to CCP section 4.1.6, which describes the issue. Although non-motorized boat access on Mad River Slough was considered as a part of Alternative B in the EA (Water Quality section, Alternative B), it is not a part of the preferred Alternative C, is not proposed in the CCP, and Mad River Slough is no longer a prioritized location for boat access in the MD CMA Public Access Plan.

E4
Comment [92]: Confusion exists about differing boundaries for the refuge units in the Plan [Ma-le'l Dunes Cooperative Management Area Public Access Plan]. Produce a map that accurately depicts the Ma-le'l Dunes CMA boundaries above mean high water.

Response [92]: Figures were revised to include jurisdictional information. See also responses B3 and B5.

E5
Comment [88]: Shellfish farmers have expressed concern regarding a proposed increase to 8,000 visitors per year might have on the quality of the water we grow our oysters in and the subsequent risk to the public health. The Health Department will significantly curtail or eliminate shellfish harvesting activities in Mad River Slough when the Plan is implemented.

Response [88]: Comment noted. See response E3.

E6
Comment [127]: [California Department of Public Health's (CDPH) 2008 comments on MD CMA Public Access Plan were submitted as comments on the Draft CCP/EA] "Unpredictable pollution events cannot be managed, therefore commercial shellfish growing is not allowed in areas that experience these types of potential impacts." [to water quality]. "Pollution sources in Humboldt Bay can directly impact water quality in the commercial shellfish growing areas and affect the classification." [Installation of a non-motorized boat ramp at the Ma-le'l north parking and picnic area...present the following potential non point pollution sources: bacterial & viral pathogens; runoff of improperly deposited waste... especially along the banks of the Mad River Slough.] "[The kayak and canoe ramp], associated increased boating activity in the Mad River Slough and the anticipated increase in visitors to the project location create an unmanageable potential source of human pathogens that is not consistent with the current use as an aquaculture site. CDPH will be required to take action if [the non-motorized boat ramp] is completed. Regulatory actions could include harvest restrictions during periods of peak activity, permanent reclassification of the growing area to Prohibited (no shellfish harvesting allowed), or a temporary harvest closure with increased microbiological sampling of the certified growing areas until the water and shellfish quality impacts can be assessed."

Response [127]: Comment noted. See response E3.

E7
Comment [48]: I encourage your efforts to promote conservation and good planning for the management of wildlife and fish in [the Humboldt Bay NWR]. The founding documents state that oyster culture should remain in the North Bay and I think the [the Service] should support that.

Response [48]: Comment noted. The Service is committed to maintaining water quality standards in Mad River Slough. See also response E3.

E8
Comment [123]: Presumably minimum dissolved oxygen has increased and maximum temperature has decreased with the new tide gates. Clarify by specifying the water quality parameters that have improved after installation of the tidegates. This beneficial effect of tidegate replacement is worth reporting.

Response [123]: Water quality data was collected by California Department of Fish and Game (CDFG) from their temperature data probes in Salmon Creek from 2007 and 2008 (before and after the tide gates were installed). The water quality data has not yet been fully summarized or analyzed and data continues to be collected; however, the Service believes that water quality improved after the installation of the tide gates. Upon completion of Phase II of the Salmon Creek Delta Restoration project, PCFWWRA or the Service will summarize water quality findings as part of the final report.

E9
Comment [90]: Please elaborate on the water quality monitoring program referenced in Section 1.6.4 [of the Ma-le'l Dunes Cooperative Management Area Public Access Plan (MD CMA Public Access Plan)].

Response [90]: The MD CMA Public Access Plan is separate from the CCP. Please refer to the Ma-le'l Dunes Public Access Plan for more detail on the water quality monitoring program, which is expected to be finalized in the summer of 2009. See also response E3.

E10
Comment [94]: There is a lack of analysis or discussion of the potential impacts of pentachlorophenol or dioxin contamination in the Humboldt Bay region on the resources of the [Humboldt Bay NWR Complex]. At least three of the units in the Complex are adjacent to known dioxin and pentachlorophenol sites (Ma-le'l/Lanphere adjacent to Sierra Pacific Industries Mill; Jacoby Creek Unit adjacent to the former Bracut Mill location; Indian Island is known to contain dioxin contamination). Include an analysis of what it means for the management of the NWR for Humboldt Bay to be listed on the CWA section 303(d) list as being impaired for dioxins. Analyze whether these sites contain hazardous materials that would have a negative impact upon resources found within the refuges. This possibility may require special management practices especially through restoration projects that would involve soil disturbing activities.

Response [94]: The purpose of the EA is to analyze the potential effects of the Refuge management alternatives on the environment. The commenter noted known dioxin and pentachlorophenol contamination sites; this is part of the existing condition under which the Service is managing the Refuge now; the Service will also continue to coordinate with working groups concerned with water quality in the Bay. An analysis of the effects of dioxins on natural resources and humans is included in the 2004 National Research Council review of a 2003 draft document by EPA titled Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds (Reassessment). Reference to this analysis was added to the CCP, chapter 4, 4.1.18.

F. Special Status Species

F1
Comment [120]: To conserve native species such as the northern red-legged frog (DFG: SSC), the plan should incorporate a monitoring program that will detect the presence of non-native bullfrog within the Humboldt Bay NWR and control/eradicate the species as necessary.

Response [120]: Strategy 3.1.16 was added to Goal 3, Objective 3.1 (page 106), which addresses prevention, early detection, and control of invasive plants and animals.

F2
Comment [121]:
USFWS should monitor juvenile salmonid response to the implementation of Phase II of Salmon Creek Delta Restoration Project and coordinate the monitoring with DFG.

Response [121]: Salmon Creek Delta Restoration project strategy 1.1.1 includes species monitoring the Refuge will do to document the results and support the adaptive management of Salmon Creek. Also, CDFG is conducting on-going monitoring of the Salmon Creek restoration project (contact M. Wallace, CDFG's Eureka office). For the Refuge to also monitor juvenile salmonids seems duplicative so additional monitoring is not included at this time.

F3
Comment [124]: Describe or indicate on a map the locations of Ponds 1 and 5 (from surveys of frog abnormalities). Clarify what Sendak (2008) was comparing to find "that northern red-legged frog abundance was greater in the smaller, permanent pond habitats out in the dune ecosystem.

Response [124]: Figure E-2 was revised to show Ponds 1 and 5. Sendak was comparing natural history facets of the species such as differences in relative abundance, movement, and breeding phenology between and among permanent and seasonal pond-breeding habitats in the study area. Clarifying text was added to the CCP (page 53 of the Draft CCP).

F4
Comment [125]: DFG agrees the pre- and post-construction surveys of amphibians on the Salmon Creek Unit are essential to understand the effects of restoration practices on amphibians. Care must be taken to maintain northern red-legged frog habitat and avoid creating conditions that encourage bullfrogs.

Response [125]: Strategy 3.1.16 was added to address the comment. 3.1.16 will create a monitoring program that will detect the presence of non-native bullfrog and control or abate its adverse effects on native species.

F5
Comment [126]: Regarding Strategies for Salmon Creek Delta Restoration, section 1.1.11. For connecting Cattail Creek to Salmon Creek, the USFWS should consult with amphibian experts with regard to maintaining breeding habitat for the northern red-legged frog and avoiding predation by fish on the frog.

Response [126]: The Refuge has consulted with the USFWS' Arcata Fish and Wildlife Office (AFWO) amphibian expert J. Bettaso. Goals of the Salmon Creek Restoration Program include enhancing and improving habitat for the Federally listed tidewater goby and salmonids. Further, to address amphibians as well, chapter 1 (section 1.6.5, Biological Program) describes the biological programs on the Refuge including an ongoing partnership with AFWO and CDFG to monitor lower Salmon Creek and Hookton Slough for salmonids, tidewater goby, as well as amphibians. A 5-year amphibian monitoring program is included as part of the Salmon Creek Restoration project. Clarifying text was added to chapter 5, strategy 1.1.1. Existing/ongoing monitoring was also mentioned on page E-12.

F7
Comment [46,100-104, 106-119,122]: A list of special status species was provided with corrections and additions to those special status species designations and their habitats.

Response [46,100-104,106-119,122]: Corrections and additions to the Appendices I, J, K and L were made as applicable.

F8
Comment [105]: Longfin smelt will soon be reclassified from SSC to State Threatened. It has been observed in Salmon Creek and in Hookton Slough.

Response [105]: Comment noted. In chapter 5, the Strategies for Salmon Creek Delta Restoration include restoration activities to benefit fish including the longfin smelt and conservation measures to avoid take and avoid jeopardizing the continued existence of salmonids, goby, and longfin smelt. Page L-3 was revised to note observation of the species in Salmon Creek & Hookton Slough.

F9
Comment [130]: Statement about "similar life histories" of salmon may be incorrect. Mike Wallace's research in south slough indicates 3 life history strategies.

Response [130]: After review of the Wallace reference, the Service concluded that the general statement on page 51 that the local salmonids' life histories were "similar" is a general statement that does not conflict with the Wallace or other documentation on strategies for salmon.

G. Cultural Resources.

G1
Comment [57,58,59,60]: We support Goal 6 and offer these suggestions to meet the objectives: (1) convene bi-annual meetings between Humboldt Bay NWR and their named Wiyot area Tribes to discuss advance planning & other issues of concern to Tribes; (2) Accelerate the schedule for Cultural Resources - Education (Alternatives B & C), by setting a 5-year goal to develop a cultural resources overview for the [Complex] in partnership with the three Wiyot area Tribes; (3) add a new 10-year goal to complete a Management Plan for FWS management [of the Humboldt Bay NWR] in partnership with the three Wiyot area Tribes [including inventory, evaluation and treatment of at-risk Wiyot cultural places; and (4) Under *Cultural*

Resources - Education [strategies,] add a reference to the contemporary Wiyot communities and cultural activities as part of the effort to develop educational displays for public benefit.

Response [57,58,59,60]: (1) Comment noted; (2) In response to the comment, the Service has accelerated the schedule for Objective 6.2 for a cultural resources overview for the Complex; instead of within 10 years, the goal is to develop the overview within 5 years; (3) Cultural Resources management strategies 6.1.1-6.1.9 & 6.2.1-6.2.6 address much of the planning coordination the commenter suggests. The strategies 6.1.3, 6.2.5 & 6.2.6 were revised to be completed within 10 years instead of 15 and "inventory, evaluation, and treatment" of at-risk cultural places was added to the agreement described in 6.1.3; and (4) To address the comment, text was added to *Cultural Resources Management - Education* strategy 6.2.1 to include education about contemporary communities. Text was revised to reflect the aforementioned revisions in the CCP under the Cultural Resources strategies and in the Final EA Table E-1.

G2
Comment [50,51]: Draft CCP section 3.4 inadequately characterizes the historic and Native American cultural and archaeological settings of the Complex. These units contain hundreds of recorded archaeological sites, ethnographic Wiyot places, historic structure, and resources of importance. Within the Complex are many sites listed on or eligible for inclusion on the National Register of Historic Places. Draft CCP section 3.4.1 (3rd paragraph) incorrectly cites that Elsasser and Heizer (1964) published on another site than CA-HUM-67. Section 3.4.2 (1st paragraph) incorrectly states that there are no listed National Register sites in or near the NWR.

Response [50,51]: The Humboldt Bay NWR Cultural Resources section 3.4, including subsections 3.4.1 and 3.4.2, have been updated and re-written to address the comments and correct the errors.

G3
Comment [52,134]: Conduct a complete records search for the Humboldt Bay Complex, and to compile the findings in the confidential database to aid FWS on-going management of and planning for these units. Contact the appropriate regional archaeological information center for a record search.

Response [52,134]: The Service conducted a record search as part of the background research for chapter 3 of the CCP. The Service will conduct an exhaustive record search when it prepares a cultural resource overview and management plan upon implementation of the final CCP.

G4
Comment [53,54,55]: 3.4.1 (4th paragraph) seems to include obsolete info only through 1990. Section needs to be updated since 1992 amendments to NHPA and 36 CFR 800 & establishment of THPO programs by Blue Lake Rancheria, Wiyot Tribe, Bear River Band of Rohnerville Rancheria. It is an incorrect suggestion that there are only a couple of places important to contemporary Wiyots within the area of FWS' jurisdiction; and infers that there have been 2 cultural resource investigations since 1918 in south Humboldt Bay, which is absolutely false. A more rigorous, updated and comprehensive summary of cultural resources setting is needed for multiple reasons.

Response [53,54,55]: See response to G2.

G5
Comment [135]: If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations.

Response [135]: The Service has and will continue to conduct cultural resource identification efforts including field surveys as necessary for undertakings in compliance with Section 106 of the NHPA.

G6
Comment [136]: Contact the Native American Heritage Commission for: A Sacred Lands File Check; a list of appropriate Native American contacts to assist with the mitigation measures.

Response [136]: See response to G3. The CCP does not constitute an undertaking under NHPA. The CCP alone will not fund or implement any specific projects on the ground. The Service will engage Section 106 of the NHPA as specific projects come forward.

G7
Comment [137]: Lack of surface evidence of archeological resources does not preclude their subsurface existence. Lead agencies should include in their mitigation plan provisions for the identification and evaluation of accidentally discovered archeological resources.

Comment [138]: Lead agencies should include in their mitigation plan provisions for the disposition of recovered artifacts, in consultation with culturally affiliated Native Americans.

Comment [61,139]: Lead agencies should include provision for discovery of Native American human remains in their mitigation plan. Add the directive to establish within 1 year, in consultation with the Wiyot area Tribes, an Inadvertent Archaeological Discovery Protocol.

Response [137,138,61,139]: The Service will consult with the affected Tribes when it plans for the disposition of artifacts under Service control and recovered from the refuge. To help fulfill CCP Goal 6 to protect tribal cultural resources at Humboldt Bay NWR, strategy 6.1.14 was added: "Within 1 year, consultation will begin with the Wiyot Tribe, Blue Lake Rancheria, and Bear River Band of Rohnerville Rancheria, to establish an Archaeological Inadvertent Discovery Protocol." The Service's protocol/policy is to follow the existing law(s). The Archaeological Resources Protection Act, the National Historic Preservation Act, and the Native American Graves Protection and Repatriation Act (NAGPRA) each have a provision for "discovery." NAGPRA has both "inadvertent discovery" and "intentional discovery." Essentially each law provides the provision to codify tribal consultation procedures in case of a discovery. NAGPRA is the most specific.

G8
Comment [56]: The Tribe strongly recommends that establishment of basic cultural resources management (CRM) capabilities for the Complex. Because FWS administers lands associated with significant water bodies in the Wiyot homeland, it is responsible for complying with NHPA (Section 106 and 110, etc.) [and ARPA, NAGPRA, etc.]. It is imperative that FWS secure professional staffing or establish contracts with California based CRM professionals to meet its responsibilities in a fair and equitable manner.

Response [56]: Comment noted. The Service's Region 1 and Region 8 Cultural Resource Team assists the Refuges to ensure that the Service meets its responsibilities for complying with NHPA, ARPA, NAGPRA, and other applicable laws and Service policies. The Service will engage local cultural resource professionals for historic preservation needs as funds and opportunities allow.

H. Environmental Justice.

H1
Comment [62]: The Service says that they will provide Native Americans reasonable access to Service managed lands and waters. However, we believe that the use of herbicides is in conflict with the intent of the Native American Policy due to the potential for impacts to native plants and wildlife. The use of herbicides has the potential to impact Native residents of the region, including basket weavers and gatherers whose ancestral lands are currently managed by the Humboldt Bay NWR.

Response [62]: Herbicides are not used in areas where gathering would occur. Pesticide use on the Refuge is in strict accordance with all regulations required under Service policy. See also responses H2 and H3.

H2
Comment [68]: Unreleased study by U.S. EPA's Region said the average 70-year-old Native American in the Pacific Northwest has 50 times the cancer risk of non-Native residents of the region due to high rate of fish consumption by tribal people, combined with the high levels of toxic chemicals found in fish tissue. Herbicide use has been found to have the potential to contaminate deer meat, another major component of the diet of many Tribal people. California quail, common flicker, pileated woodpecker, and Roosevelt elk are of importance to Tribal people. The use of herbicides may result in disproportionate exposure to Native people due to the use of native species.

Response [68]: Comment noted and analysis was added to the Environmental Justice section in the EA (Appendix E) to address the possible disproportionate exposure of Native people to herbicides due to

the use of native species. See also the strategies in chapter 5 of the CCP that call for coordination among the Wiyot Tribe, Bear River Band of Rohnerville Rancheria, the Blue Lake Rancheria and the Service regarding resource management: 6.1.3, 6.1.13, 6.3.2, 6.3.3. See also response H3 regarding the required use permit and coordination prior to plant gathering.

H3
Comment [70]: Prior notification of spraying should be available for interested individuals as well as tribes. Notification should include maps, planned timing of application and other site-specific information to allow basketweavers and gatherers to make use of the available plant resources before spraying. The areas sprayed should be posted clearly with cautionary language regarding hunting and gathering of plants or animals in sprayed areas, with weatherproof signage in place for a minimum of 3 years. Place signs in roads leading into and out of the area.

Response [70]: The purpose of the measures suggested in the comment seems to be to notify interested individuals and Tribes of the specifics of proposed pesticide spraying on the Refuge. The Compatibility Determination (CD) for Plant Gathering in Appendix F provides for a special use permit to be issued by the Refuge for plant gathering and access regulated to ensure protection of critical habitat. One of the stipulations of the CD is that the Refuge Manager has the authority to close areas of the Refuge to fulfill Refuge purposes or ensure safety. Special use permits and the coordination meetings listed in strategies 6.1.3, 6.1.13, 6.3.2, and 6.3.3 should ensure that any potential conflicts are avoided.

H4
Comment [69]: We believe that the ability of California Indian Basketweavers to safely gather plants on their ancestral territories without fear of being exposed to poisonous chemicals is necessary…to continue the traditions important to our cultural heritage."

Response [69]: Comment noted. See responses to H2 and H3.

H5
Comment [20]: There is no discussion of environmental justice impacts of management of Humboldt Bay NWR or for Castle Rock NWR.

Response [20]: See responses to comments H1, H2 and H3 and the revised Environmental Justice analysis in the Final EA.

H6
Comment [63]: Use of herbicides has the potential to impact Native residents of the region, including basket weavers and gatherers whose ancestral lands are currently managed by the Humboldt Bay NWR. A study on the persistence of herbicide residues in plants of importance to California Indians conducted by the Department of Pesticide Regulation found that herbicides remain in plant tissues used by California Indian basketweavers.

Response [63]: In response to the comments, additional analysis was added to the Environmental Justice section of the EA. The information provided by the commenter was carefully considered, but the Service did not find conclusive results in the study cited. The Service is aware of the potential human health risks of overexposure to pesticides and the potential for contamination of plants and water by off-site movement of herbicides. Pesticide use on the Refuge is in strict accordance with all regulations required under Service policy. Additionally, tribal representatives are required to obtain a special use permit from the Refuge staff prior to gathering on Refuge lands. For more information, see Appendix F, Compatibility Determination for Plant Gathering for Humboldt Bay NWR.

H7
Comment [64]: The use of herbicides to spray unspecified plant species in unspecified locations does not provide sufficient information to constitute disclosure and assessment of potential environmental impacts that may result from such management. What species are targeted, number of acres to be sprayed, methods of spraying, what buffers zones will be maintained along perennial and intermittent stream/seeps/sprigs, and what alternative methods have been analyzed should be included in the EA. What monitoring will be conducted to document impacts and effectiveness of herbicides. We believe that non-chemical methods of removal and prescribed burning should always be the preferred methods for noxious weed

management. Secretary of Agriculture Venneman wrote that the definition of IPM makes it very clear that pesticide use should be the last resort.

Response [64]: A list of invasive plant species that may be treated and the herbicides used are discussed in sections 1.6.5 Invasive Species Management, Goal 3 and Objective 3.1, and Invasive Species Management section under the Features Common to all Alternatives section in the EA and under the analysis of each of the Alternatives A, B & C in the EA. The effects are analyzed in the section Invasive Species (Integrated Pest Management) of the EA. Table E-3 lists "Herbicides that May be Used to Control Invasive Plants on Humboldt Bay NWR." To address the comments, information was added in the Final EA and text was added to clarify the Pesticide Use Proposal measures to mitigate potentially adverse effects. Pesticide use on the Refuge is in strict accordance with all regulations required under Service policy.

I. Miscellaneous.

I1
Comment [96]: Prepare a consistency determination for the CCP and submit to the California Coastal Commission.

Response [96]: A May 20, 2009 letter was sent from the Service to the California Coastal Commission (Commission) requesting their concurrence with the Service's negative determination for the CCP. In the Commission's July 20, 2009 letter, they agreed that with the commitment for additional consistency review of future projects, implementation of the CCP will not adversely affect coastal resources. The Commission also concurred with the Service's negative determination made pursuant to 15 CFR 930.35 of the NOAA implementing regulations. A new appendix was added, Appendix Q: Compliance with the Federal Coastal Zone Management Act.

I2
Comment [36]: Regarding the water trails on the Humboldt Bay NWR brochure: (1) Teal Island Trail would be best designated as a high water trail only to avoid stranding kayakers; (2) consider adding White Slough as a water trail.

Response [36]: Comment noted. (1) The Refuge does caution visitors about tide level concerns both in the Complex brochure and in person; (2) White Slough - The Refuge has considered adding White Slough to the water trail system, but stranding and safety considerations have kept it from being added to the water trail map. While taking a kayak to White Slough may be a good option for more experienced boaters, the Refuge management thinks that distance and stranding considerations are too great to include it on the Refuge's water trail map. Also, the Refuge does not want to encourage parking and accessing the Refuge at Hwy 101. See also response C1.

I3
Comment [17]: Can Caltrans and the refuge work together to provide more convenient non-vehicular access to the refuge especially the White Slough Unit?

Response [17]: White Slough is not accessible to public and is not expected to be during the life of this CCP (15 years). See also response C1. Text was added to the end of CCP section 3.3.2 Humboldt Bay NWR Visitor Services that explains that the White Slough Unit is closed to the public.

I4
Comment [29]: Adding wheelchair accessible trails seems worthwhile on Salmon Creek and Hookton Slough Units.

I5
Comment [33]: The low contour dike seems a possible solution to Hookton Road being taken out by immediate future flooding, but drainage to the west/upstream will require outflow provisions. However, may be better to address low spot west of Clough Road by raising the road bed and adding an adequate culvert.

Response [29,33]: Comments noted.

I6
Comment [21]: Page F-40 says if mosquito populations exceed human health thresholds that pesticides will be considered, but there is no description of the human health threshold.

Response [21]: Information from Humboldt County Health Department about thresholds for chemical mosquito spraying and larval control with water management was added to page F-40, Appendix F, Compatibility Determination for Mosquito Control on Humboldt Bay NWR.

I7
Comment [32]: The Refuge has been constructive in dealing with drainage issues and mosquitoes.

Response [32]: Comment noted.

I8
Comment [38]: I am concerned about security at refuge access points open to the public. Vehicle break-ins have increased locally and are a threat to personal property. I have had to change my use [due to vehicle security].

Response [38]: Security at Refuge access points and parking areas is a valid and continuing concern. The Refuge staff makes every effort to address these concerns through Refuge staff visibility and a law enforcement contract with DOI agencies. Strategies 5.1.15, 5.4.15, and 5.5.8 in the CCP include increasing law enforcement on the Refuge by contract or by support from other Service law enforcement and the proposed program budget (Table 17 in the CCP) includes a law enforcement agreement with the Bureau of Land Management.

I9
Comment [49]: I do not approve of the Southern Pacific Shorebird Conservation Plan's recommendation in Section 1, page 17 recommending to "Prohibit further alteration of tidal flats for oyster culture." This is contrary to available science as shorebirds have been shown to prefer shellfish culture areas over adjacent mudflat or eelgrass.

Response [49]: Comment noted. The Southern Pacific Shorebird Conservation Plan was developed separately from this Draft CCP/EA. The Draft CCP/EA includes a reference to the plan as a related project/plan or study in the same area as the Humboldt Bay NWR Complex. The Draft CCP/EA has no bearing on the approval of the Southern Pacific Shorebird Conservation Plan.

I10
Comment [71]: I would like the public to be aware of what the hunter and fishermen and women have done to help create and maintain these Wildlife Refuges.

Response [71]: Comment noted. Chapter 5, Strategy 5.2.18 for Visitor Services Environmental Education addresses outreach to the public about the historical support hunters and anglers have provide for the refuge system and conservation.

I11
Comment [7]: The US Fish and Wildlife Service should assume one of the major roles in the restoration of the Bay's marshlands, should extensive salt marsh restoration become feasible.

Response [7]: Comment noted. Through coordination with and participation in the groups and programs listed in section 1.7 of the CCP, the Service has and continues to assume a major role in the Bay's restoration in cooperation with other Federal, Tribal, State, & local agencies; including the Humboldt Bay Harbor Recreation and Conservation District in pursuing restoration goals in and around the Bay.

I12
Comment [16]: What are effects of Highway 101 on Salmon Creek and White Slough Units? Does the Highway act as a migration barrier? Can the Refuge work with Caltrans to mitigate impacts?

Response [16]: Hwy 101 likely does act as a migration barrier to small animals and large mammals. The Refuge does coordinate with California Department of Transportation to attempt to mitigate known adverse impacts. Both agencies will continue to look for cost-effective ways to improve conditions for wildlife passage in the future. Although a designed wildlife crossing is not an integral part of Highway 101 in this location, wildlife crossings are typically designed into and incorporated as a part of planning for future highways.

J. Castle Rock NWR

J1
Comment [10]: We are concerned that Cassin's Auklet and Rhinoceros Auklet are in serious decline and also concerned about the Leach's Storm-Petrel and Fork-tailed Storm Petrel. Are these declines related to increased Aleutian Goose roosting pressure? To pretend that thousands of roosting geese have no impact on any of the 14 nesting species on Castle Rock is disingenuous. Birds migrating to nest on Castle Rock are being negatively impacted by thousands of roosting geese. Enormous potential negative impact of the geese should have been studied. Until we know the impact, prudent, intelligent science dictates that the geese should not be allowed a roosting niche on Castle Rock.

Response [10]: The Service shares these concerns, but there is currently no feasible management option to allow the Service to eliminate, deter, or haze geese off of Castle Rock without adversely affecting other protected species and their habitat, such as the burrow-nesting seabirds. Text was added to CCP section 4.1.19 Habitat Management on Castle Rock NWR.

J2
Comment [77]: There are no sand beaches on Castle Rock. The tiny beach that exists is of small cobble (>1 cm). There is a tiny patch of very small cobble - or pebble sand - on the reef east of the island.

Response [77]: The CCP text was corrected.

J3
Comment [78]: I would strongly recommend installation of acoustic monitoring of seabirds concurrent with the video monitoring for: (1) detecting and (2) obtaining some index of abundance of nocturnal burrow nesting species without adding any impact. Lack of knowledge of an abundance index could result in mismanagement of refuge by allowing, for example, storm petrel and auklet declines due to inadequate soil burrow habitat.

Response [78]: The Refuge staff will look for opportunities to implement these ideas in the near future. A strategy 1.1.14 was added to incorporate the recommendations in this comment. The budgets proposed in Tables 16 and 17 were increased accordingly for both one-time costs and estimated annual cost.

J4
Comment [79]: Alternative C, 3rd cell in Table E-2: I strongly feel that the '5-year survey' for fauna and flora should include an assessment of soils and their use by burrow nesting seabirds; [including sampling soil depth, grain size, organic content, etc.] and sampling the study areas for seabird burrow density and probable species using them. Without sampling, mismanagement of Refuge could result by allowing, for example, storm petrel and auklet declines due to inadequate soil burrow habitat.

Response [79]: The Refuge staff will look for opportunities to implement these ideas in the near future. Under Castle Rock NWR Objective 1.1, strategy 1.1.4 was revised to add that research will also evaluate quantity, quality, and rate of erosion of soils available for burrow nesting seabirds. In response to the comment, the budget proposed in Table 16 was increased to implement strategy 1.1.4, as expanded.

J5
Comment [80]: What is the cost-benefit of a wilderness designation for Castle Rock NWR? What is gained in protection as a Wilderness Area in terms of real protection, conservation funding, and improved wildlife resources? What is potentially costly in terms of (a) conflicts with commercial and sport fishing adjacent to the refuge and (b) will legal conflict arise with airspace use by Crescent City Airport (especially if the proposed airport expansion proceeds)?

Response [80]: The Federal designation of wilderness on Castle Rock NWR is not evaluated on a cost-benefit basis. The Wilderness Act does not mention costs. The wilderness review and inventory follows guidelines that result in a conclusion as to whether Castle Rock meets the requirements of wilderness designation. As to non-monetary costs versus benefits, having Castle Rock NWR designated as wilderness may not result in greater protections because it is already closed to the public, but could be used as a filter to screen proposed projects. The Refuge is closed to the public already. The costs and adverse effects of designation are not expected to be significant whether it remains without a designation or it is recommended for wilderness designation. The Wilderness Act requires that a legislative environmental impact statement (EIS) be prepared to analyze the effects of a recommendation for wilderness designation on the environment (wildlife habitat and other resources). Clarifying text was added to the EA.

There is no commercial or sport fishing on Castle Rock, and wilderness designation would not alter that. Currently, there is no conflict with the Crescent City airport, and although there can be restrictions of airspace over some wilderness areas, they are not common and often voluntary. At this time, the Service does not expect that the proposed Crescent City airport plans would be in conflict with a recommendation for wilderness designation.

J6
Comment [82]: We support the Preferred Alternative C. Wilderness designation would give Castle Rock an appropriate level of resource protection.

J7
Comment [83]: Large numbers of Aleutian Geese have impacted habitat on Castle Rock for other species, and changed vegetation. Monitoring these impacts and restoring damaged habitat is desirable. Alternative C does allow for needed surveys that cannot be accomplished remotely. Alternative C would allow for an assessment of restoration actions.

J8
Comment [84]: The remote monitoring cameras that display pictures of the Castle Rock wildlife activity at our National and State Redwood Park Headquarters is a valuable public educational tool. And, continued participation in our Aleutian Goose Festival and other events are also valuable educational opportunities.

Response [82,83,84]: Comments noted.

J9
Comment [141]: Comment in favor of hunting ACG near Crescent City.

J10
Comment [142]: Comment opposed to hunting ACG near Crescent City in late season prior to migration north.

Response [141,142]: Comments noted.

J11
Comment [81]: Where are alternatives for environmental education and interpretation? As a restricted access and largely inaccessible refuge, Castle Rock NWR realizes its best potential for people in its environmental education and interpretation. More and alternative options for expanded programs to this end are needed.

Response [81]: The alternatives for environmental education were unintentionally omitted from the table of the Draft EA, but were described in the text of the Draft EA. The omission was corrected by adding to Table E-2 the description of Goal 2 (as described in chapter 5 of the Draft CCP) and the alternatives for Environmental Education and Interpretation (as described in the text on pages E-44 and E-45 of the Draft CCP/EA).

4.0 Comment Authors

4.1 State Agencies

Agency	*Signature*
State Clearinghouse and Planning Unit	Roberts, Terry
California Department of Fish and Game	Lancaster, Dave
California Department of Fish and Game	Stacey, Gary B.
California Department of Public Health	Trevena, Eric
California Coastal Commission	Simon, Larry
California Native American Heritage Commission	Sanchez, Katy
California State Lands Commission	Newton, Gail

4.2 Local Agencies

Organization	*Signature*
Humboldt Harbor, Recreation, and Conservation District	Hull, Dave

4.3 Organizations

Organization	*Signature*
Blue Lake Rancheria	Eidsness, Janet
California Indian Basketweavers Association	Kalt, Jennifer
California Outdoor Heritage Alliance	Hennelly, Mark
Coast Seafoods Company	Dale, Greg
Crescent Coastal Research	Strong, Craig S.
Environmental Protection Information Center	Greacen, Scott
Explore North Coast	Schrieber, Ed
Friends of Del Norte	Cooper, Eileen
Humboldt Bay Oyster Co.	Van Herpe, Todd
Humboldt Baykeeper	Smith, Michelle D.
North Coast Chapter of California Waterfowl Association	Holdner, Jim
UC Davis Sea Grant Office	Schlosser, Susan

4.4 General Public

Brandenburg, S.	Laird, A.
Cox, R.	Mills, J.
Crawford, R.	Orr, J.
Forsell, W.	Romo, T.
Gartland, J.	Schrieber, E.
Kuehn, D.	Susich, G.
Kuehner, R.	Sway, S.

5.0 Summary of Changes

5.1 Changes to the Comprehensive Conservation Plan (CCP)

This section explains and summarizes the major changes made between the draft and final versions of the CCP.

Chapters 3, 3.1.2, 3.6.3. Regarding sea level rise, references to Appendix P: Coastal Flood Hazard Maps were added to the sections addressing climate change.

Chapter 3, 3.1.2. Regarding sea-level rise/climate change, a reference to http://www.fws.gov/home/cllimatechange/ was added to section 3.1.2.

Chapter 3, 3.2.2. Regarding the North Bay islands within the approved Refuge boundary, clarifying text was added to 3.2.2 to explain that they are not owned in fee title by the Service, so no management actions are proposed.

Chapter 3, 3.2.5. Regarding Sendak's research on frogs, clarifying text was added to the amphibians and reptiles section. Ponds 1 and 5 were identified on applicable Salmon Creek Unit figures.

Chapter 3, 3.3.2. Regarding White Slough Unit, text was added to section 3.3.2 Humboldt Bay NWR Visitor Services to explain that the White Slough Unit is closed to the public.

Chapter 3, 3.4. Regarding Humboldt Bay cultural resources, section 3.4, including subsections 3.4.1 and 3.4.2 have been updated and replaced.

Chapter 4, 4.1.1. Regarding sea level rise, references to Appendix P: Coastal Flood Hazard Maps were added to the sections addressing climate change.

Chapter 4, 4.1.3. Regarding possible solutions to solve Aleutian cackling geese management issues, text was added to section 4.1.3 in the CCP.

Chapter 4, 4.1.5. Regarding removing eucalyptus and other non-native trees, clarifying text was added to section 4.1.5, the rationale for Objective 1.4 in the CCP, and the description of Alternatives in the EA.

Chapter 4, 4.1.6. Regarding water quality concerns in Mad River Slough, clarifying text was added to 4.1.6 and text regarding a proposed non-motorized boat launch was removed.

Chapter 4, 4.1.18. Regarding dioxins, reference to an effects analysis was added to 4.1.18.

Chapter 4, 4.1.9. Regarding jurisdiction of tidelands, the State has legislatively granted to the Humboldt Bay Harbor, Recreation, and Conservation District (HBHRC District) management of areas within the Refuge boundary that are below the elevation of "mean higher high water", which is 3.15 feet above mean sea. Clarifying text has been added to sections 4.1.9 of the CCP and all applicable maps (figures).

Chapter 4, 4.1.19. Regarding infeasibility of deterring geese from Castle Rock, clarifying text was added to section 4.1.19 (previously 4.1.18) Habitat Management on Castle Rock NWR.

Chapter 5, 1.1.1. Regarding monitoring on Salmon Creek, text was added to include juvenile salmonids and amphibian monitoring in strategy 1.1.1.

Chapter 5, 1.2.8. Regarding wildlife habitat restoration and jurisdiction in tidelands, a new strategy 1.2.8 was added.

Chapter 5, 1.5.7. Regarding wildlife habitat restoration and jurisdiction in tidelands, a new strategy 1.5.7 was added.

Chapter 5, 1.6.8. Regarding wildlife habitat restoration and jurisdiction in tidelands, a new strategy 1.6.8 was added.

Chapter 5, 2.3.8. Regarding restoration of dune/riparian swamp habitat, a new strategy 2.3.8 was added under Humboldt Bay NWR Goal 2.

Chapter 5, 2.4.2. Regarding restoration of dune forest margins, clarifying text was added to strategy 2.4.2.

Chapter 5, 3.1.16. Regarding protection of the northern red-legged frog from non-native bullfrogs, a new strategy 3.1.16 was added under Humboldt Bay NWR Goal 3.

Chapter 5, 5.1.8. Regarding water quality concerns in Mad River Slough, text regarding a proposed non-motorized boat launch was removed from Objective 5.1 and strategy 5.1.8.

Chapter 5, 5.1.14. Regarding jurisdiction of tidelands, clarifying text was added to Objective 5.4, strategy 5.4.14 of the CCP.

Chapter 5, 5.1.14. Regarding percentage of fee title lands open to hunting, clarifying text was added to the rationale for Objective 5.4 of the CCP.

Chapter 5, 5.1.14. Regarding illegal parking and access at Jacoby Creek, clarifying text was added to the rationale for Objective 5.4 of the CCP.

Chapter 5, 6.1.3, 6.2.5, 6.2.6. Regarding cultural resources management timeframes for completion of strategies, these strategies were revised to be completed within 10 years (instead of 15 years).

Chapter 5, 6.1.3. Regarding cultural resources management; inventory, evaluation and treatment of at-risk cultural places was added to strategy 6.1.3.

Chapter 5, 6.1.14. Regarding inadvertent discovery, a new strategy 6.1.14 was added under Humboldt Bay NWR Goal 6 to begin consultation with the Wiyot Tribe, Blue Lake Rancheria, and Bear River Band of Rohnerville Rancheria, to establish an Archaeological Inadvertent Discovery Protocol.

Chapter 5, 6.2. Regarding the timeframe for preparation of a cultural resources overview, this Objective 6.2 was revised to be completed within 5 years (instead of 10 years).

Chapter 5, 6.2.1. Regarding cultural resources management education, strategy 6.2.1 was revised to include education about contemporary communities.

Chapter 5, 1.1.4. Regarding Castle Rock NWR, monitoring strategy 1.1.4 was revised to include evaluation of soil erosion (as related to burrow-nesting seabirds) and seabird nesting density.

Chapter 5, 1.1.14. Regarding Castle Rock NWR, a new strategy 1.1.14 was added under Castle Rock NWR Goal 1 to improve the acoustic monitoring being done concurrent with the existing video monitoring on Castle Rock.

Chapter 6, Table 16. The budget for Castle Rock NWR was increased by $5,000 to fund the revision of monitoring strategy 1.1.4 to include evaluation of soil erosion (as related to burrow-nesting seabirds) and seabird nesting density.

Chapter 6, Table 16. The budget for Castle Rock NWR was increased by $10,000 for the new strategy 1.1.14 to improve the acoustic monitoring being done concurrent with the existing video monitoring on Castle Rock.

5.2 Changes to the Environmental Assessment (EA)

This section explains and summarizes the major changes made between the draft and final versions of the Environmental Assessment (Appendix E to the CCP).

Figures in the EA. Regarding jurisdiction of tidelands, a clarifying note was added to all applicable EA figures (maps) stating, "Note: Tide lands and waterways under the jurisdiction of the U.S. Fish and Wildlife Service include all lands and waters with an elevation greater than "mean higher high water" or 7.06 NGVD."

Figures E-2 in the EA. Regarding Sendak's research referenced in the CCP, Ponds 1 and 5 were identified this map of Salmon Creek Unit.

Chapter 2, Table E-1. Regarding cultural resources, Table E-1 was revised to reflect the changes to strategies 6.1.3, 6.2.2, 6.2.5, and 6.2.6.

Chapter 2. Regarding removing eucalyptus and other non-native trees, clarifying text was added to the descriptions of Alternatives in the EA.

Chapter 2. Regarding water quality concerns in Mad River Slough, text was added to the description of Alternatives B and C in the EA.

Chapter 4. Regarding pesticide use, additional explanation about the Pesticide Use Proposal (PUP) process and additional analysis of the potential effects of herbicides was added to the environmental consequences chapter 4 of the EA, under the resource sections for Soils, Invasive Species, and Environmental Justice for Humboldt Bay NWR.

Chapter 4, Table E-2. Regarding Castle Rock NWR, the omission was corrected by adding the description of Goal 2 (as described in the text in chapter 5 of the Draft CCP) and the alternatives for Environmental Education and Interpretation (as described in the text on pages E-44 and E-45 of the Draft CCP/EA) to the Summary of Alternatives Table E-2.

Chapter 4. Regarding Castle Rock NWR, an Environmental Justice section was added to the EA.

Chapter 4. Regarding Castle Rock NWR, clarifying text was added to indicate that the timeframe for the recommendation for wilderness designation is within 15 years.

5.3 Other Appendices to the CCP

This section explains and summarizes the major changes made between the draft and final versions of the Appendices to the CCP, not including Appendix E, which is summarized in 5.2, above.

Appendix B, Appendix C, Appendix D. Regarding jurisdiction of tide lands, a clarifying note was added to figures (maps) in Appendix B (Visitor Services Plan), Appendix C (Waterfowl Hunt Plan), Appendix D (Sport Fishing Plan), and all applicable maps (figures) stating, "Note: Tide lands and waterways under the jurisdiction of the U.S. Fish and Wildlife Service include all lands and waters with an elevation greater than "mean higher high water" or 7.06 NGVD.

Appendix B: Visitor Services Plan. Regarding water quality concerns in Mad River Slough, text was added to the rationale under Wildlife Observations and Photography.

Appendix C: Waterfowl Hunt Plan. Regarding adding a throw rope (as a safety measure) at some of the blinds, text was added to section I, about South Bay.

Appendix F: Compatibility Determinations for Mosquito Control on Humboldt Bay NWR. Information from Humboldt County Health Department about thresholds for chemical mosquito spraying and larval control with water management was added to page F-40.

Appendix G: Wilderness Review for Humboldt Bay NWR and Castle Rock NWR. The timeframe noted in Appendix G was changed from 10 years to 15 years to submit a recommendation for wilderness designation and prepare a legislative environmental impact statement that supports the recommendation to be consistent with Alternative C in the Draft EA.

Appendix I: Compliance with Section 7 of the Federal Endangered Species Act. Revisions to species information were made. The title of the appendix was revised (previously entitled, Section 7 ESA Listed Species). Compliance correspondence with US Fish and Wildlife Service and NOAA Fisheries Service was added.

Appendix J: Plant Lists. Species information was revised.

Appendix K: Wildlife Lists. Species information was revised.

Appendix L. Locally Occurring Special Status Species. Species information was revised.

The following new appendices were added:

Appendix P: Coastal Flood Hazard Maps. Maps show the extent of a sea level rise scenario with a base flood elevation plus 1.4 meters of sea level rise.

Appendix Q: Compliance with the Federal Coastal Zone Management Act. Correspondence with the California Coastal Commission is included.

Appendix R: Responses to Comments on the January 2009 Draft Comprehensive Conservation Plan and Environmental Assessment.

Historic U.S. Coast and Geodetic Survey topographic sheet of Humboldt Bay
Published in 1870

N

Scale Unknown

Historic U.S. Coast and Geodetic Survey topographic sheet of Humboldt Bay
Published in 1932

N
Scale Unknown