

U.S. Fish & Wildlife Service

Rachel Carson National Wildlife Refuge

*Comprehensive Conservation
Plan and Environmental
Assessment*

June 2007





Celebrating Rachel Carson's Legacy
1907 - 2007



*This blue goose,
designed by J.N. "Ding" Darling,
has become the symbol of the
National Wildlife Refuge System*

The U.S. Fish & Wildlife Service is the principal federal agency responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people. The Service manages the 93-million acre National Wildlife Refuge System comprised of more than 535 national wildlife refuges and thousands of waterfowl production areas. It also operates 65 national fish hatcheries and 78 ecological services field stations. The agency enforces federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restore wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid Program which distributes hundred of millions of dollars in excise taxes on fishing and hunting equipment to state wildlife agencies.

Comprehensive Conservation Plans provide long-term guidance for U.S. Fish and Wildlife Service management decisions; they set forth goals, objectives, and strategies for accomplishing refuge purposes; and, they identify our best estimate of future needs. They detail levels of program planning that are sometimes substantially above our current budget allocations; as such, they serve primarily in strategic planning and in prioritizing Service programs. They do not constitute a commitment for increases in staffing, operating and maintenance, or future land acquisition funding.



U.S. Fish & Wildlife Service

Rachel Carson National Wildlife Refuge

Comprehensive Conservation Plan and Environmental Assessment

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Summary

Type of Action:	Administrative
Location	Rachel Carson National Wildlife Refuge York and Cumberland Counties, Maine
Lead Agency:	U.S. Department of the Interior, Fish and Wildlife Service
Responsible Official:	Marvin E. Moriarty, Regional Director, Region 5

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This comprehensive conservation plan (CCP) for the Rachel Carson National Wildlife Refuge is the culmination of a planning effort involving a variety of partners and communities. The CCP establishes 15-year management goals and objectives for wildlife and habitat, public use, and partnerships for the refuge. The refuge includes the Brave Boat Harbor, Moody, Lower Wells, Upper Wells, Mousam River, Goose Rocks, Little River, Biddeford Pool, Goosefare Brook, and Spurwink River divisions. Staff from the refuge headquarters office in Wells, Maine, will implement this plan to further the protection and management of endangered, threatened, and other plant and animal species of concern, including migratory wildlife.

The plan is designed to expand and improve opportunities for wildlife-dependent recreation, protect the 3,833 acres remaining within the approved acquisition boundary, and expand the refuge by 5,558 acres beyond its current approved boundary. It would add additional acreage to the Brave Boat Harbor, Upper Wells, Spurwink, Biddeford, Mousam River, Little River, and Moody divisions, and would establish a new York River Division encompassing the largest undeveloped salt marsh south of Portland. A new administrative complex, including office space, maintenance facilities, and a visitor contact station, will be built. In this plan, we propose combining the Moody, Lower Wells, Upper Wells, and Mousam River divisions into one Wells Bay Division.

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USFWS

Moose

Land Protection Plan

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I. Introduction

This land protection plan (LPP) provides detailed information about our proposal to expand the Rachel Carson National Wildlife Refuge along the southern Maine coast. The refuge is part of the National Wildlife Refuge System (Refuge System) administered by the U.S. Fish and Wildlife Service (Service, we, our). We distributed the draft proposal for a 30-day period of public review and comment in August 2006. Our main audience was affected landowners, interested individuals, organizations, federal and state agencies, and local officials. The comments we received helped our Regional Director make a final decision regarding land acquisition. Once approved, this LPP will allow us to acquire from willing sellers 5,558 acres of nationally significant wildlife habitat.

The purposes of this LPP are, to

- inform affected landowners and other interested parties about the resource protection needs, location, size, and acquisition priority of those 5,558 acres of nationally significant wildlife habitat;
- inform owners of land in our current, approved acquisition boundary that we are interested in acquiring that land, and remind them of our policies, priorities, options, and methods for protecting it;
- inform landowners whose properties we propose for acquisition about our policies, priorities, options, and methods for protecting their lands; and
- inform them about our long-standing policy of acquiring land only from willing sellers; and,
- remove land from our current approved refuge boundary that is no longer suitable for Service acquisition.
- The 5,558 acres we propose to acquire are considered nationally significant, under a set of biologically based criteria for identifying and mapping habitat for Service trust resources. Those lands now lack permanent, long-term protection by a conservation organization or agency. We believe their high natural resource values merit their inclusion within the Refuge System. As the Service acquires those lands, we will manage them for their wildlife resources, emphasizing the protection of such federal trust resources as federal-listed endangered or threatened species and migratory birds.

II. Project Area Description

❖ Existing Refuge Lands

The refuge lies along 50 miles of coastline in York and Cumberland counties in southern Maine, in the heart of the Gulf of Maine watershed, a region of great biological diversity. The refuge comprises 10 divisions in the towns of Cape Elizabeth, Scarborough, Old Orchard Beach, Saco, Biddeford, Kennebunkport, Kennebunk, Wells, Ogunquit, York, and Kittery. Those divisions include the following acreage we own outright or in easement.

- Brave Boat Harbor Division: 748 acres; Towns of Kittery and York
- Moody Division: 403 acres; Towns of Ogunquit and Wells
- Lower Wells Division: 1,003 acres; Towns of Wells and Kennebunk
- Upper Wells Division: 667 acres; Town of Kennebunk
- Mousam River Division: 516 acres; Towns of Kennebunk and Kennebunkport
- Goose Rocks Division: 542 acres; Town of Kennebunkport
- Little River Division: 266 acres; Towns of Kennebunkport and Biddeford

Project Area Description

- Biddeford Pool: 126 acres; Town of Biddeford
- Goosefare Brook: 502 acres; Towns of Saco and Biddeford
- Spurwink River: 520 acres; Towns of Scarborough and Cape Elizabeth

Each of the divisions was established for the protection and conservation of migratory birds, and each protects a tidal river or an estuary resource. We have yet to acquire 3,833 acres in our 9,126-acre approved refuge acquisition boundary.

❖ **Biological Significance**

Distributed at the mouths of more than a dozen tidal rivers and their watersheds, the refuge divisions occupy a crucial place in this increasingly developed, fragmented region where the rivers meet the sea. Refuge estuaries provide nurseries for many marine fish. Its tidal rivers provide pathways for fish moving upstream and downstream to spawn. Fifty-five species of fish live in refuge estuaries and streams, including the American eel, alewife, and blueback herring. The federal-listed shortnose sturgeon once may have lived in the York River.

The diverse aquatic and upland habitats on the refuge support breeding, migrating and wintering birds, and provide essential habitat for threatened or endangered species. Fifty percent to 75 percent of the Maine piping plover population nests on or near the refuge. Its coastal habitats include rocky and sandy shores, rivers, beaches, salt marshes, mudflats, and salt pannes. The Wells and Ogunquit marshes form the second largest salt marsh complex in the state, and have been identified as a focus area of statewide conservation significance.

Refuge salt marshes, mudflats, and salt pannes provide nesting, feeding, and staging habitat for more than 45 species of shorebirds and wading birds. The American black duck is the most common wintering waterfowl species, and can be found on open water on every marsh and river. Thousands of other waterfowl winter on the refuge, including common eider, scoter, bufflehead, common goldeneye, and common loon.

Lands on or near the refuge provide food and habitat for more than 250 species of birds. Maine Audubon and the State of Maine designated parts of the refuge an Important Bird Area: a place that supports habitat for rare or threatened species, a diverse assemblage of birds, or large concentrations of birds. Its upland forests of oak, hemlock, red spruce, pitch pine, and white pine and early successional grasslands and shrublands support such migrating birds—for which the refuge was established—as warblers, thrushes, and other songbirds, where they revitalize themselves in route to or from northern breeding areas.

❖ **Current Acquisition Boundary**

Maps A-1 through A-6 depict lands owned by the refuge and the current approved acquisition boundary. We reviewed that boundary to identify lands that are no longer suitable for Service acquisition. Table A.1 provides a summary of the privately owned lands within the boundary and the privately owned lands to be removed from the boundary. Appendix I provides a list of the privately owned lands within the boundary.

❖ **Proposed Expansion Lands**

Our proposal expands by 5,558 acres the Service acquisition of significant wetland and upland migratory bird habitat (maps A-1 through A-6). All of the land we acquire will become part of the refuge.

The Service identified important fish and wildlife habitats in southern Maine with geographic information system (GIS) habitat suitability models: an innovative and biologically sound approach to protecting habitat. The expansions below will contribute significantly to the conservation of federal trust resources in coastal Maine. They will also enhance opportunities for public use, including wildlife observation, interpretation, nature photography and recreational hunting. Our proposal focuses on expanding the 10 divisions and creating a new division around the highly significant York River.

Table A.1. A summary of lands still in private ownership within the approved refuge boundary

<i>Mainland Division</i>	<i>Private Land Tracts</i>		<i>Private Land Tracts to be Removed</i>		<i>New Total of Land Within Approved Refuge Boundary</i>
	<i>Parcels</i>	<i>Acres</i>	<i>Parcels</i>	<i>Acres</i>	
Brave Boat Harbor	51	267	1	11	256
Moody	122	59	3	15	44
Lower Wells	51	421	3	13	408
Upper Wells	80	980	4	4	976
Mousam River	35	346	3	4	342
Goose Rocks	95	339	?	11	328
Little River	47	233	8	39	194
Biddeford Pool	129	282	62	33	249
Goosefare Brook	27	94	N/A	0	94
Spurwink River	41	812	17	34	778
Total	678	3,833	101	164	3669

York River—2,211 acres

The 23-square-mile York River watershed, an area of concern in southern Maine, lies in the Mt. Agamenticus (Mt. A.) conservation planning area. The Mt. Agamenticus to the Sea initiative forms a partnership among state, federal and local groups to conserve the largest unfragmented block of coastal wildlife habitat between Portland and the New Jersey Pine Barrens. It harbors 24 rare plant species and 11 rare animal species in a center of biological diversity in Maine. The proposed York River Division will build upon the 7,000 acres of habitat now conserved in public or quasi-public ownership by linking our Brave Boat Harbor Division through the York River to Mt. A. conservation lands.

That new division will provide a corridor of wildlife habitat from the mountain to the sea. The tidal portion of the York River extends from York harbor inland about 5 miles, then widens to encompass a salt marsh dominated by cordgrass and needle rush. A white pine-red oak forest with some pitch pine and red maple, containing patches of shrubland, grassland, and freshwater wetland, borders the salt marsh.

We identified habitats in the York River watershed that support federal trust resources, and are working with conservation partners, local communities, and landowners to protect them. We propose to create the York River Division by acquiring the most significant 2,211 acres of that wildlife habitat: contiguous and disjunct fingers of salt marsh along the main channel and tributaries of the river, and critical terrestrial uplands.

Waterfowl, particularly black ducks, use the tidal river and salt marsh during migration. The winding, protected river is especially important as habitat for black ducks in harsh weather. Greater and lesser yellowlegs, semipalmated and least sandpipers, and black-bellied and semipalmated plovers forage on the tidal river mudflats. Commercially and recreationally important finfish and shellfish rely on the salt marsh as nursery habitat, including the American eel, alewife, and rainbow smelt.

The New England cottontail, a species petitioned for listing under the Endangered Species Act, lives in several of the shrubland borders of the river's tributaries. Those pockets of thicket habitat also provide habitat for

the American woodcock, prairie warbler, and chestnut-sided warbler. Protecting that habitat also benefits the saltmarsh sharp-tailed sparrow. That species, a top conservation priority for Partners in Flight Planning Area 9, is identified as a species of Continental Importance in the Eastern Avifaunal Biome, and is designated in need of immediate conservation action.

Biddeford Pool—1,272 acres

Of the 5,558 acres we propose to acquire, 1,272 lie in the Biddeford expansion area, roughly defined along Route 9 to Newtown Road, south to West Street, south to the Little River (or branch), then along the river back to Route 9. Habitats in that area include early successional grassland and shrubland, high-quality wetland (forested wetland, pocket swamp, vernal pool), river, and mixed upland forest. Due to its high concentrations of wetlands and rare plants and animals, this is also a state focus area of ecological significance. Its habitats fulfill the needs at various life cycle stages for key focal species such as bobolink, willow flycatcher, wood thrush, American woodcock, prairie warbler, alewife, Blanding's turtle, and New England cottontail.

Brave Boat Harbor—534 acres

Five hundred thirty-four acres lie in the Brave Boat Harbor expansion area. Refuge land to the east, a large, undeveloped area to the north, and development to the south and west border that area. Its habitats include a large, freshwater wetland, forested wetland, upland forest, shrubland, and grassland. Those fulfill the needs at various life cycle stages for such key federal trust resources as American black duck, Louisiana waterthrush, American woodcock, blue-winged warbler, and wood thrush, among others. The state-listed spotted turtle also dwells here.

Spurwink River—537 acres

Five hundred thirty-seven acres lie in two locations in the Spurwink River expansion area. One is roughly defined along Pleasant Hill Road, then east to existing refuge lands. The second runs along Hillside Avenue, then east, connecting other refuge lands. Those two locations include the last large blocks of land that remain undeveloped adjacent to the refuge in Scarborough. One landowner holds about 24 percent of that land. The property along Pleasant Hill Road would complete a wildlife corridor connecting the refuge with the Scarborough Marsh State Wildlife Management Area.

Habitats in the 537 acres include early successional grassland, shrubland, forested wetland, river, and mixed forest. Those fulfill the needs at various life cycle stages for such key federal trust resources as bobolink, American woodcock, blue-winged warbler, alewife, and New England cottontail, among others.

Upper Wells/Mousam River—255 acres

Two hundred fifty-five acres lie in the Upper Wells/Mousam River expansion area, which includes five small segments surrounded by or adjacent to the refuge or its approved acquisition boundary. Those segments will improve the management capabilities of the refuge for a multitude of wildlife species. Habitats include freshwater wetland, forested wetland, bog, upland forest, grassland, shrubland, and tidal stream. Those fulfill the needs at various life cycle stages for such key federal trust resources as American black duck, Louisiana waterthrush, bobolink, American woodcock, blue-winged warbler, alewife, and wood thrush, among others.

Moody—21 acres

Twenty-one acres owned by one landowner lie in the Moody expansion area. They provide additional buffer for refuge lands to the south and east. That acreage is primarily grassland, and has been cooperatively managed for more than 12 years by the landowner and the refuge to maintain habitat for bobolink and other grassland species of concern.

Little River—728 acres

Seven hundred twenty-eight acres lie in the Little River expansion area. They abut the proposed Biddeford expansion area, and are roughly defined along Route 9 south from the Little River to the Biddeford/Kennebunkport line, then northwest along the town line, then northeast back to the Little River. Their habitats include early successional grassland and shrubland, high-quality wetland (forested wetland, pocket swamp, vernal pool), river, and mixed upland forest. This area is a state focus area of ecological significance, because of its high concentrations of wetlands and rare plants and animals. Those habitats fulfill the needs at various life cycle

stages for such key focal species as bobolink, willow flycatcher, wood thrush, American woodcock, prairie warbler, alewife, Blanding's turtle, and New England cottontail.

III. Status of Resources to be Protected

Our Gulf of Maine Program mapped valuable habitats for federal-listed endangered or threatened species, declining migratory songbirds, shorebirds, waterfowl, and anadromous fish in southern Maine and throughout the U.S. portion of the Gulf of Maine watershed (USFWS unpublished data). That analysis guided our proposed expansion of the refuge acquisition boundary. About 34,000 acres encompass the lands with the highest value for wildlife in 12 towns in southern Maine.

We initially investigated acquiring approximately 25,800 acres, or 75 percent of those lands with the highest wildlife value, by purchasing fee title or conservation easements. We subsequently refined that land protection to focus on the wildlife habitats of highest value on 5,558 acres adjacent to the approved refuge acquisition boundary, and a new division encompassing the wildlife habitat of highest value in the York River watershed. We selected that subset of lands based on their highest aggregate habitat values and their conservation potential, given their parcel sizes.

The land acquisition we propose will benefit the quality of life in the communities around the refuge. The rapid growth of urban sprawl is a leading factor in the decline of quality of life in the region. Southern Maine's coastal areas continue to face numerous threats and pressures. Those include the development of permanent and seasonal camps, homes, and other structures, recreational boating and kayaking, the presence of humans during waterbird nesting seasons, unleashed pets, and the exploitation of cultural resources. Sources of pollution include septic systems, animal waste, urban runoff, construction, agricultural chemicals, logging, mining, hazardous material spills, sand and gravel extractions, junk yards, landfills, litter, and debris. The growing human population exacerbates those stresses, which accumulate over time.

Threats to refuge fish and wildlife resources will come primarily from outside the refuge boundaries, through increased boating, non-point source pollution runoff, nutrient loading and habitat fragmentation. To ensure that we maintain the quality of the refuge environment, and people continue to experience quality visits, we will restrict public use to specific sites and well-marked trails. Service acquisition of these lands will minimize those threats, and accomplish the goals and objectives of many national and regional conservation plans or initiatives.

❖ Land Conservation Partners

We will expand our partnerships with such state agencies as the Maine Department of Inland Fisheries and Wildlife, Parks and Conservation, and the Land for Maine's Future on prioritizing, conserving, and managing high-value wildlife habitats. We will expand our partnerships with land trusts in the 12 towns neighboring the refuge and non-governmental organizations, including The Nature Conservancy, Maine Audubon Society, The Trust for Public Land, the Maine Coast Heritage Trust, and the Friends of Rachel Carson Refuge. We will also assist local communities in identifying parcels that support important trust resources for conservation.

❖ Habitat Suitability Model

We used the Gulf of Maine Program Habitat Suitability Model to define the proposed expansion boundary for the refuge. The model is also a valuable planning tool for other conservation partners, including the Wells National Estuarine Research Reserve. We mapped the habitats of 43 endangered species, migratory birds (including non-game birds of management concern, shorebirds, and waterfowl), and migratory (inter-jurisdictional and anadromous) fishes. Then we combined those individual maps to identify areas with high richness and habitat quality for those evaluation species. We also mapped large, contiguous areas of undeveloped land and protected land in the study area.

For our analysis, we selected a subset of the federal "trust species": those with seriously reduced populations nationwide, in the Gulf of Maine watershed, or in the State of Maine. We included trust species if they were known to appear in the study area more than occasionally, and were (1) federal-listed as threatened or endangered,

or (2) state-listed by two of the three states in the Gulf of Maine watershed, or (3) state-listed by Maine, or (4) experiencing persistent, long-term declines in populations over much of their U.S. range.

We used the biological survey information to identify habitats and test certain habitat maps derived from the models. We developed simple habitat models, similar to the Service habitat suitability index models, for use in our GIS. For each species, that development included review of the literature and discussions with experts to identify and estimate the relative suitability of such habitat features as land cover types, water depths, or soil types. The suitability of each factor was expressed as an index ranging from 0 (least suitable) to 1.0 (most suitable), relative to conditions available in southern Maine.

Those models compute habitat suitability according to how the type or level of each environmental factor corresponded to the preferred conditions. Thus, the identification of habitat depends on the accuracy of both the models and the environmental base maps to which the models are applied. We used the draft models to produce habitat maps for all 43 species, 16 of which had multiple coverages (e.g., roosting and feeding; reproducing and wintering). To interpret that complex array of data, we produced a composite coverage that included habitat information for all species.

The composite displayed the overall range of habitat values regardless of the underlying land cover type. To display habitat value by cover type (e.g., show the relatively highest value grasslands, or the highest value forested areas) we made composites of habitat scores for each of four major land cover classes: (1) grass, shrub, and bare land; (2) forest; (3) freshwater aquatic and fresh emergent wetlands; and (4) saltwater, estuarine and saline emergent wetlands, so that we could select highly scored examples of one or all cover classes.

For our preferred alternative in the draft CCP, we derived subsets of those areas with the highest aggregate habitat values that offer ecological diversity and conservation potential based on the extent of the tracts.

❖ **Links to Recovery Plans and Other Conservation Initiatives**

Piping Plover Recovery Plan (USFWS 1996)

The primary objectives in this recovery plan are to achieve well-distributed increases in plover numbers and productivity and provide long-term protection for breeding and wintering plovers and their habitats. The approved refuge acquisition boundary includes multiple nesting beaches for the federal-listed threatened piping plover on the Upper Wells, Goose Rocks, and Goosefare Brook divisions. The Mousam River Division provides additional areas for foraging. The expanded acquisition boundary does not include piping plover nesting habitats, but would protect foraging grounds and provide additional buffers for the nesting areas. Protecting these lands from development also protects the water quality and high-value estuarine systems plovers require.

Northern Bald Eagle Recovery Plan (USFWS 1983)

The primary objective in this recovery plan is to re-establish self-sustaining populations of bald eagles throughout the northern states, including Maine. Our proposal supports that objective by providing roosting, perching and feeding areas for migratory bald eagles in all 10 divisions and the proposed York River Division.

Roseate Tern Recovery Plan (USFWS 1998)

The primary recovery objective in this plan is to increase the northeast nesting population of the federal-listed endangered roseate tern to 5,000 breeding pairs. That total should include at least six large colonies with high productivity. A large colony consists of at least 200 nesting pairs. The roseate tern population in Maine is considered one large colony, with a record high of 289 pairs in 2001. We are striving to expand their geographic distribution and increase their nesting population in Maine. The refuge holds conservation easements on several parcels in the Crescent Surf Beach and Parsons Beach area in the Upper Wells Division that support the loafing, feeding and staging of roseate terns.

New England Cottontail

This candidate species for federal listing appears year-round on the refuge and surrounding lands. Our land protection proposal includes early successional habitat to be managed for large blocks of thicket habitat to benefit

New England cottontail. We think the primary reason for that species' steep decline is the lack of thicket habitat in blocks larger than 15 to 20 acres.

Partners in Flight (PIF) Plan for Physiographic Area 9 (Dettmers and Rosenberg 2000) and Bird Conservation Region 30 priorities (2004, unpublished data)

The PIF Area 9 plan identifies bird species of conservation concern in the southern New England physiographic area. The refuge lies at the northernmost extent of that physiographic area. Its priority habitats include maritime marshes, beaches and dunes, mature hardwood forests, shrublands, pitch pine barrens, and grasslands. Forest fragmentation, urbanization, and human use severely threaten them. We propose their protection for the benefit of species for which our region has high conservation responsibility.

Saltmarsh

Our land protection proposal supports protecting this priority habitat by acquiring salt marsh and its critical surrounding upland. The threats to this habitat and the wildlife species associated with it include pollution, human disturbance, sea-level rise, invasive species, and predation. Enhancing the protection of salt marsh habitat will benefit PIF priority species, including salt marsh sharp-tailed sparrow and American black duck. Salt marsh sharp-tailed sparrows and Nelson's sharp-tailed sparrows both breed in salt marshes in the refuge. Egrets, ibises, and herons use them extensively as foraging sites while breeding or migrating. Ospreys and northern harriers forage in refuge marshes during migration. Those marshes also provide critical feeding, migrating, wintering and, to a lesser extent, breeding habitat for the American black duck. The salt marsh along the York River will help protect aquatic habitat for the American eel, alewife, and other fish species.

Mature Mixed Forest

Our plan protects larger blocks of unfragmented, mature, mixed forest. Forest fragmentation is one of the largest threats in PIF Area 9. Protecting the remaining forested blocks is suggested for halting the decline of many of their priority bird species. The following PIF priority birds will benefit: rose-breasted grosbeak, Baltimore oriole, veery, scarlet tanager, wood thrush, black-and-white warbler, hairy woodpecker, black-billed cuckoo, blackburnian warbler, and eastern wood-pewee.

Early Successional Shrub/Grassland/Pitch Pine

Our proposal will increase our shrubland management capability and enable us to create and maintain shrubland habitats for the following priority bird species in PIF Area 9: American woodcock, prairie warbler, eastern towhee, and whip-poor-will. Those species need management to stabilize or reverse declines in their populations. Shrubland habitat also supports breeding populations of New England cottontail on the refuge. The lands we propose for protection include grassland and other open habitats. The PIF Area 9 plan recommends the identification, protection, and management of large grasslands such as those to reverse the decline of such grassland birds as the bobolink in the Northeast.

Beaches/Dunes

The lands we included in our land protection proposal do not include beach or dune systems. Many of the beaches are in town, state, or federal ownership. The remaining beaches generally are developed and in private ownership. However, our land protection proposal does include buffers of maritime marsh and salt marsh that in turn protect water quality and quantity in the tidal rivers and estuaries. Good water quality in those estuarine ecosystems is important for piping plovers, least, common, and roseate terns, and American oystercatchers.

Freshwater Wetlands

Forested freshwater wetlands and emergent marsh are conserved in this land protection proposal, benefiting the American black duck, American bittern, great blue heron, and Blanding's turtle.

North Atlantic Regional Shorebird Conservation Plan (2000)

The goals in this plan include maintaining or enhancing "current or historic population levels and diversity of shorebirds" and protecting or managing "sufficient area of high priority habitats to support current populations

of breeding, migrating and wintering shorebirds.” Our proposal protects breeding habitat for the American woodcock, piping plover, willet, common snipe and killdeer; and migratory habitat for the semipalmated plover, semipalmated sandpiper, greater yellowlegs, and others.

North Atlantic Waterfowl Management Plan (2004)

The 2004 update for this plan identifies 14 waterfowl priorities for BCR 30. Our land protection proposal provides important breeding, migrating and wintering grounds for the American black duck, wood duck, and mallard. Another nine species benefit from protected migrating, foraging and wintering grounds: the common eider; greater scaup, lesser scaup, black scoter; common goldeneye, long-tailed duck, surf scoter, white-winged scoter; red-breasted merganser, and the Atlantic breeding population of Canada goose.

North American Waterbird Conservation Plan (2002)

This plan identifies 55 priority species of concern in North America. Our proposal supports that plan’s species and population goals for the sustainable distribution, diversity, and abundance of waterbirds throughout North America and for restoring populations of priority species, including those in decline. Our proposal will also support that plan’s habitat goal to secure, maintain, and enhance sufficient high-quality habitat throughout the year to achieve and maintain sustainable populations of waterbirds throughout North America.

Our protection plan benefits 12 waterbird species of conservation concern, including breeding habitat for the least tern, a species of high concern. It also provides salt marsh protection for migrating and summer foraging habitat for immature and mature little blue herons, the snowy egret, tricolored heron, and roosting and staging habitat for the roseate tern. For species of moderate concern, our plan provides foraging habitat for Bonaparte’s gull, black-crowned night-heron, common tern, and great cormorant.

Maine Department of Inland Fisheries and Wildlife (MDIFW) Species Assessments and Management Plans

The MDIFW has developed species assessment and management plans for wild turkeys, migratory shorebirds, passerines, ruffed grouse, woodcocks, common eiders, waterfowl, bald eagles, peregrine falcons, piping plovers, black racers, Blanding’s turtles, grasshopper sparrows, spotted turtles, moose, deer, coyotes, river otters, snowshoe hares, beavers, minks, bobcats, raccoons, muskrats, red foxes, woodchucks, gray foxes, and short-tailed and long-tailed weasels. Our proposal conforms to those plans by supporting permanent habitat protection for those species.

Shortnose Sturgeon Recovery Plan (1998)

The recovery objective in this plan is to recover populations to levels of abundance at which they no longer require protection under the Endangered Species Act. For each population segment, the minimum population size will be large enough to maintain genetic diversity and avoid extinction. The York River supports potential, high-quality habitat for the shortnose sturgeon, which probably once lived in the river. Although no sturgeons recently have been documented in the York River, it can serve as a recovery site as the recovery plan is implemented.

IV. Our Proposed Action

With the support of our conservation partners, we will acquire 5,558 acres of land from willing sellers. We believe that acreage represents a realistic objective over the next 15 years, given our past rate of acquisition. We will continue to cooperate with the state and those partners in seeking ways to protect the remaining 28,442 acres (of the 34,000 acres of priority lands) of land that supports important trust resources and can accommodate priority public uses. We may participate in managing some of those lands, but we do not anticipate the need for the Service to acquire them.

Maps A–1 through A–6 and associated tables A2.1 through A2.7 show our proposed expansion areas. The tables list map lots by division and provide other information we thought would be of interest, including

- Town
- Map number

- Current ownership: public or private, non-governmental organization (NGO), Coast Guard (CG) or Navy
- Acreage
- Service priority for acquisition
- Proposed acquisition method

Most of the parcels that support nationally significant trust resources in our proposal are privately owned. We placed each parcel in one of two priorities for acquisition: Priority 1 or Priority 2. We identified 3,347 acres as Priority 1. Those are either unacquired parcels in our currently approved acquisition boundary, or lie immediately adjacent to that boundary.

We identified 2,211 acres as Priority 2. Those are parcels that lie within the proposed York River Division.

We will use those priorities only when two parcels are available for acquisition, and we have funding to purchase only one. Those priorities do not reflect a landowner's preference to sell the land. Because Service policy is to acquire land only from willing sellers, the actual order of land acquisition will be based on availability.

❖ **York River Division**

The York River is located in the southern third of York County, and traverses its width. The York River watershed is an area of concern in southern Maine. The Mt. Agamencus to the Sea Initiative involves many local and state land trusts in the cooperative protection of this area. We identified areas of the York River that support federal trust resources, and will partner with conservation groups in protecting them. That area lies adjacent to and west of U.S. Route 1 and the Maine Turnpike, and is bounded by the Town of York and the Atlantic Ocean to the east. The York River system contains substantial, undeveloped expanses of salt marsh reaching from the sea inland past the Maine Turnpike. The land valuable to wildlife includes contiguous and disjunct fingers of salt marsh along the main channel and tributaries of the river.

The proposed new division and most of the other division expansion areas are composed of about 60 percent tidal marsh (creek, flat, emergent wetland, field). The remaining lands consist mostly of forest. Elevation rises from sea level to 11 feet above sea level. The wetlands and adjacent uplands provide the most valuable wildlife habitat. The target habitat is high salt marsh dominated by cordgrass and needle rush.

The forest community includes lowland red maple, pitch pine, stands of white pine-red oak, and small tracts of shrublands, grasslands, freshwater wetlands, and uplands. Those occur on sandy soils and rocky slopes adjacent to the shores. The dominant trees are red and white oak, although white pine, pitch pine, and red maple are also present. Patches of huckleberry, lowbush, and velvet-leaf blueberry grow in moist hollows. Hemlock mixes with an understory of gray birch. Other understory shrubs include beaked hazelnut, witch hazel, and wild raisin. Canada mayflower, bunchberry, starflower, and teaberry are common herbs in this natural community.

The riverine system meanders more than 10 miles through low marshes and gently sloping banks. The salt marsh and protected shores benefit migratory birds. Waterfowl, particularly black ducks, use the tidal river and salt marsh during migration. The winding, protected river is especially important as habitat for black ducks in harsh weather. Other abundant species include Canada goose, mallard, bufflehead, red-breasted merganser, and common goldeneye. Most puddle ducks use the salt pannes and the upper reaches of tidal creeks, while diving ducks prefer the deeper parts of the tidal creeks and the mouths of rivers and streams.

Greater and lesser yellowlegs, semipalmated and least sandpipers, and black-bellied and semipalmated plovers forage on the tidal river mudflats. Commercially and recreationally important finfish and shellfish rely on the salt marsh as nursery habitat, including the American eel, alewife, and rainbow smelt.

The New England cottontail, a species petitioned for listing under the Endangered Species Act, inhabits several of the shrubland borders of the tributaries of the York River. Those pockets of thicket habitat also provide habitat for the American woodcock, prairie warbler, and chestnut-sided warbler. Protecting that habitat will also benefit the saltmarsh sharp-tailed sparrow, a species of top conservation priority in Partners in Flight Planning Area 9,

Protection Options Considered

a species of Continental Importance in the Eastern Avifaunal Biome, and one designated in need of immediate conservation action.

Various northern bird species winter in the area, and it is also important to a variety of migratory passerines, shorebirds, wading birds, gulls, terns, and raptors. Virginia and sora rails are present, and grouse, pheasants, and turkeys use the area. Northern harriers breed in the estuary communities, and Cooper's and broad-winged hawks nest in the upland forest. Infrequently during the winter, bald eagles stay in parts of the area, where they feed primarily on herring gulls and black ducks. Rough-legged hawks, northern harriers, and sharp-shinned hawks hunt over the salt marshes in winter. Short-eared, great horned, and snowy owls feed on small mammals and birds in the salt marsh during winter. Great horned, barred, and northern saw-whet owls are fairly common throughout the area, but only great horned owls have been confirmed as nesters.

Commercially and recreationally important finfish and shellfish species that rely on coastal wetlands for important nursery areas will also benefit, including the American eel and alewife. A rich assemblage of mammals, including deer, river otters, minks, striped skunks, raccoons, red foxes, moose, fishers, gray foxes, beavers, porcupines, snowshoe hares, New England cottontails, and other small mammals live in the York River watershed. Our proposed new division will provide continued, wildlife-dependent recreation, including wildlife observation and waterfowl and deer hunting.

V. Protection Options Considered

The following discussion identifies the protection options that are available to us. We evaluated each of them before developing our proposed action, which we present in detail in attachments 1 and 2. Our policies are to acquire only the minimal interest necessary to meet refuge goals and objectives, and to acquire land only from willing sellers. We believe our proposed action is a cost-effective way of providing the minimal level of protection needed to meet those objectives, given the information now available to us. However, as lands become available in the future, changes in their protection options may be warranted to ensure we are using the best option at that time.

❖ Option 1. No Service Acquisition; Protection by Others

Under option 1, we will maintain present refuge acquisition boundaries, and will not expand the refuge or protect additional lands. However, we will continue to purchase the lands within the approved land acquisition boundary through fee title or conservation easement. Our draft CCP/EA evaluates this "no new acquisition" option in alternative A.

Under that option, we will cooperate with such state agencies as the Maine Department of Inland Fisheries and Wildlife, State Parks, and Conservation and the Land for Maine's Future, as well as land trusts in our 12 neighboring towns, national non-government organizations such as The Nature Conservancy, Maine Audubon Society, The Trust for Public Land, Maine Coast Heritage Trust, and Friends of Rachel Carson Refuge to support their land protection and management programs of mutual interest and benefit to the Service.

Our concern with this option is that, although ownership by those groups affords some level of protection, they often do not have the financial or administrative resources to buy all the significant lands, nor can they actively manage the lands as needed to protect priority species. Without our contribution to land protection, many of the lands we identified would likely be developed. Conservation groups and the public have stated that Service acquisition and management is vital for ensuring the long-term protection of nationally significant lands that support trust resources.

In summary, we do not propose to use option 1 because

- It would not adequately protect federal trust resources on the refuge;
- It does not support the refuge vision, goals, and objectives; and

- It is not supported by the state or the majority of the public, our partners, or elected officials.

❖ **Option 2. Less-than-Fee Acquisition by the Service**

In option 2, we will protect and manage lands by purchasing only a partial interest, typically in the form of a conservation easement. That option keeps the land in private ownership, while allowing the refuge some control over its use. We will negotiate with each landowner the extent of the rights we are interested in buying. Those may vary, depending on the configuration and location of the land, the current extent of development, the nature of wildlife activities nearby, the needs of the landowner, and other considerations. Attachment 2 identifies the parcels that we propose to acquire through conservation easements.

Easements are most appropriate for use when

- The parcel is large, only minimal management of the resource is needed, and development is the greatest threat;
- The landowner wants to maintain ownership; or
- Only a portion of the parcel contains lands of interest to the Service.

❖ **Option 3. Full Fee Simple and Less-than-Fee Acquisition by the Service**

In option 3, we will use a combination of full fee simple and less-than-fee acquisition, the latter in the form of conservation easements. We propose to acquire 237 parcels totaling 1,240 acres in full fee simple and 106 parcels totaling 4,318 acres via easement. This option provides us the utmost flexibility in managing priority parcels, and ensures the permanent protection of nationally significant federal trust resources. Generally, the lands we buy require active management. We propose fee acquisition when adequate land protection is not ensured under other ownerships, or active land management is required, or the parcel is too small to sell a conservation easement. Attachment 2 identifies, parcel by parcel, what we propose to acquire in full fee simple and through conservation easements.

We should also note that as future transactions progress, a conservation easement could be converted to full fee simple acquisition: for example, when an owner is interested in selling the remainder of interest in the land; or when changes in zoning or land use regulation compromise resource values; or, when our management objectives change so that more active management is necessary to meet refuge goals and objectives. We will evaluate that need on a case-by-case basis.

VI. Acquisition Methods

We may use four methods of acquiring either a full or a partial interest in the parcels identified for Service acquisition: (1) fee purchase (e.g., complete title, or a partial interest like a conservation easement); (2) donation; (3) exchange; or (4) transfer.

❖ **Purchase**

Fee purchase involves buying a full (fee simple) or partial interest (conservation easement) in land from willing sellers as our funding permits. Fee simple ownership assures the permanent protection of resources, and allows the complete control necessary for managing habitat, providing public use opportunities, and managing public access. Conservation easements will ensure the permanent protection of resources and allow the minimum control necessary for management activities. Generally, we purchase at least the development rights, and possibly, the ability to control access during the nesting season.

A conservation easement refers to the purchase of limited rights (less-than-fee) from a willing landowner. That landowner retains ownership of the land and sells certain rights to the Service, after agreement by both parties. Easements are property rights, and are usually perpetual. If a landowner later sells the property, the easement

continues as part of the title. Properties subject to easements generally remain on the tax rolls, although the assessment may be reduced by the reduction of market value if the town gives the landowner a tax abatement for that easement.

Much of our funding to buy land in either fee or conservation easement comes from the Land and Water Conservation Fund, which is composed of certain user fees, proceeds from the disposal of surplus federal property, the federal motor boat fuels tax, and oil and gas lease revenues. About 90 percent of that fund now derives from Outer Continental Shelf oil and gas leases. Another source of funding is the Migratory Bird Conservation Fund, which derives from Federal Duck Stamp revenue. We plan to use primarily the Land and Water Conservation Fund to purchase the land our proposal identifies.

❖ **Donation**

We generally encourage donations in fee title or conservation easement for lands, provided that such management concerns as contaminants are not major issues. We are not aware of any present opportunities to accept donations.

❖ **Exchange**

We have the authority to exchange land in Service ownership for other land that has equal or greater wildlife habitat value. Inherent in that concept is the requirement to get dollar-for-dollar value, occasionally by an equalization payment. Exchanges are attractive because they usually do not increase federal holdings or require purchase funds. However, they also may be very labor-intensive, and take a long time to complete. We are not aware of any present opportunities for an exchange.

❖ **Transfer**

Transfers may occur in the future, as lands become excess to the needs of other federal agencies; however, we are not currently aware of any opportunities.

VII. Service Land Acquisition Policies

Once our Director approves a new refuge acquisition boundary, we contact affected landowners to determine if they are interested in selling their properties. If an owner expresses an interest in selling, a real estate appraiser will appraise that property to determine its market value. Once appraisals have been completed and funding becomes available, we can present an offer for the landowner's consideration. Unless sold, donated, or transferred to the Service, lands within the approved acquisition boundary do not automatically become part of the refuge.

The Service, like other Federal agencies, has the power of eminent domain. We rarely use that approach, because our established policy is to work with willing sellers as funds become available. On rare occasions, we have used eminent domain, or condemnation, to clear title on unknown ownerships or to establish value. Our proposal assumes the continuation of our long-standing, willing-sellers-only policy.

Appraisals are conducted by Service appraisers or private appraisers under contract to the Service, and must meet federal as well as professional standards. We are required by law to appraise properties at market value, based on comparable sales of similar properties.

A landowner may choose to sell land to the Service in fee simple, but retain the right to occupy an existing residence, referred to as a "life-use reservation." As that name implies, life-use reservations apply to the seller's lifetime, but they can also apply to a specific number of years. After the appraisal is approved, and before making the offer, we would discount from the appraised value of the buildings and land the value for life use, based on the age of the owner and the term of the reservation. The occupant would be responsible for the upkeep on the reserved premises.

VIII. Coordination

In 1998, we began to evaluate the need for additional protection at the refuge as part of its CCP. We started an environmental assessment (EA) to study protecting federal trust resources on lands adjacent to the refuge and establishing a new division in the York River watershed, and officially announced our planning in a Notice of Intent in the “Federal Register.”

Effective conservation usually begins with effective community involvement. To ensure that our future management of the refuge will reflect the issues, concerns, and opportunities expressed by the public, we kept updated mailing lists of refuge neighbors, friends, professional contacts, and others for sharing information and updates about the CCP process.

In May and June 1998, refuge staff invited visitors to a series of morning coffees, to discuss current refuge operations and the planning process. We sent four press releases about the CCP to 15 newspapers in Maine and New Hampshire. Local public access cable stations also ran notices. The York County Coast Star, southern Maine’s primary local newspaper, raised public awareness by publishing a long article about our refuge planning. We also designed and distributed leaflets about the morning coffees and our upcoming Issues Workbook.

In summer 1999, we distributed to the public 500 copies of a 12-page issues workbook, the backbone of this plan’s important public participation component. That workbook provided background information about the planning project and a means for interested citizens to share their concerns and thoughts on important refuge issues. A refuge volunteer tallied the responses in the more than 100 workbooks that returned. In July 1999, we sent to our CCP mailing list an update summarizing the responses, and distributed it from the refuge office. Refuge planning team members met several times per month to synthesize information and prepare the CCP, and briefed the Regional Office in September 1999.

We also held several information-gathering workshops in 1999. They included a gathering in March of the extended planning team, a public use and community goals meeting in June, and a biological resources meeting, also in June. Our facilitated, all-day Alternatives Workshop in August gathered 15 stakeholder representatives. Refuge staff and 10 observers, including congressional representatives and Service administrators, assisted the workshop participants in setting goals in the topical areas of wildlife, community, public use, and water quality. We mailed a complete summary of their comments and the materials the workshop generated to participants and observers soon after.

Throughout our draft CCP/EA planning process, we solicited and carefully considered public comments on Service land acquisition. We worked with the MDIFW, statewide conservation organizations, local municipalities, local land trusts and national conservation organizations directly involved in land protection strategies in coastal Maine. Their continuing work will preserve additional federal trust resources. Specifically, the State of Maine helped us develop the Habitat Suitability Model and prioritize lands for Service acquisition.

We prepared a draft LPP to support the land protection proposal in our draft CCP/EA for the refuge. We distributed that draft to affected landowners, our conservation partners, State of Maine and local agencies, and other interested individuals and groups for a 30-day public review and comment period. We also held public meetings during that period.

IX. Socioeconomic and Cultural Impacts

Some say Maine's seacoast is the backbone of the state economy. That is not surprising, as Maine's southern coast and mid-coast regions are growing at a faster rate (1.7 percent between 1990 and 1996) than the state as a whole (0.9 percent between 1990 and 1996), with most of its 1.2 million people living in coastal counties (State Planning Office, 2000). Most certainly, the natural beauty and rich resources of the shore and ocean draw people to the coast.

The refuge contributes directly to the economies of 11 towns in coastal Maine. Since 1966, the Service has paid refuge revenue sharing to counties or towns for the refuge land it administers. Lands acquired by the Service are removed from the tax rolls. However, under the provisions of the Refuge Revenue Sharing Act (16 U.S.C. 715s), the county or other local unit of government receives an annual revenue sharing payment that often equals or exceeds the amount that would have been collected from property taxes if the land had stayed in private ownership. In 2004, the Service paid \$58,019 to communities in Maine for refuge lands. If the Service acquires all the additional lands in this proposal, it would add \$65,000 to Maine communities in refuge revenue sharing, projecting the 2004 distribution rate Congress allocated. This figure does not take into account property tax losses, if any.

Wildlife-dependent uses of the refuge include consumptive and non-consumptive recreational activities. Consumptive activities include sport hunting for waterfowl (including eiders), upland gamebirds, and deer, as well as fishing and shellfishing. Non-consumptive activities include wildlife observation and photography and environmental education and interpretation. This proposal will expand opportunities for hunting, watching, and photographing wildlife, and environmental education and interpretation.

The industries of coastal Maine include lobstering and other commercial fisheries, commercial seabird viewing, other natural resource-based industries such as timber and blueberries, environmental education, aquaculture, real estate and land development. In some areas, such as Route 1 in Wells, the characteristic land use is commercial strip development. In others, such as York Beach, there is extensive primary and secondary residential development. Still others, such as sections along Route 9 in Kennebunkport, are characterized as rural with scattered development, or series of small town or village centers, such as York Harbor, Ogunquit, Kennebunkport, and the historic resort village of Biddeford Pool. Other areas have extensive recreational land uses, theme attractions such as Old Orchard Beach, and recreational beaches such as Scarborough Beach and Ferry Beach. A series of visitor attractions range from York's Wild Kingdom to the Wells National Estuarine Research Reserve. Most of those are outdoor attractions, catering to both local and tourist populations.

The Service routinely reviews and assesses archaeological and historic sites under Section 106 of the National Historic Preservation Act (NHPA), when ground-disturbing activities are likely. A detailed archaeological report, "Rachel Carson National Wildlife Refuge Historic and Prehistoric Archaeological Resource Survey" (1995), is on file at refuge headquarters. It identifies areas of high, moderate, and low or unknown archaeological resource sensitivity.

Our proposal would increase the protection of cultural resources, because refuge lands would not be developed, and because we adhere to the protection requirements of the NHPA. Service ownership would protect known cultural sites against vandalism, and would protect as yet unidentified or undeveloped sites from disturbance or destruction. Our environmental education and interpretation programs will also continue to promote public understanding and appreciation of the area's rich cultural resources. In summary, we do not predict any significant adverse socioeconomic or cultural impacts from our proposed action.



U.S. Fish and Wildlife Service

Land Protection Plan Expansion Areas

Rachel Carson National Wildlife Refuge - Brave Boat Harbor Division Kittery, ME - Map A-1

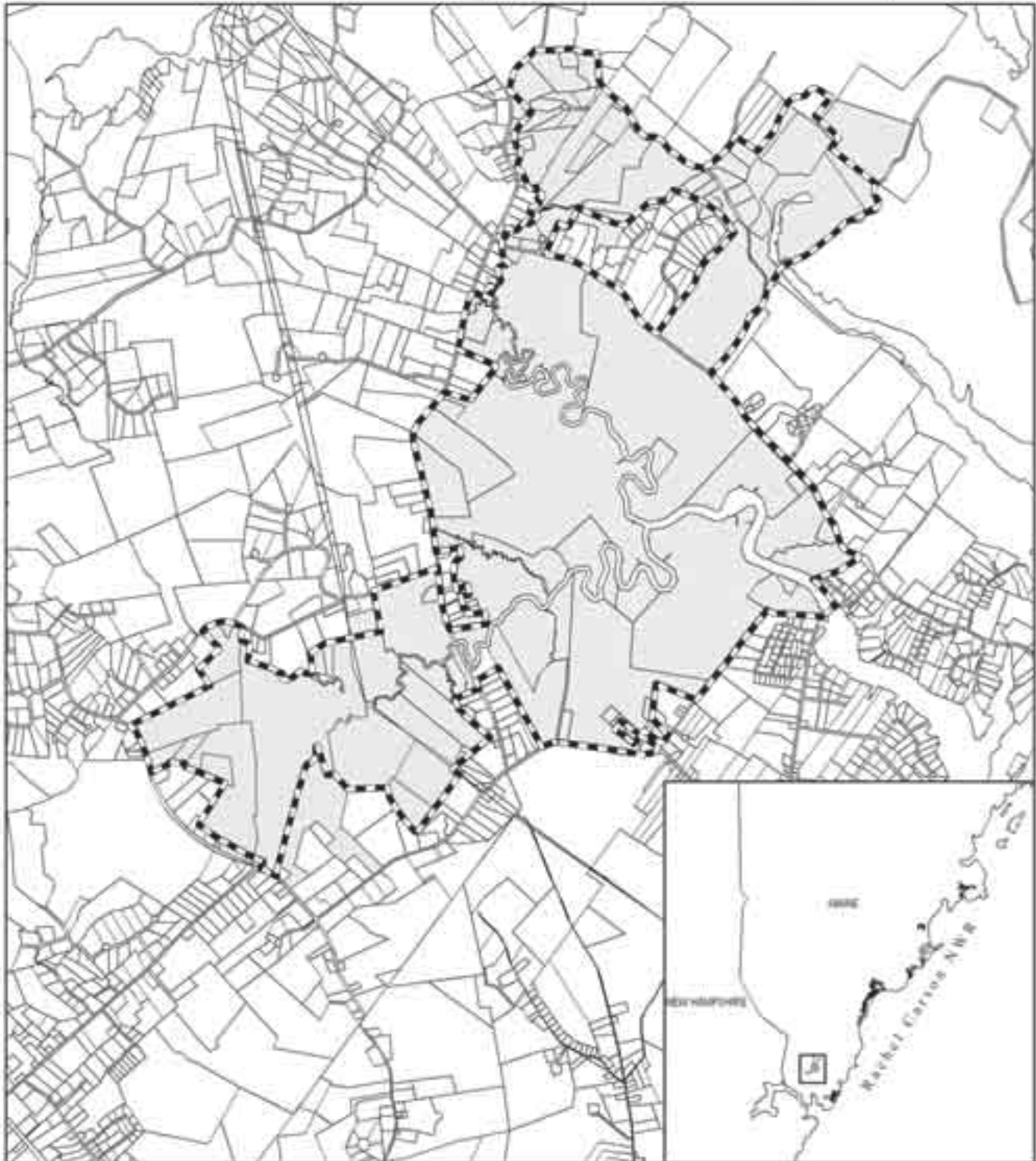




U.S. Fish and Wildlife Service

Land Protection Plan Expansion Shows

Rachel Carson National Wildlife Refuge - York River Division York & Eliot, ME - Map A-2



- LPP Focus Areas
- York, Kittery and Eliot Parcels
- LPP Expansion Parcels



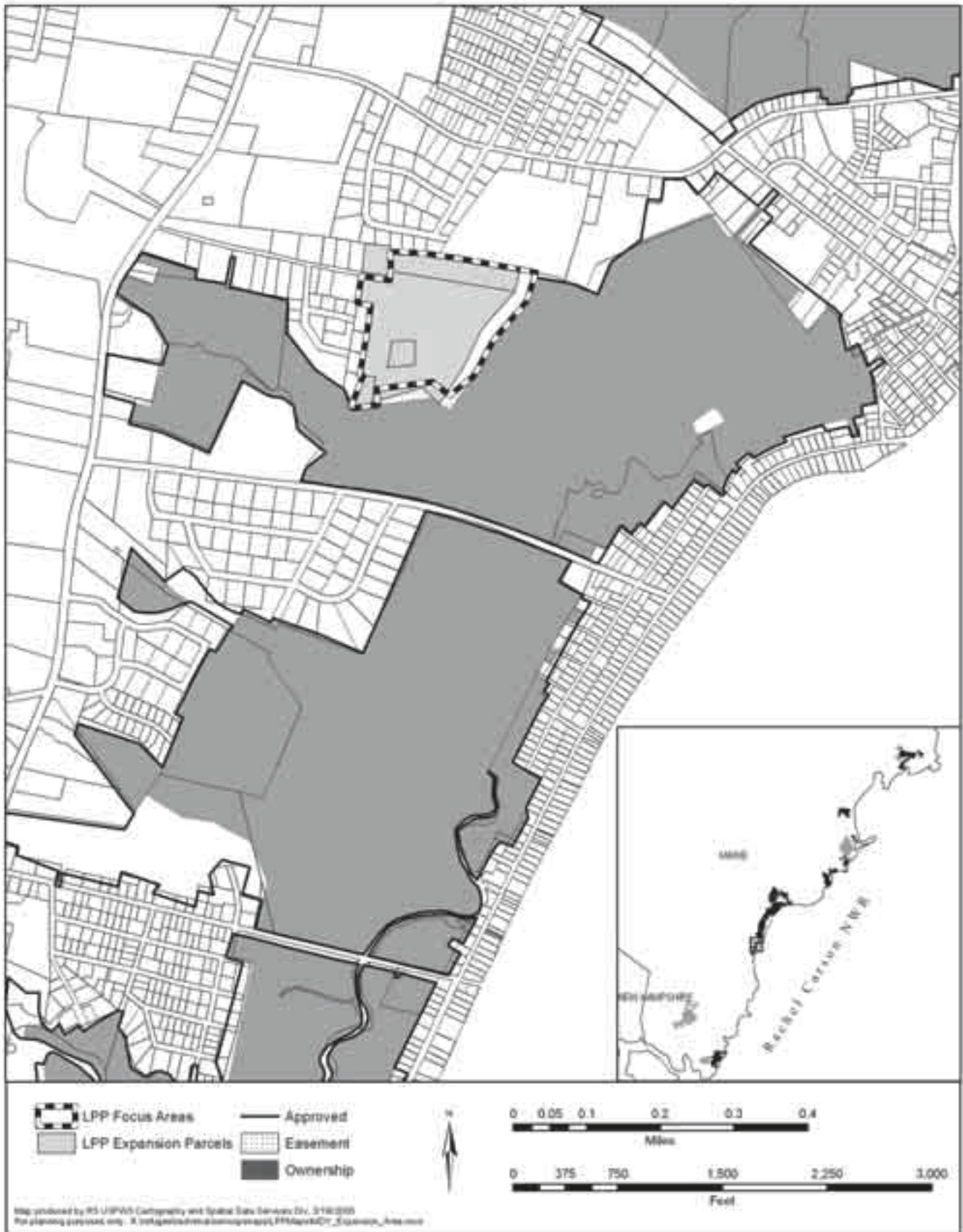
Map produced by RTI LPPMS: Cartography and Spatial Data Services Div. 2009
For planning purposes only. It is not intended for use in legal proceedings.



U.S. Fish and Wildlife Service

Land Protection Plan Expansion Areas

Rachel Carson National Wildlife Refuge - Moody Division - Wells, ME - Map A-3





U.S. Fish and Wildlife Service

Land Protection Plan Expansion Areas

Rachel Carson National Wildlife Refuge - Upper Wells and Mousam River Divisions Wells, ME - Map A-4

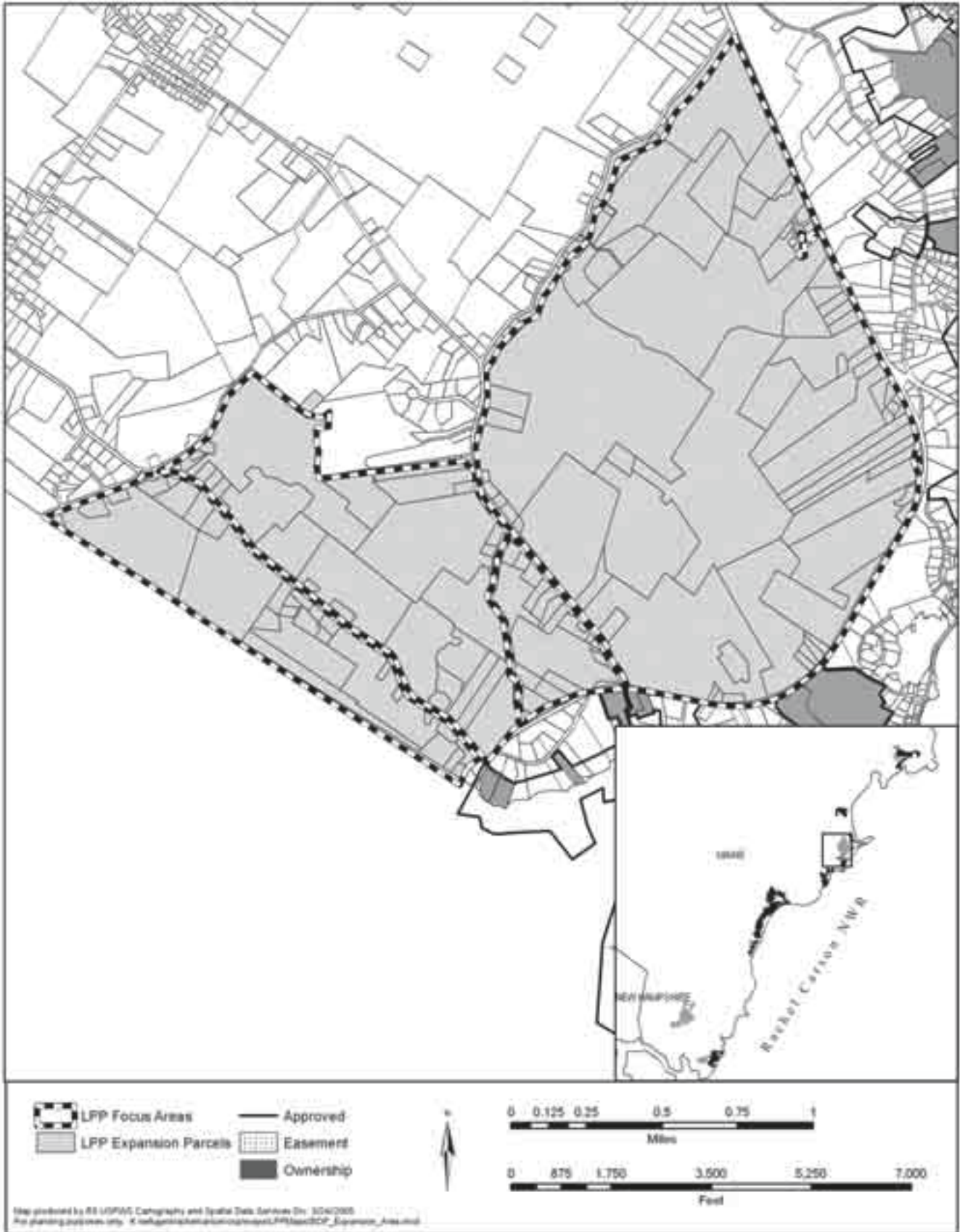




U.S. Fish and Wildlife Service

Land Protection Plan Expansion Areas

Rachel Carson National Wildlife Refuge - Biddeford Pool Division Biddeford, ME - Map A-5





U.S. Fish and Wildlife Service

Land Protection Plan Expansion Area

Rachel Carson National Wildlife Refuge - Spurwink Division Scarborough, ME - Map A-6



Key to Tables

Parcel ID (Map Lot)	Map, block, and lot numbers from town tax maps.
Town	The town where the parcel is located.
Map #	The map in attachment 1 that shows the parcel.
Ownership	All parcels in the proposed acquisition area are privately owned, i.e. owned by individuals, corporations, conservation organizations, etc.
Acres	Estimated acreage for each parcel from our Geographic Information System (GIS) database. This estimate may not exactly match town tax records; some parcels lack detailed information.
Priority 1	Parcels not yet acquired within the currently approved Refuge boundary.
Priority 2	All other parcels in the proposed refuge boundary and the new York River Division.
Acquisition Method	Whether we would pursue acquisition in full fee simple (fee) or a partial fee conservation easement (see discussion in “Acquisition Methods”). We identify what we believe, given the information now available, is the minimal level of Service interest needed for project objectives that are also cost-effective. However, as lands become available in the future, changes may be warranted to ensure we are using the option that best fits the situation at that time and meets our and landowner needs.

Table A2.1. Brave Boat Harbor Division - Kittery

<i>Map Lot</i>	<i>Town</i>	<i>Map #</i>	<i>Ownership</i>	<i>Acres</i>	<i>Priority</i>	<i>Acquisition Method</i>
63,0,29	Kittery	A-1	Private	12.0	1	Easement
63,0,31	Kittery	A-1	Private	8.0	1	Fee
63,0,23	Kittery	A-1	Private	42.0	1	Easement
63,0,32	Kittery	A-1	Private	6.0	1	Fee
63,0,34	Kittery	A-1	Private	8.3	1	Fee
63,0,11A	Kittery	A-1	Private	12.0	1	Easement
56,0,6	Kittery	A-1	Private	9.5	1	Fee
63,0,11	Kittery	A-1	Private	21.0	1	Easement
63,0,27	Kittery	A-1	Private	7.8	1	Fee
56,0,1	Kittery	A-1	Private	40.0	1	Easement
63,0,25	Kittery	A-1	Private	17.0	1	Easement
57,0,24	Kittery	A-1	Private	8.0	1	Fee
57,0,22	Kittery	A-1	Private	19.0	1	Easement
57,0,1	Kittery	A-1	Private	0.0	1	Fee
57,0,4	Kittery	A-1	Private	6.2	1	Fee
57,0,5	Kittery	A-1	Private	8.3	1	Fee
57,0, 20	Kittery	A-1	Private	6.7	1	Fee
57,0,18	Kittery	A-1	Private	7.0	1	Fee
57,0,6	Kittery	A-1	Private	13.6	1	Easement
57,0,11	Kittery	A-1	Private	0.0	1	Fee
57,0,14	Kittery	A-1	Private	1.0	1	Fee
63,0,39	Kittery	A-1	Private	13.8	1	Easement
63,0,28	Kittery	A-1	Private	8.3	1	Fee
63,0,37	Kittery	A-1	Private	10.9	1	Easement
63,0,42	Kittery	A-1	Private	1.2	1	Fee
63,0,31	Kittery	A-1	Private	3.0	1	Fee
63,0,22	Kittery	A-1	Private	1.2	1	Fee
63,0,21	Kittery	A-1	Private	0.7	1	Fee
56,0,9	Kittery	A-1	Private	6.5	1	Fee
56,0,08-1	Kittery	A-1	Private	1.0	1	Fee
56,0,08-2	Kittery	A-1	Private	4.0	1	Fee
43,0,2	Kittery	A-1	Private	26.7	1	Easement
63,0,15	Kittery	A-1	Private	3.4	1	Fee
63,0,25-1	Kittery	A-1	Private	2.8	1	Fee
63,0,3	Kittery	A-1	Private	3.3	1	Fee
42,0,18	Kittery	A-1	Private	4.6	1	Fee
63,0,4	Kittery	A-1	Private	4.1	1	Fee
42,0,24	Kittery	A-1	Private	2.0	1	Fee
42,0,16	Kittery	A-1	Private	1.4	1	Fee
57,0,8	Kittery	A-1	Private	6.2	1	Fee

Table A2.2. York River Division - York

<i>Map Lot</i>	<i>Town</i>	<i>Map #</i>	<i>Ownership</i>	<i>Acres</i>	<i>Priority</i>	<i>Acquisition Method</i>
218-057	York	A-2	Private	3.134	2	Fee
218-055	York	A-2	Private	6.452	2	Fee
218-059	York	A-2	Private	13.510	2	Easement
218-061	York	A-2	Private	10.241	2	Easement
218-060	York	A-2	Private	3.008	2	Fee
218-135	York	A-2	Private	25.143	2	Easement
218-063	York	A-2	Private	3.013	2	Fee
218-062	York	A-2	Private	3.051	2	Fee
218-064	York	A-2	Private	3.378	2	Fee
402-003	York	A-2	Private	54.458	2	Easement
218-133	York	A-2	Private	0.701	2	Fee
401-065	York	A-2	Private	5.857	2	Fee
218-131	York	A-2	Private	8.217	2	Fee
218-065	York	A-2	Private	6.255	2	Fee
218-068	York	A-2	Private	3.003	2	Fee
218-066	York	A-2	Private	3.025	2	Fee
401-067	York	A-2	Private	25.156	2	Easement
218-127	York	A-2	Private	0.360	2	Fee
218-125	York	A-2	Private	33.029	2	Easement
218-073	York	A-2	Private	17.642	2	Easement
401-069	York	A-2	Private	12.246	2	Easement
218-129	York	A-2	Private	5.090	2	Fee
218-067	York	A-2	Private	0.772	2	Fee
218-069	York	A-2	Private	3.440	2	Fee
218-123	York	A-2	Private	34.871	2	Easement
401-055	York	A-2	Private	5.656	2	Fee
402-001	York	A-2	Private	55.006	2	Easement
218-071	York	A-2	Private	0.979	2	Fee
401-053	York	A-2	Private	3.664	2	Fee
219-061	York	A-2	Private	3.165	2	Fee
219-063	York	A-2	Private	3.428	2	Fee
401-071	York	A-2	Private	3.820	2	Fee
219-027	York	A-2	Private	3.747	2	Fee
218-096	York	A-2	Private	8.812	2	Fee
218-111	York	A-2	Private	12.851	2	Easement
219-049	York	A-2	Private	80.606	2	Easement
218-093	York	A-2	Private	3.936	2	Fee
219-051	York	A-2	Private	8.123	2	Fee
218-089	York	A-2	Private	1.419	2	Fee
218-091	York	A-2	Private	1.840	2	Fee
215-040	York	A-2	Private	1.719	2	Fee
215-067	York	A-2	Private	91.363	2	Easement
215-069	York	A-2	Private	188.934	2	Easement
215-049	York	A-2	Private	1.900	2	Fee

Attachment 2. Land Ownership Information for Proposed Acquisitions

Table A2.2. York River Division - York (continued)

<i>Map Lot</i>	<i>Town</i>	<i>Map #</i>	<i>Ownership</i>	<i>Acres</i>	<i>Priority</i>	<i>Acquisition Method</i>
215-051	York	A-2	Private	8.452	2	Fee
215-053	York	A-2	Private	12.398	2	Easement
215-055	York	A-2	Private	4.836	2	Fee
215-065	York	A-2	Private	221.558	2	Easement
215-063	York	A-2	Private	3.898	2	Fee
207-045	York	A-2	Private	36.285	2	Easement
214-035	York	A-2	Private	43.818	2	Easement
215-071	York	A-2	Private	5.932	2	Fee
207-043	York	A-2	Private	25.126	2	Easement
214-033	York	A-2	Private	2.310	2	Fee
208-045	York	A-2	Private	148.325	2	Easement
214-029	York	A-2	Private	2.998	2	Fee
208-001	York	A-2	Private	19.310	2	Easement
208-005	York	A-2	Private	3.393	2	Fee
208-003	York	A-2	Private	17.414	2	Easement
214-028	York	A-2	Private	17.475	2	Easement
208-017	York	A-2	Private	51.110	2	Easement
208-049	York	A-2	Private	5.661	2	Fee
208-047	York	A-2	Private	11.523	2	Easement
207-041	York	A-2	Private	44.836	2	Easement
214-003	York	A-2	Private	1.835	2	Fee
208-025	York	A-2	Private	12.299	2	Easement
207-042	York	A-2	Private	2.624	2	Fee
208-023	York	A-2	Private	29.170	2	Easement
206-022	York	A-2	Private	0.905	2	Fee
206-019	York	A-2	Private	3.792	2	Fee
206-021	York	A-2	Private	4.438	2	Fee
206-019	York	A-2	Private	9.154	2	Fee
206-009	York	A-2	Private	26.235	2	Easement
206-013	York	A-2	Private	23.302	2	Easement
208-032	York	A-2	Private	1.657	2	Fee
206-049	York	A-2	Private	2.997	2	Fee
208-031	York	A-2	Private	2.087	2	Fee
206-004	York	A-2	Private	3.019	2	Fee
207-039	York	A-2	Private	29.516	2	Easement
401-056	York	A-2	Private	5.233	2	Fee
401-070	York	A-2	Private	4.778	2	Fee
206-047	York	A-2	Private	34.934	2	Easement
208-036	York	A-2	Private	2.145	2	Fee
208-029	York	A-2	Private	2.059	2	Fee
208-035	York	A-2	Private	0.991	2	Fee
208-027	York	A-2	Private	1.983	2	Fee
208-033	York	A-2	Private	2.129	2	Fee
208-034	York	A-2	Private	103.427	2	Easement
406-017	York	A-2	Private	7.904	2	Fee

Table A2.3. York River Division - Eliot

<i>Map Lot</i>	<i>Town</i>	<i>Map #</i>	<i>Ownership</i>	<i>Acres</i>	<i>Priority</i>	<i>Acquisition Method</i>
76,17	Eliot	A-2	Private	1.3	1	Fee
57,0,8	Eliot	A-2	Private	130.0	1	Easement
76,9	Eliot	A-2	Private	3.2	1	Fee
76,10	Eliot	A-2	Private	3.3	1	Fee
66,47	Eliot	A-2	Private	6.9	1	Fee
58,01	Eliot	A-2	Private	116.0	1	Easement
57,5	Eliot	A-2	Private	53.0	1	Easement
66,48	Eliot	A-2	Private	3.6	1	Fee
58,0,3	Eliot	A-2	Private	18.6	1	Easement
56,5	Eliot	A-2	Private	14.6	1	Easement
58,0,2	Eliot	A-2	Private	10.0	1	Easement

Table A2.4. Moody Division - Wells

<i>Map Lot</i>	<i>Town</i>	<i>Map #</i>	<i>Ownership</i>	<i>Acres</i>	<i>Priority</i>	<i>Acquisition Method</i>
00111-014.	Wells	A-3	Private	4.39	1	Fee
00111-015.	Wells	A-3	Private	14.78	1	Easement
00111-015.A	Wells	A-3	Private	0.75	1	Fee
00111-016.2	Wells	A-3	Private	0.58	1	Fee

Table A2.5. Upper Wells and Mousam - Kennebunk

<i>Map Lot</i>	<i>Town</i>	<i>Map #</i>	<i>Ownership</i>	<i>Acres</i>	<i>Priority</i>	<i>Acquisition Method</i>
22 2A	Kennebunk	A-4	Private	49.60	1	Fee
22 103	Kennebunk	A-4	Private	5.22	1	Fee
22 102	Kennebunk	A-4	Private	5.79	1	Fee
21 16	Kennebunk	A-4	Private	17.88	1	Fee
22 101	Kennebunk	A-4	Private	4.38	1	Fee
22 4	Kennebunk	A-4	Private	26.35	1	Fee
22 5D	Kennebunk	A-4	Private	24.62	1	Fee
22 2B	Kennebunk	A-4	Private	7.27	1	Fee
22 5	Kennebunk	A-4	Private	5.09	1	Fee
22 5E	Kennebunk	A-4	Private	5.97	1	Fee
12 3	Kennebunk	A-4	Private	31.84	1	Fee
12 2	Kennebunk	A-4	Private	12.44	1	Fee
22 3	Kennebunk	A-4	Private	3.43	1	Fee
23 1	Kennebunk	A-4	Private	15.56	1	Fee
23 1B	Kennebunk	A-4	Private	5.60	1	Fee
22 1	Kennebunk	A-4	Private	59.79	1	Fee
23 1C	Kennebunk	A-4	Private	20.52	1	Fee
12 12	Kennebunk	A-4	Private	5.59	1	Fee
23 12	Kennebunk	A-4	Private	1.74	1	Fee
23 11	Kennebunk	A-4	Private	1.55	1	Fee
23 13	Kennebunk	A-4	Private	1.58	1	Fee

Attachment 2. Land Ownership Information for Proposed Acquisitions

Table A2.5. Upper Wells and Mousam - Kennebunk (continued)

Map Lot	Town	Map #	Ownership	Acres	Priority	Acquisition Method
12 13	Kennebunk	A-4	Private	10.60	1	Fee
23 14	Kennebunk	A-4	Private	2.12	1	Fee
23 15	Kennebunk	A-4	Private	2.14	1	Fee

Table A2.6. Biddeford Pool Division

Map Lot	Town	Map #	Ownership	Acres	Priority	Acquisition Method
4-56-2	Biddeford	A-5	Private	0.97	1	Fee
4-56-1	Biddeford	A-5	Private	1.74	1	Fee
4-56	Biddeford	A-5	Private	5.07	1	Fee
4-40	Biddeford	A-5	Private	6.68	1	Fee
4-73	Biddeford	A-5	Private	0.63	1	Fee
4-72	Biddeford	A-5	Private	0.88	1	Fee
4-70	Biddeford	A-5	Private	2.99	1	Fee
4-61-9	Biddeford	A-5	Private	1.00	1	Fee
4-61-1	Biddeford	A-5	Private	1.77	1	Fee
4-61-6	Biddeford	A-5	Private	1.06	1	Fee
4-61-5	Biddeford	A-5	Private	3.03	1	Fee
4-61-3	Biddeford	A-5	Private	1.96	1	Fee
4-61-7	Biddeford	A-5	Private	1.21	1	Fee
4-61-8	Biddeford	A-5	Private	1.26	1	Fee
4-61-2	Biddeford	A-5	Private	3.00	1	Fee
4-61	Biddeford	A-5	Private	19.98	1	Easement
4-58-1	Biddeford	A-5	Private	14.99	1	Easement
4-57-1	Biddeford	A-5	Private	0.95	1	Fee
4-58	Biddeford	A-5	Private	0.83	1	Fee
4-57	Biddeford	A-5	Private	34.46	1	Easement
4-53-1	Biddeford	A-5	Private	2.88	1	Fee
4-53	Biddeford	A-5	Private	1.77	1	Fee
9-18	Biddeford	A-5	Private	127.11	1	Easement
5-10	Biddeford	A-5	Private	0.67	1	Fee
5-13-1	Biddeford	A-5	Private	1.41	1	Fee
5-13-4	Biddeford	A-5	Private	104.07	1	Easement
5-13-2	Biddeford	A-5	Private	5.66	1	Fee
5-18	Biddeford	A-5	Private	28.27	1	Easement
5-15	Biddeford	A-5	Private	1.28	1	Fee
4-74	Biddeford	A-5	Private	55.71	1	Easement
4-36-2	Biddeford	A-5	Private	2.95	1	Fee
4-36-3	Biddeford	A-5	Private	2.90	1	Fee
4-36-4	Biddeford	A-5	Private	2.83	1	Fee
4-32	Biddeford	A-5	Private	1.20	1	Fee
4-31	Biddeford	A-5	Private	2.98	1	Fee
4-32-1	Biddeford	A-5	Private	2.03	1	Fee
4-30-1	Biddeford	A-5	Private	2.21	1	Fee
4-30-2	Biddeford	A-5	Private	1.03	1	Fee
4-37	Biddeford	A-5	Private	42.47	1	Easement

Table A2.6. Biddeford Pool Division (continued)

Map Lot	Town	Map #	Ownership	Acres	Priority	Acquisition Method
4-30	Biddeford	A-5	Private	69.16	1	Easement
4-29	Biddeford	A-5	Private	15.84	1	Easement
4-28-1	Biddeford	A-5	Private	8.53	1	Fee
4-75	Biddeford	A-5	Private	3.59	1	Fee
4-74-1	Biddeford	A-5	Private	2.06	1	Fee
4-67	Biddeford	A-5	Private	4.52	1	Fee
4-68	Biddeford	A-5	Private	7.05	1	Fee
4-64	Biddeford	A-5	Private	3.86	1	Fee
4-63	Biddeford	A-5	Private	50.10	1	Easement
4-62	Biddeford	A-5	Private	3.21	1	Fee
4-78	Biddeford	A-5	Private	1.42	1	Fee
4-69	Biddeford	A-5	Private	1.14	1	Fee
4-66-3	Biddeford	A-5	Private	1.95	1	Fee
4-66-1	Biddeford	A-5	Private	1.70	1	Fee
4-66-2	Biddeford	A-5	Private	1.67	1	Fee
4-65	Biddeford	A-5	Private	0.62	1	Fee
4-66	Biddeford	A-5	Private	26.94	1	Easement
4-71-1	Biddeford	A-5	Private	0.41	1	Fee
4-71	Biddeford	A-5	Private	0.80	1	Fee
4-82-5	Biddeford	A-5	Private	1.39	1	Fee
4-82-3	Biddeford	A-5	Private	1.62	1	Fee
4-82-6	Biddeford	A-5	Private	0.95	1	Fee
4-82	Biddeford	A-5	Private	85.68	1	Easement
4-59	Biddeford	A-5	Private	18.08	1	Easement
4-59-1	Biddeford	A-5	Private	0.94	1	Fee
4-39	Biddeford	A-5	Private	0.79	1	Fee
4-59-2	Biddeford	A-5	Private	2.14	1	Fee
4-59-4	Biddeford	A-5	Private	41.00	1	Easement
4-59-3	Biddeford	A-5	Private	29.61	1	Easement
4-48-3	Biddeford	A-5	Private	7.05	1	Fee
4-48-2	Biddeford	A-5	Private	7.11	1	Fee
4-48	Biddeford	A-5	Private	19.67	1	Easement
4-44	Biddeford	A-5	Private	5.74	1	Fee
4-43	Biddeford	A-5	Private	3.59	1	Fee
4-38-3	Biddeford	A-5	Private	1.16	1	Fee
4-38-1	Biddeford	A-5	Private	0.73	1	Fee
4-38-2	Biddeford	A-5	Private	2.93	1	Fee
4-36-1	Biddeford	A-5	Private	2.98	1	Fee
4-36	Biddeford	A-5	Private	2.49	1	Fee
4-26-1	Biddeford	A-5	Private	0.93	1	Fee
4-38	Biddeford	A-5	Private	30.89	1	Easement
4-38-5	Biddeford	A-5	Private	0.62	1	Fee
4-23-1	Biddeford	A-5	Private	1.21	1	Fee
4-24-3	Biddeford	A-5	Private	6.14	1	Fee
4-25-3	Biddeford	A-5	Private	1.39	1	Fee
4-25-9	Biddeford	A-5	Private	1.33	1	Fee
4-25-7	Biddeford	A-5	Private	0.94	1	Fee

Table A2.6. Biddeford Pool Division (continued)

<i>Map Lot</i>	<i>Town</i>	<i>Map #</i>	<i>Ownership</i>	<i>Acres</i>	<i>Priority</i>	<i>Acquisition Method</i>
4-33	Biddeford	A-5	Private	0.78	1	Fee
4-35	Biddeford	A-5	Private	4.89	1	Fee
4-111	Biddeford	A-5	Private	55.76	1	Easement
5-13-5	Biddeford	A-5	Private	3.37	1	Fee
5-11	Biddeford	A-5	Private	0.62	1	Fee
5-15-1	Biddeford	A-5	Private	1.40	1	Fee
5-15-2	Biddeford	A-5	Private	1.27	1	Fee
5-15-3	Biddeford	A-5	Private	1.25	1	Fee
5-27	Biddeford	A-5	Private	0.81	1	Fee
4-25	Biddeford	A-5	Private	205.33	1	Easement
10-25	Biddeford	A-5	Private	3.88	1	Fee
4-112	Biddeford	A-5	Private	3.80	1	Fee
5-23-1	Biddeford	A-5	Private	1.42	1	Fee
5-23	Biddeford	A-5	Private	1.99	1	Fee
5-19	Biddeford	A-5	Private	44.70	1	Easement
5-28	Biddeford	A-5	Private	26.72	1	Easement
5-28-1	Biddeford	A-5	Private	3.67	1	Fee
5-29-1	Biddeford	A-5	Private	7.28	1	Fee
5-29-3	Biddeford	A-5	Private	12.04	1	Easement
5-34-1	Biddeford	A-5	Private	0.82	1	Fee
5-33-1	Biddeford	A-5	Private	2.81	1	Fee
5-39	Biddeford	A-5	Private	1.37	1	Fee
5-40	Biddeford	A-5	Private	30.78	1	Easement
10-45	Biddeford	A-5	Private	3.13	1	Fee
10-46	Biddeford	A-5	Private	2.35	1	Fee
10-47	Biddeford	A-5	Private	2.30	1	Fee
10-48	Biddeford	A-5	Private	2.82	1	Fee
9-18-3	Biddeford	A-5	Private	32.39	1	Easement
9-18-1	Biddeford	A-5	Private	19.28	1	Easement
0-0	Biddeford	A-5	Private	5.66	1	Fee
9-7	Biddeford	A-5	Private	1.02	1	Fee
9-7-1	Biddeford	A-5	Private	1.27	1	Fee
9-10	Biddeford	A-5	Private	17.64	1	Easement
9-11	Biddeford	A-5	Private	1.78	1	Fee
9-14	Biddeford	A-5	Private	13.03	1	Easement
9-15	Biddeford	A-5	Private	54.66	1	Easement
4-23	Biddeford	A-5	Private	11.40	1	Easement
4-28	Biddeford	A-5	Private	14.30	1	Easement
4-28-2	Biddeford	A-5	Private	1.75	1	Fee
4-38-4	Biddeford	A-5	Private	0.70	1	Fee
5-37	Biddeford	A-5	Private	10.64	1	Easement
9-18-2	Biddeford	A-5	Private	31.05	1	Easement
9-7-3	Biddeford	A-5	Private	2.12	1	Fee
9-7-2	Biddeford	A-5	Private	1.31	1	Fee
9-7-4	Biddeford	A-5	Private	6.99	1	Fee
5-35	Biddeford	A-5	Private	17.63	1	Easement

Table A2.6. Biddeford Pool Division (continued)

<i>Map Lot</i>	<i>Town</i>	<i>Map #</i>	<i>Ownership</i>	<i>Acres</i>	<i>Priority</i>	<i>Acquisition Method</i>
5-41	Biddeford	A-5	Private	2.51	1	Fee
4-48-5	Biddeford	A-5	Private	2.26	1	Fee
4-48-1	Biddeford	A-5	Private	4.50	1	Fee
4-48-4	Biddeford	A-5	Private	11.07	1	Easement
4-25-6	Biddeford	A-5	Private	0.86	1	Fee
4-25-8	Biddeford	A-5	Private	0.87	1	Fee
4-25-2	Biddeford	A-5	Private	0.95	1	Fee
4-25-4	Biddeford	A-5	Private	7.40	1	Fee
4-25-10	Biddeford	A-5	Private	4.77	1	Fee
4-25-5	Biddeford	A-5	Private	0.87	1	Fee
4-25-1	Biddeford	A-5	Private	1.43	1	Fee
4-35-1	Biddeford	A-5	Private	60.33	1	Easement
4-24-4	Biddeford	A-5	Private	1.10	1	Fee
5-13-3	Biddeford	A-5	Private	126.35	1	Easement
5-13	Biddeford	A-5	Private	43.74	1	Easement
4-24-1	Biddeford	A-5	Private	0.26	1	Fee
5-38	Biddeford	A-5	Private	21.99	1	Easement
5-29	Biddeford	A-5	Private	36.77	1	Easement
5-29-2	Biddeford	A-5	Private	11.19	1	Easement
5-34-2	Biddeford	A-5	Private	1.51	1	Fee
5-34	Biddeford	A-5	Private	2.32	1	Fee
4-24	Biddeford	A-5	Private	1.75	1	Fee
4-24-2	Biddeford	A-5	Private	8.87	1	Fee

Table A2.7. Spurwink Division

<i>Map Lot</i>	<i>Town</i>	<i>Map #</i>	<i>Ownership</i>	<i>Acres</i>	<i>Priority</i>	<i>Acquisition Method</i>
RO96,0,9	Scarborough	A-6	Private	76.0	1	Easement
RO96,0,5	Scarborough	A-6	Private	47.5	1	Easement
RO96,0,18	Scarborough	A-6	Private	15.0	1	Easement
RO96,0,19	Scarborough	A-6	Private	15.5	1	Easement
RO95,0,5	Scarborough	A-6	Private	12.4	1	Easement
RO95,0,5A	Scarborough	A-6	Private	13.5	1	Easement
RO95,0,6	Scarborough	A-6	Private	31.6	1	Easement
RO95,0,10	Scarborough	A-6	Private	81.5	1	Easement
RO98,0,20	Scarborough	A-6	Private	43.0	1	Easement
RO99,0,42	Scarborough	A-6	Private	30	1	Easement
RO98,0,18	Scarborough	A-6	Private	37.4	1	Easement
RO98,016A	Scarborough	A-6	Private	6.7	1	Fee
RO98,0,13	Scarborough	A-6	Private	14.3	1	Easement
RO98,0,16	Scarborough	A-6	Private	14.4	1	Easement
RO99,0,44A	Scarborough	A-6	Private	15.0	1	Easement
RO99,0,43	Scarborough	A-6	Private	3.0	1	Fee

Appendix B



USFWS

Nelson's sharp-tailed sparrow and saltmarsh sharp-tailed sparrow

Resources of Concern

- Introduction
- Potential Resources of Concern for the Rachel Carson NWR
- Priority Resources of Concern
- Adaptive Management

I. Introduction

Congress has entrusted the Service with conserving and protecting migratory birds and fish, federally listed threatened and endangered species, inter-jurisdictional fishes, wetlands, and certain marine mammals. Those are known as “trust resources.” In addition to that mandate, each refuge has one or more purposes for which it was established that guide its management goals and objectives. Refuges also support other elements of biological diversity, including invertebrates, rare plants, unique natural communities, and ecological processes that contribute to biological diversity and integrity and environmental health at the refuge, ecosystem, and broader scales (USFWS 1999, 2003).

Given the many purposes, mandates, policies, regional, and national plans that can apply to a refuge, there is a need to identify the potential resources of concern and then prioritize those resources that the refuge is best suited to focus on in its management strategies. The Rachel Carson refuge used the process that follows in identifying priority resources of concern and developing habitat goals, objectives, and strategies to benefit these resources.

The Habitat Management Plan policy (620 FW) defines “resources of concern” as

“All plant and/or animal **species, species groups, or communities** specifically identified in Refuge purpose(s), System mission, or international, national, regional, State, or ecosystem conservation plans or acts. For example, waterfowl and shorebirds are a resource of concern on a refuge whose purpose is to protect ‘migrating waterfowl and shorebirds.’ Federal or State threatened and endangered species on that same refuge are also a resource of concern under terms of the respective endangered species acts.”

The phrases “resources of concern” and “conservation targets” are synonymous, and can be used interchangeably.

II. *Potential Resources of Concern for the Rachel Carson NWR*

In collaboration with other refuges in northeast New England, we developed a matrix of *potential* resources of concern for the region. To determine the potential resources of concern that would guide the management priorities at each refuge, we examined a multitude of guiding documents and other information sources. Those typically identify focal species, species groups, or habitats, and typically fall into three categories:

- Legal Mandates
- USFWS Trust Resources
- Biological Integrity, Diversity, and Environmental Health Policy

❖ Legal Mandates

Statutory Authority

The National Wildlife Refuge Improvement Act of 1997 states that each refuge shall be managed to fulfill the mission of the Refuge System: “*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.*” (Refuge Improvement Act; Public Law 105-57)

Enabling Legislation (Establishing Orders)

The enabling legislation is the legal authority by which the refuge was initially established and lands acquired within the refuge.

On December 16, 1966, Congress established the Coastal Maine refuge under the authority of the Migratory Bird Conservation Act of 1929, which authorizes the purchase of land “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (16 U.S.C. 715d).

In a formal dedication ceremony on June 27, 1970, the refuge was renamed in honor of scientist and author Rachel Carson, who spent much of her life along the Maine Coast.

Refuge Purposes

The National Wildlife Refuge Improvement Act of 1997 also states that each refuge “...shall be managed to fulfill...the specific purposes for which the refuge was established...” The purposes of a refuge are those specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding the refuge, refuge unit, or refuge sub-unit.

The relationship between the System Mission and the purpose(s) of each refuge is defined in Section 3 of Director’s Order No. 132: “we view the System mission, goals, and unit purpose(s) as symbiotic; however, we give priority to achieving a unit’s purpose(s) when conflicts with the System mission or a specific goal exist.” Section 13 of that order indicates “Where a refuge has multiple purposes related to fish, wildlife, and plant conservation, the more specific purpose will take precedence in instances of conflict.” As stated in Section 14, “When we acquire an addition to a unit under an authority different from the authority used to establish the original unit, the addition also takes on the purpose(s) of the original unit, but the original unit does not take on the purpose(s) of the addition.”

The Rachel Carson refuge was established for the following purposes:

- “use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (Migratory Bird Conservation Act).
- “suitable for... 1) incidental fish and wildlife oriented recreational development, 2) protection of natural resources, 3) conservation of endangered or threatened species...” (16 USC 460k-1; Refuge Recreation Act)
- “conservation of wetlands of the Nation in order to maintain the public benefits they provide to help fulfill international obligations contained in various migratory bird treaties and conventions...” (16 U.S.C. 13901(b); 100 Stat 3583; Emergency Wetlands Resources Act of 1986)
- “for the development, advancement, management, conservation and protection of fish and wildlife resources...” (16 USC Section 742f(a)(1) Fish and Wildlife Act of 1956)

❖ USFWS Trust Resources

Although the refuge purposes are the first obligation, managing for trust resources is also a priority for the refuge. Trust resources are further defined as follows:

Migratory Birds

A list of all species of migratory birds protected by the Migratory Bird Treaty Act (16 U.S.C. 703–711) and subject to the regulations on migratory birds are contained in subchapter B of title 50 CFR §10.13. The Migratory Birds Program also maintains subsets of that list that provide priorities at the national, regional, and ecoregional (bird conservation region) scales.

The primary sources of information that the refuge used to identify potential migratory birds species of concern included

- Bird Conservation Regions (BCR) 30 and 14 Plans (the Rachel Carson refuge lies in the transition zone between those two BCR regions).
- Continental and Regional Plans for land birds, waterfowl, shorebirds, and marsh birds

- Rocky Mountain Bird Observatory Species Assessment Database
- USFWS Birds of Conservation Concern
- Federal Threatened and Endangered species
- Status and Trend Information from refuge bird surveys

Interjurisdictional Fish

Those are “populations that two or more States, nations, or Native American tribal governments manage because of their geographic distribution or migratory patterns (710 FW 1.5H).” Examples include anadromous species of salmon and free-roaming species endemic to large river systems, such as paddlefish and sturgeon (Director’s Order No. 132, 6[c]).

A standard set of information resources is not available for fish. However, we used the best available information from the following sources:

- USFWS Regional Fisheries Office
- USFWS Gulf of Maine Coastal Program

Marine Mammals

The Marine Mammal Protection Act of 1972 (16 U.S.C. 1361–1421h) prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. The list of marine mammals under the jurisdiction of the Service follows:

- West Indian Manatee (Antillean and Florida)
- Polar Bear (AK Chukchi/Bering Seas and Beaufort Sea)
- Pacific Walrus (AK)
- Sea Otter (South Central AK, Southeast AK, Southwest AK, CA, and WA)

The Rachel Carson refuge is a coastal refuge in the Gulf of Maine, where many marine mammals are found; however, none of those are the species listed under Service jurisdiction.

Wetlands

The Emergency Wetlands Resources Act of 1986 (Pub. L. 99–645 (100 Stat. 3582). This act, approved November 10, 1986, authorizes the purchase of wetlands from Land and Water Conservation Fund monies, removing a prior prohibition on such acquisitions. It requires the Secretary to establish a National Wetlands Priority Conservation Plan, requires the States to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund amounts equal to the import duties on arms and ammunition.

The wetlands of the Rachel Carson refuge are included in the list of wetlands that warrant protection (USFWS Regional Wetlands Concept Plan, Emergency Wetlands Resources Act, October 1990).

Threatened and Endangered Species

The Endangered Species Act (16 U.S.C. 1531–1544, December 28, 1973, as amended 1976–1982, 1984 and 1988) states in Sec. 8A.(a) that “*The Secretary of the Interior (hereinafter in this section referred to as the “Secretary”) is designated as the Management Authority and the Scientific Authority for purposes of the Convention and the respective functions of each such Authority shall be carried out through the United States Fish and Wildlife*

Service.” The act also requires that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act.

To identify Federal threatened or endangered species of relevance to the Rachel Carson refuge, we reviewed

- Federal Threatened and Endangered Species List
- Recovery Plans for Federal-listed species in our region

❖ **Biological Integrity, Diversity, and Environmental Health**

The National Wildlife Refuge System Improvement Act of 1997 states that, in administering the System, the Service shall “*ensure that the biological integrity, diversity, and environmental health of the System are maintained...*” (601 FW 3; also known as the “Integrity Policy”). The Service (2003) defines these terms as follows:

Biological Diversity—the variety of life and its processes, including the variety of living organisms, the genetic differences between them, and the communities and ecosystems in which they occur.

Biological Integrity—biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities.

Environmental Health—composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment.

Where possible management on the refuge restores or mimics natural ecosystem processes or functions and thereby maintains biological diversity, integrity, and environmental health. Given the continually changing environmental conditions and landscape patterns of the past and present (e.g., rapid development, climate change, sea level rise), relying on natural processes is not always feasible nor always the best management strategy for conserving wildlife resources. Uncertainty about the future requires that the refuge manage within a natural range of variability rather than emulating an arbitrary point in time. Rather than trying to maintain stability, we will maintain mechanisms that allow species, genetic strains, and natural communities to evolve with changing conditions.

As Meretsky et al. (2006) state, the Integrity Policy directs refuges to assess their importance across landscape scales and “forge solutions to problems arising outside refuge boundaries.” Regional land use problems include habitat fragmentation and lack of connectivity, high levels of contaminants, and incompatible development or recreational activities.

To assess the historical condition, site capability, current regional landscape conditions, and biological diversity and environmental health data pertinent to the refuge, we used the following resources:

- Maps and associated data on site capability
 - ◆ Kuchler’s (1964) potential natural vegetation
 - ◆ Soils, topography, and hydrology
 - ◆ History of natural disturbance patterns: e.g., fire, insect outbreaks, storms
- Map of current landscape condition showing conserved lands network, connectivity, land use patterns, and management/ownership trends surrounding the refuge
- Map of existing vegetation on the refuge, including distribution and abundance of invasive species

- Regional/Global Environmental Trends
 - ◆ Climate Change
 - ◆ Air pollution: e.g., mercury
 - ◆ Water pollution (Maine Department of Conservation)
- Maine Natural Areas Program information on rare, declining, or unique natural communities and plant populations
- Maine Wildlife Action Plan
- Status and Trend Information from refuge surveys and studies of sharp-tailed sparrows, waterfowl, shorebirds, breeding Neotropical land birds, marsh and wading birds, piping plovers and least terns, rare plants, anuran call counts, vernal pools, and New England cottontail.

❖ **Summary Table**

Table B.1 is a list of the *potential* wildlife species of concern for the refuge, based on the information compiled and analyzed under legal mandates, trust resources, and integrity policy. For rare plants and natural communities, we were able to identify the *priority rare plants and natural communities*, since those are more site-specific than wildlife (see table B.2).

Guide to Table B.1	
¹ Seasons on the Refuge	B =Breeding W =Wintering M =Migration YR =Year-Round
² Federal T&E	Federal Endangered Species List T =Threatened E =Endangered
³ State T&E	State of Maine Threatened and Endangered Species List T =Threatened E =Endangered SC =Special Concern
⁴ BCR30	December 6-9, 2004, Cape May, New Jersey Bird Conservation Region 30 Meeting HH =Highest Priority H =High Priority M =Moderate Priority
⁵ BCR 14	Bird Conservation Region 14: Atlantic Northern Forest; Dettmers 2004. Draft: Blueprint for the Design and Delivery of Bird Conservation in the Atlantic Northern Forest. USFWS.
⁶ USFWS Birds of Conservation Concern	USFWS 2002. Birds of conservation concern 2002 (for BCR 14 and BCR 30). Division of Migratory Birds, Arlington, Virginia.
⁷ Federal Trust Fish Species (USFWS Trend Data)	-----. 2003. Attachment I – Federal Trust Species and Trends – Atlantic Anadromous Species in the document called <i>Strategic Growth – Land Acquisition Priority System</i> , Fiscal Year 2005 – Budget Cycle. D =Decreasing I =Increasing
⁸ Maine Wildlife Action Plan Priorities (Draft 2005)	1 =Very High 2 =High
⁹ Shorebird Plan-Atlantic Flyway	Clark and Niles 2000 North Atlantic Regional Shorebird Plan .
¹⁰ Waterbird Plan	James A. Kushlan, Melanie J. Steinkamp, Katharine C. Parsons, Jack Capp, Martin Acosta Cruz, Malcolm Coulter, Ian Davidson, Loney Dickson, Naomi Edelson, Richard Elliot, R. Michael Erwin, Scott Hatch, Stephen Kress, Robert Milko, Steve Miller, Kyra Mills, Richard Paul, Roberto Phillips, Jorge E. Saliva, Bill Sydeman, John Trapp, Jennifer Wheeler, and Kent Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas. Washington, DC, U.S.A. H =High Risk M =Moderate Risk L =Low Risk NR =Not Currently At Risk
¹¹ Waterfowl Plan	North American Waterfowl Management Plan: Strengthening the Biological Foundation: 2004 Strategic Guidance. Population Trends. I =Increasing D =Decreasing NT =No Trend

Table B.1. Potential Resources of Concern for Rachel Carson NWR

Species (gray highlight indicates focal species of concern identified in our habitat objectives)	Seasons on Refuge ¹	Federal T&E ²	Maine T&E ³	BCR 30 & PIF 9 ⁴	BCR 14 & PIF 27 ⁵	USFWS Birds of Conservation Concern ⁶	Federal Trust Fish Species (USFWS Trend Data) ⁷	Maine Wildlife Action Plan Priorities ⁸	Shorebird Plan-Atlantic Flyway ⁹	Waterbird Plan ¹⁰	Waterfowl Plan ¹¹
WATERBIRDS											
American bittern	B, M			HH	M			2			
American coot								2			
Arctic tern	M		T		H			2		H	
Black-crowned night-heron	B, M		SC	M	H			2		M	
Black tern	M		E					1		M	
Clapper rail	B, M			M							
Common loon	M, W				M			2			
Common moorhen	M		SC					2			
Common tern	B, M		SC		H	X		2		L	
Glossy ibis								2			
Great cormorant	W		SC		HH			2		M	
Horned grebe	W			H	M						
Least bittern								2			
Least tern	B, M		E	HH		X		1		H	
Little blue heron	B, M			H						H	
Northern gannet	M				H					NR	
Pied-billed grebe								2			
Red-necked grebe	W				H						
Red-throated loon	W			HH	M						
Roseate tern	B, M	E	E	HH	H			1		H	
Snowy egret	B, M			HH				2		H	
WATERFOWL											
American black duck	B, W			HH	HH			2			D
Atlantic brant	M?			HH	M						NT
Atlantic Canada goose	M, W			HH	H						I
Barrow's goldeneye	W		SC		HH			2			NT
Black scoter	M, W			H	H						D
Bufflehead	M, W			H							I
Common eider	B, M, W			HH	HH			2			D
Common goldeneye	M, W			M	M						NT
Greater scaup	M, W			H	M			2			NT
Harlequin duck	W		T	H	HH			2			NT
Hooded merganser	B, M			H							I
Lesser scaup	M, W			H							D
Long-tailed duck	M, W			H	M						D
Mallard	B, M, W			H							NT
North Atlantic Canada goose	M, W			H							NT
Red-breasted merganser	M, W			M							I
Ruddy duck								2			
Surf scoter	M, W			H	M						D
White-winged scoter	M, W			H							D
Wood duck	B, M				M						I
SHOREBIRDS											
American oystercatcher	B?, M			HH	M	X		1	5		
American golden plover	M			H	H				4		
American woodcock	B, M			HH	HH			2	5		
Black-bellied plover	M			H	H				3		
Buff-breasted sandpiper	M			H		X			4		
Common snipe	M								3		
Dunlin	M			H					3		
Greater yellowlegs	M			H				2	4		
Hudsonian godwit	M			H	M	X			4		
Killdeer	B, M			M	M				2		

Potential Resources of Concern for the Rachel Carson NWR

Species (gray highlight indicates focal species of concern identified in our habitat objectives)	Seasons on Refuge ¹	Federal T&E ²	Maine T&E ³	BCR 30 & PIF 9 ⁴	BCR 14 & PIF 27 ⁵	USFWS Birds of Conservation Concern ⁶	Federal Trust Fish Species (USFWS Trend Data) ⁷	Maine Wildlife Action Plan Priorities ⁸	Shorebird Plan-Atlantic Flyway ⁹	Waterbird Plan ¹⁰	Waterfowl Plan ¹¹
Least sandpiper	M			M	M				3		
Lesser yellowlegs	M			M					2		
Long-billed dowitcher	M								2		
Marbled godwit	M			H		X			4		
Pectoral sandpiper	M								2		
Piping plover	B	T	E	HH	HH			1	5		
Purple sandpiper	M, W			H	HH	X		2	3		
Red-necked phalarope	M		SC	H	HH			2	3		
Red knot	M			HH	H	X		2	5		
Red phalarope	M			M	H				3		
Ruddy turnstone	M			HH				2	4		
Sanderling	M			HH	M			2	4		
Semipalmated plover	M			M	M				2		
Semipalmated sandpiper	M			H	HH			2	4		
Short-billed dowitcher	M			H	H				3		
Solitary sandpiper	M			H					3		
Spotted sandpiper	M			M					3		
Stilt sandpiper	M								3		
Upland sandpiper	M		T	M	H	X		1	4		
Whimbrel	M		SC	HH	H	X		2	5		
White-rumped sandpiper	M			H					3		
Willet	B, M			H	M			2	4		
Wilson's phalarope	M			M					4		
Wilson's plover	M			H		X			4		

LANDBIRDS											
American redstart	B				H						
American pipit	M?		E					2			
Bald eagle	M, W	T	T	M	M			2			
Baltimore oriole	B, M			H		X		2			
Bank swallow	B, M				M						
Barn swallow	B, M				M			2			
Barred owl								2			
Bay-breasted warbler	M				HH	X		2			
Black-and-white warbler	B, M			H				2			
Black-billed cuckoo	B, M				M			2			
Blackburnian warbler	B, M			M	M			2			
Blackpoll warbler	M				M	X					
Black-throated-blue warbler	M				H			2			
Black-throated-green warbler	B, M				M			2			
Blue-gray gnatcatcher								2			
Blue-winged warbler	B?		SC	HH	H	X		1			
Bobolink	B, M				H			2			
Broad-winged hawk	B, M			H							
Brown creeper	B, M				M						
Brown thrasher	B, M			H				2			
Canada warbler	B, M			M	HH	X		2			
Cape May warbler	M				H	X		2			
Chestnut-sided warbler	B, M				H	X		2			
Chimney swift	B, M				H			2			
Common nighthawk	B, M				H			2			
Cooper's hawk	B, M		SC								
Eastern screech owl	YR		SC								
Eastern kingbird	B, M			H				2			
Eastern meadowlark	B, M		SC					2			
Eastern screech owl								2			
Eastern towhee	B, M			H				2			
Eastern wood-pewee	B, M				H						

Potential Resources of Concern for the Rachel Carson NWR

Species (gray highlight indicates focal species of concern identified in our habitat objectives)	Seasons on Refuge ¹	Federal T&E ²	Maine T&E ³	BCR 30 & PIF 9 ⁴	BCR 14 & PIF 27 ⁵	USFWS Birds of Conservation Concern ⁶	Federal Trust Fish Species (USFWS Trend Data) ⁷	Maine Wildlife Action Plan Priorities ⁸	Shorebird Plan-Atlantic Flyway ⁹	Waterbird Plan ¹⁰	Waterfowl Plan ¹¹
Field sparrow	B, M		SC	H				2			
Golden eagle	M, W		E					2			
Grasshopper sparrow								2			
Gray catbird	B, M			M							
Great-crested flycatcher	B, M			H				2			
Hairy woodpecker	YR										
Horned lark	M, W				M			2			
Ipswich savannah sparrow	W				HH						
Loggerhead shrike	M, W		SC	M				2			
Long-eared owl								2			
Louisiana waterthrush	B?, M			H				2			
Marsh wren	B, M			H		X		2			
Nelson's sharp-tailed sparrow	B, M			M	HH	X		2			
Northern bobwhite	B?			H							
Northern flicker	B, M				M			2			
Northern goshawk	B, M				M						
Northern harrier	M				M						
Northern parula	B, M				M			2			
Olive-sided flycatcher	B, M		SC		H	X		2			
Ovenbird	B, M				M						
Palm warbler	M				M						
Peregrine falcon	M		E		M	X		1			
Pine grosbeak	B, M				M						
Purple finch	B, M				H			2			
Purple martin	B		SC					2			
Prairie warbler	B, M			HH		X		2			
Red-shouldered hawk	B, M		SC								
Rose-breasted grosbeak	B, M				M			2			
Ruffed grouse	YR				M						
Rusty blackbird								2			
Saltmarsh sharp-tailed sparrow	B, M		SC	HH		X		1			
Scarlet tanager	B, M			H				2			
Seaside sparrow			SC	HH		X					
Sedge wren			E	M		X		1			
Short-eared owl								1			
Veery	B, M				H			2			
Vesper sparrow	B, M				M			2			
Whip-poor-will	B, M		SC	H	M	X		2			
Willow flycatcher	B, M			H				2			
Wood thrush	B, M			HH	HH	X		2			
Yellow-bellied flycatcher	M				M						
Yellow-bellied sapsucker	M				H			2			
Yellow-throated vireo								2			

MAMMALS											
Eastern red bat	B, M		SC								
Eastern small-footed bat	YR?		SC					2			
Eastern pipistrelle	B, M		SC								
Southern flying squirrel	YR		SC								
Hoary bat	B, M		SC								
Harbor porpoise	YR										
New England cottontail	YR		SC					1			
Northern bog lemming	YR		T					2			
Silver-haired bat	B, M		SC								

Potential Resources of Concern for the Rachel Carson NWR

Species (gray highlight indicates focal species of concern identified in our habitat objectives)	Seasons on Refuge ¹	Federal T&E ²	Maine T&E ³	BCR 30 & PIF 9 ⁴	BCR 14 & PIF 27 ⁵	USFWS Birds of Conservation Concern ⁶	Federal Trust Fish Species (USFWS Trend Data) ⁷	Maine Wildlife Action Plan Priorities ⁸	Shorebird Plan-Atlantic Flyway ⁹	Waterbird Plan ¹⁰	Waterfowl Plan ¹¹
AMPHIBIANS											
Blue-spotted salamander	YR							2			
Northern leopard frog	YR										
REPTILES											
Black racer	?		E					2			
Blanding's turtle	YR		E					1			
Brown snake	YR		SC								
Eastern hognose snake	?										
Eastern ribbon snake	YR		SC								
Spotted turtle	YR		T					2			
Wood turtle	YR ?		SC					2			
FISH											
Alewife	YR						D				
American eel	YR						D	1			
American shad	YR						D	2			
Atlantic salmon	YR						D	1			
Blueback herring	YR						D				
Rainbow smelt	YR						D	2			
Shortnose sturgeon	?	E					D	1			
Striped bass	YR						I	1			
INVERTEBRATES											
Ringed boghaunter	YR		E					1			
Ebony boghaunter	YR		SC								

Guide to Table B.2

¹State Status

State of Maine Threatened and Endangered Species List

T=Threatened **E**=Endangered **SC**=Special Concern

²Srank

State Rarity Ranks (determined by the Maine Natural Areas Program)

S1=Critically imperiled in Maine because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extirpation from the State of Maine

S2=Imperiled in Maine because of rarity (6-20 occurrences or few remaining individuals or acres) or because of other factors making it vulnerable to further decline

S3=Rare in Maine (on the order of 20-100 occurrences)

S4=Apparently secure in Maine

S5=Demonstrably secure in Maine

SH=Occurred historically in Maine, and could be rediscovered; not known to have been extirpated.

SU=Possibly in peril in Maine, but status uncertain; need more information

SX=Apparently extirpated in Maine (historically occurring species for which habitat no longer exists in Maine)

³Grank

Global Rarity Ranks (determined by The Nature Conservancy)

G1=Critically imperiled globally because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extirpation from the State of Maine

G2=Globally imperiled because of rarity (6-20 occurrences or few remaining individuals or acres) or because of other factors making it vulnerable to further decline

G3=Globally rare (on the order of 20-100 occurrences)

G4=Apparently secure globally

G5=Demonstrably secure globally

T=Subspecies rank

Q=Questionable rank

HYB=Hybrid species

Table B.2. Rare Plants and Exemplary Natural Communities on Rachel Carson NWR*

<i>Rare Plant Species</i>	<i>State Status¹</i>	<i>Srank²</i>	<i>Grank³</i>
American Sea Blight, <i>Suaeda calceoliformis</i>	T	S1	G5
Beach Plum, <i>Prunus Maritima</i>	E	S1	G4
Dwarf Glasswort, <i>Salicornia Bigelovii</i>	SC	S1	G5Q
Eastern Joe Pye Weed, <i>Eupatorium dubium</i>	E	S2	G5
Hollow Joe Pye Weed, <i>Eupatorium fistulosum</i>	E	S2	G5?
Pale Green Orchis, <i>Platanthera flava</i>	SC	S2	G4T4
Rich's Sea Blight, <i>Suaeda maritima ssp Richii</i>	SC	S1	G5T3
Sassafras, <i>Sassafras albidum</i>	SC	S2	G5
Sea-beach Sedge, <i>Carex silicea</i>	SC	S3	G5
Slender Blue Flag Iris, <i>Iris prismatica</i>	E	S2	G4/G5
Smooth Winterberry Holly, <i>Ilex laevigata</i>	SC	S3	G5
White Wood Aster, <i>Aster divaricatus</i>	T	S3	G5
Wild Coffee, <i>Triosteum aurantiacum</i>	E	S1	G4

Exemplary Natural Communities

Coastal Dune-Marsh Ecosystem		S3	
Dune Grassland		S2	G4?
Pitch Pine Bog		S2	G3G5
White Oak – Red Oak forest		S3	

*Special thanks to Don Cameron, Maine Natural Areas Program for reviewing our list and providing clarification on occurrences

III. Priority Resources of Concern

The table of potential resources of concern (B.1) that was developed in Section II contains a large number of species with a broad array of habitat needs. We need to prioritize those species and their habitats to determine where to focus refuge management strategies. To guide us in prioritizing that list, we considered the following concepts:

- Achieving refuge purposes and managing for trust resources as well as biological diversity, integrity, and environmental health can be addressed through the habitat requirements of "focal species" or species that may represent guilds that are highly associated with important attributes or conditions within habitat types. The use of focal species is particularly valuable in addressing Service trust resources such as migratory birds.
- The Bird Conservation Region (BCR) plans are increasing their effectiveness at ranking and prioritizing those migratory birds most in need of management of conservation focus. Although all species that make it to a ranked BCR priority list are in need of conservation attention, we selected **focal species** that ranked as High or Moderate in Continental Concern with a High to Moderate BCR Responsibility. See www.abcbirds.org/nabci for BCR rules used to rank birds.
- Focal species selected that were not birds (e.g., New England cottontail, American eel, Blanding's turtle) were identified as resources of concern due to concern over their population status rangewide or because they are under review for inclusion on the Federal Endangered or Threatened Species list. Fish species were reviewed using criteria from the Service Land Acquisition Priority System, Federal Trust Species and Trends—Atlantic Anadromous Species.

- Habitat conditions on or around the refuge may limit its capability to support or manage for a potential species of concern. We evaluated the following site-specific factors.
 - ◆ Patch size requirements
 - ◆ Habitat connectivity
 - ◆ Incompatibility surrounding land uses
 - ◆ Environmental conditions: soils, hydrology, disturbance patterns, contaminants, predation, invasive species
 - ◆ Specific life history needs
- The likelihood that a potential species of concern would have a positive reaction to management strategies.
- The ability to rely on natural processes to maintain habitat conditions within a natural range of variability suitable to the focal species
- The ability to use adaptive management (flexibility and responsiveness of the refuge and the habitats) in the face of changing environmental conditions (e.g., climate change).

❖ **High and Moderate Priority Habitat Types**

Refuge management most often focuses on restoring, managing, or maintaining habitats or certain habitat conditions to benefit a suite of focal species or a suite of plants and animals associated with a particular habitat. We identified the high and moderate priority habitats on the Rachel Carson refuge based on information compiled in Section I (e.g., site capability, historic condition, current vegetation, conservation needs of wildlife associates). As part of that process, we identified any limiting factors that affect the refuge's ability to maintain those habitats (see table B.3).

Table B.3. High and Moderate Priority Habitats on Rachel Carson NWR

<i>High Priority Habitat Types</i>	<i>Reason for Selecting as High Priority*</i>	<i>Limiting Factors for Maintaining this Habitat</i>
Dune grassland, beach, rocky shore, subtidal and intertidal	1=Purposes: Migratory Birds (shorebirds) 2=Threatened, Endangered and candidate Species (piping plover) 3=Trust Resources (multiple focal species) 4=BIDEH (marine ecosystem)	Keeping pace with sea level rise, overuse by public, development, climate change, invasive species.
Salt marsh	1=Purposes: Migratory birds (wading and shorebirds); Wetlands 2=Trust Resources (multiple focal species) 4=BIDEH (marine ecosystem)	Keeping pace with sea level rise, development, climate change, invasive species, and contaminants.
Tidal rivers	1=Purposes: Migratory Birds (waterfowl) 2=Threatened, Endangered, and candidate Species (American eel under review for listing) 3=Trust Resources (interjurisdictional fish) 4=BIDEH (marine ecosystem)	Contaminants, residential/commercial development, siltation, water quantity and quality.
Freshwater wetlands: emergent marsh, scrub shrub wetland, bog, vernal pool, forested wetland	1=Purposes: Wetlands, Migratory Birds (breeding landbirds) 4=BIDEH (wetland ecosystems, Blandings turtle)	Invasive species, residential and commercial development, water quantity and quality.
Early Successional: Shrubland	1=Purposes: Migratory Birds (migrating and breeding landbirds) 2=Threatened, Endangered, and candidate Species (New England cottontail – under review for Federal listing) 3=Trust Resources (priority breeding landbirds)	Invasive species, succession to forest.
Mixed forest	1=Purposes: Migratory Birds (landbirds) 3=Trust Resources (breeding focal landbirds),	Invasive species, forest fragmentation.
<hr/>		
<i>Moderate Priority Habitat Types</i>	<i>Reason for Selecting as a Moderate Priority</i>	
Freshwater rivers	Minimal freshwater river habitats available on refuge 4=BIDEH	Water quality and quantity and invasive species.
Nearshore and marine open water	Limited capacity to influence Trust Resources 4=BIDEH	Climate change, invasive species, water quality.
Early Successional: Grassland	Minimal habitat available on refuge 3=Trust Resources (1 focal species)	Invasive species, succession.

* 1=Legal Mandates: Purposes 2=Federal Endangered, Threatened, and candidate species
3=USFWS Trust Resources/Focal Species 3=Biological Integrity, Diversity, and Environmental Health Policy (BIDEH)

Based on the habitat types described in table B.3, we then developed a table of the priority species of concern with their associated habitat types (table B.4). This table also describes the habitat structured required by each priority or “focal” species, and identifies other species that would benefit from the same or similar habitat conditions.

Table B.4 Priority Resources of Concern, Habitat Structure, and Other Benefitting Species on Rachel Carson NWR

<i>Priority Resources of Concern</i>		<i>Habitat Structure</i>	<i>Other Benefitting Species</i>
<i>Species or Species Group</i>	<i>Habitat Type</i>		
Piping plover	Dune grassland – beach – rocky shore, tidal and intertidal	Breeding: Nest above the high tide line on open sand, gravel or shell-covered beaches, especially on sand spits and blowout areas in dunes. Feed in the “splash zone” and in wrack piles at the high tide line.	Waterfowl and wading birds
Least tern		Breeding: Nest on open sand, gravel, or shell-covered beaches above the high tide line.	
Migratory shorebirds		Migration: feeding and roosting	
Nelson’s sharp-tailed sparrow	Saltmarsh, tidal creeks, estuaries, and bays	Breeds in salt, freshwater, and brackish marshes; Females wedge or suspend a nest in medium high cordgrass just above the substrate or water near the mean high-tide line.	Willet, wading birds, anadromous fish, other migratory waterfowl
Saltmarsh sharp-tailed sparrow		Breeds almost exclusively in salt marsh; Females wedge or suspend a nest in medium high cordgrass just above the substrate or water near the mean high-tide line.	
Black duck		Migration, Wintering: In winter in New England and Maritime Provinces of Canada, uses tidal habitats exclusively. Tides, icing, time of day, and human disturbance interact to affect use of coastal habitats. During spring and fall migration use estuarine wetlands, tidal flats, shallow freshwater wetlands, among other wetlands	
Roseate and common terns		Migration: feeding	
Common eider		Year-round: feeding areas utilized extensively	
Blanding’s turtle	Freshwater wetlands	Year-round: Vernal pool complexes and small wetlands; wetlands in a matrix of intact upland forest; shallow, dark, heavily-vegetated waters with soft muddy bottoms; nests in sandy or loamy uplands including plowed fields; basks on logs, stumps, and banks; May travel to as many as 6 different wetlands in a year, traveling as far as a mile or more	Spotted turtle
Willow flycatcher		Breeding: Fairly open areas with scattered shrubs or forest edges; moist or wet shrubby areas; dense stands of shrubs > 2.1 m in height; nest is ~1.2 m off the ground. Territory size 2.6 to 4.5 acres	Marsh wren

Priority Resources of Concern

<i>Priority Resources of Concern</i>		<i>Habitat Structure</i>	<i>Other Benefiting Species</i>
<i>Species or Species Group</i>	<i>Habitat Type</i>		
New England cottontail	Early successional: shrubland	Year-Round: Patches > 10 ha; Native shrublands and regenerating forests with dense understory cover at least 0.5 m tall and less than 7.5 cm (3 inches) in diameter and stem densities of ~10,000 stems/ha	Willow flycatcher; blue-winged warbler; field sparrow; migrating songbirds
Eastern towhee		Breeding: Dense, brushy dry areas, pitch pine-scrub oak forests, utility rights-of-way; nests on or near ground; well-developed litter layer	
American woodcock		Breeding: Open second growth, young forests in close proximity to singing grounds	
Prairie warbler		Breeding: Usually associated with poor soils, shrublands and thickets, overgrown fields with scattered trees, pine plantations (especially Christmas tree plantings), oak clearcuts, and powerline right-of-ways	
Rose-breasted grosbeak	Mixed forest	Breeding: Edges of mature moist deciduous or mixed forests with understory of shrubs or saplings; closed canopy (~85%); canopy height ~70 feet	Baltimore oriole, blackburnian warbler, eastern wood pewee, hairy woodpecker, broad-winged hawk, indigo bunting, black-and-white warbler
Black-billed cuckoo		Breeding: Shrublands, thickets, and other woodlands with dense, shrubby vegetation; Numbers fluctuate with caterpillar outbreaks	
Scarlet tanager		Breeding: Mixed and deciduous mature forest (particularly oak-pine forests); closed canopy; trees > 23 cm (9 inches) dbh; minimum forest area needed to sustain a viable population 10–12 ha	
Wood thrush		Breeding: Mature deciduous and mixed forests, particularly near wetlands; tall trees (~53 feet or more); a shrub-subcanopy layer, shade, moist soil and leaf litter; closed canopy	
Veery		Breeding: Damp, second growth, young forests with open canopy and dense understory. Will use hardwood and hemlock forests	
American eel	Freshwater rivers	Migration: females migrate upstream to mature in freshwater wetlands. Males prefer freshwater rivers and brackish waters until both mature males and females return to the Sargasso Sea to breed.	Freshwater mussels, wood turtle
Louisiana waterthrush		Breeding: Extensive deciduous and mixed bottomland forests along fast-flowing streams; moss covered logs, thick understory; area sensitive – minimum 250 acres to sustain breeding population	
Bobolink	Early successional: grassland	Breeding: Prefers a mixture of grasses and broad-leaved forbs with high grass-forb ratio. Densities significantly higher in fields with relatively low amounts of total vegetative cover, low alfalfa cover, and low total legume cover. These vegetative characteristics occur in hay fields ≥ 8 yr old. Fields > 10 ha (~25 acres) preferred	Eastern meadowlark

IV. Adaptive Management

The priority resources of concern and their respective habitat attributes were used to develop specific habitat objectives. Refuge habitat management objectives must be achievable. Many factors, such as the lack of resources, existing habitat conditions, species response to habitat manipulations, climatic changes, contaminants or invasive species, may reduce or eliminate the ability of the refuge to achieve objectives. Although these limiting factors were considered during the development of refuge objectives, conditions are likely to change over the next 15 years and beyond.

The refuge will use adaptive management to respond to changing conditions that impair our ability to measure and achieve the habitat objectives. That will require us to establish and maintain a monitoring program to ensure that we can detect and respond to changing conditions.

References

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- _____. 2003. *Biological integrity, diversity, and environmental health*. USFWS Policy 601 FW3. U.S. Fish and Wildlife Service, Washington, D.C.

Appendix C

John & Karen Hollingsworth/USFWS



Refuge landscape

Wilderness Review

- Wilderness Inventory Areas
- Summary of Wilderness Inventory Findings
- Conclusion
- Wilderness Review Team

Wilderness Inventory Areas

Our wilderness inventory team identified 10 wilderness inventory areas (WIAs) in the Rachel Carson National Wildlife Refuge. Our findings for each WIA follow.

Note: Each refuge division was created initially to protect a tidal river or an estuary resource. Subsequent boundary expansions included adjacent uplands to protect wetlands and water quality and provide critical wildlife habitat.

❖ Brave Boat Harbor Division

1. Describe the division in a general manner (acres, habitats etc.). Is the area in federal fee title ownership?

The Brave Boat Harbor Division encompasses approximately 700 acres in the towns of York and Kittery, and manages an additional 40 acres under a conservation easement. Oak-pine forest with vernal pools and old field upland habitats surround salt marsh and estuary habitat. Portions of upland forest have a dense understory of serviceberry (*Amelanchier canadensis*), bayberry (*Myrica pensylvanica*), sweet gale (*Myrica gale*), high bush blueberry (*Vaccinium corymbosum*), male-berry (*Lyonia liqustrina*), and spirea (*Spirea latifolia*). Some forested areas have an understory of speckled alder (*Alnus rugosa*), winterberry (*Ilex veticillata*), honeysuckle (*Lonicera morrowi*), sweet gale, spirea, poison ivy (*Toxicodendron rydbergii*), and Virginia rose (*Rosa virginiana*) (Lortie and Pelletier 1988). Several rare plants, including white wood aster, saltmarsh false-foxglove, and dwarf glasswort, are found at the division.

This area was nominated for inclusion in the Maine Ecological Reserves program because of its saltmarsh ecosystem and the presence of oak-pine forest, exemplary white oak-red oak forest and perched hemlock-hardwood swamp communities, acidic fen, shrub swamp, and vernal pool (McMahon 1998). It also lies within a Maine Beginning With Habitat Focus Area (Greater Brave Boat Harbor/Gerrish Island) known to harbor rare natural communities, including red oak-white oak forest, dune grassland, and spartina saltmarsh (Maine Department of Inland Fisheries and Wildlife).

2. Describe why the division does not meet the roadless criteria (number of roads, total miles). Are the roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use?

None of the divisions are undivided, contiguous blocks of habitat. Brave Boat Harbor is defined and divided by Seapoint Road, Raynes Neck Road, Short Farm Road, and others.

3. Is the division of sufficient size to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management?

No.

4. Describe why the division does not meet the naturalness criteria (number of structures, including all imprints of mans work). Does the division appear to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable? Are the human impacts substantially unnoticeable in the unit as a whole? Does the division contain significant hazards caused by humans, such as the presence of unexploded ordnance from military activity? Describe the presence of physical impacts of refuge management facilities and activities.

Each division is located at the wildland-urban interface. However, homes lie next to and, in some cases, within blocks of protected habitat. We believe the Rachel Carson refuge has more neighbors than any other national wildlife refuge. Hundreds of homes lie within a mile of this division. From most places on it, homes and other improvements are visible. It has no known human-created hazards and no known ordnance. Refuge prescribed fire units are located in this division.

5. **Does the area meet the solitude criteria? Does the division provide opportunities for solitude or primitive and unconfined recreation? Does the area offer the opportunity to avoid the sights, sounds and evidence of other people?**

No. Homes and other improvements are visible from most places on this division.

6. **Please address any supplemental values (identified above) that occur in this WIA.**

None.

❖ **Moody Division**

1. **Describe the division in a general manner (acres, habitats, etc.). Is the area in federal fee title ownership?**

The Moody Division comprises 391 acres in the towns of Ogunquit and Wells, and manages 4 acres under a conservation easement. The division is almost entirely salt marsh, with some old field and coastal scrub-shrub habitat.

2. **Describe why the division does not meet the roadless criteria (number of roads, total miles). Are the roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use?**

Furbish Road and Borne Avenue bisect the division. None of the divisions are undivided, contiguous blocks of habitat.

3. **Is the division of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management?**

No.

4. **Describe why the division does not meet the naturalness criteria (number of structures, including all imprints of mans work). Does the division appear to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable? Are the human impacts substantially unnoticeable in the unit as a whole? Does the division contain significant hazards caused by humans, such as the presence of unexploded ordnance from military activity? Describe the presence of physical impacts of refuge management facilities and activities.**

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5. **Does the area meet the solitude criteria? Does the division provide opportunities for solitude or primitive and unconfined recreation? Does the area offer the opportunity to avoid the sights, sounds and evidence of other people?**

No. Homes and other improvements are visible from most places on this division.

6. **Please address any supplemental values (identified above) that occur in this WIA.**

None.

❖ **Lower Wells Division**

1. **Describe the division in a general manner (acres, habitats, etc.). Is the area in federal fee title ownership?**

The Lower Wells Division comprises 1,000 acres, with 6 acres under easement in the Town of Wells. Lower Wells is almost entirely salt marsh, with some maritime forest edges, coastal shrublands, and open fields. This division includes the Webhannet salt marshes, one of the largest salt marsh systems in the state, and an important black duck wintering area. Most of the historic barrier beach is now dense residential and commercial development. Scoters congregate in winter in the nearshore marine waters.

2. **Describe why the division does not meet the roadless criteria (number of roads, total miles). Are the roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use?**

Drakes Island Road, Upper Landing Road, Lower Landing Road, and Mile Road all cross the division. None of the divisions are undivided contiguous blocks of habitat.

3. **Is the division of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management?**

No.

4. **Describe why the division does not meet the naturalness criteria (number of structures, including all imprints of mans work). Does the division appear to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable? Are the human impacts substantially unnoticeable in the unit as a whole? Does the division contain significant hazards caused by humans, such as the presence of unexploded ordnance from military activity? Describe the presence of physical impacts of refuge management facilities and activities.**

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5. **Does the area meet the solitude criteria? Does the division provide opportunities for solitude or primitive and unconfined recreation? Does the area offer the opportunity to avoid the sights, sounds and evidence of other people?**

No. Homes and other improvements are visible from most places on this division.

6. **Please address any supplemental values (identified above) that occur in this WIA.**

None.

❖ **Upper Wells Division**

1. **Describe the division in a general manner (acres, habitats, etc.). Is the area in federal fee title ownership?**

This division, in the Town of Wells, encompasses 643 acres, with an additional 13 acres under easement. The division is approximately 50 percent mixed pine and hardwood forest and 50 percent salt marsh, beach dune, old field and shrub habitat. Several rivers run through it: the Little and Merriland rivers, and Branch Brook. Crescent Surf Beach in this division usually supports the largest concentration of nesting least terns in Maine.

Up to eight pairs of federal-listed threatened piping plovers have nested on the beach, and it is a staging area for the federal-listed endangered roseate tern. New England cottontails live in the scrub-shrub habitat. Upper Wells encompasses portions of a pitch pine bog natural community, a sparsely forested peatland. Upland forests contain an overstory of pitch pine, white pine, red maple, and red oak. The understory has dense thickets of serviceberry bayberry, sweet gale, high bush blueberry, male-berry, and spirea (Lortie and Pelletier 1988).

2. **Describe why the division does not meet the roadless criteria (number of roads, total miles). Are the roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use?**

Western Avenue (Route 9), Skinner Mill Road, Harts Road and the Boston and Maine Railroad all cross the division. None of the divisions are undivided, contiguous blocks of habitat.

3. **Is the division of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management?**

No.

4. **Describe why the division does not meet the naturalness criteria (number of structures, including all imprints of mans work). Does the division appear to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable? Are the human impacts substantially unnoticeable in the unit as a whole? Does the division contain significant hazards caused by humans, such as the presence of unexploded ordnance from military activity? Describe the presence of physical impacts of refuge management facilities and activities.**

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5. **Does the area meet the solitude criteria? Does the division provide opportunities for solitude or primitive and unconfined recreation? Does the area offer the opportunity to avoid the sights, sounds and evidence of other people?**

No. Homes and other improvements are visible from most places on this division.

6. **Please address any supplemental values (identified above) that occur in this WIA.**

None.

❖ **Mousam River Division**

1. **Describe the division in a general manner (acres, habitats, etc.). Is the area in federal fee title ownership?**

The Mousam River Division, in the Town of Kennebunk, contains 431 acres, and has an additional 64 acres under conservation easement. The division is primarily forested uplands with abundant vernal pools. The other habitats include salt marsh, river, estuary, open field and scrub-shrub.

2. **Describe why the division does not meet the roadless criteria (number of roads, total miles). Are the roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use?**

Western Avenue (Route 9), Brown Street, Harts Road, Hawthorne Lane, Caspar Lane, Ocean View road and the Bridle Path all cross the division. None of the divisions are undivided, contiguous blocks of habitat.

3. **Is the division of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management?**

No.

4. **Describe why the division does not meet the naturalness criteria (number of structures, including all imprints of mans work). Does the division appear to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable? Are the human impacts substantially unnoticeable in the unit as a whole? Does the division contain significant hazards caused by humans, such as the presence of unexploded ordnance from military activity? Describe the presence of physical impacts of refuge management facilities and activities.**

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5. **Does the area meet the solitude criteria? Does the division provide opportunities for solitude or primitive and unconfined recreation? Does the area offer the opportunity to avoid the sights, sounds and evidence of other people?**

No. Homes and other improvements are visible from most places on this division.

6. **Please address any supplemental values (identified above) that occur in this WIA.**

None.

❖ **Goose Rocks Division**

1. **Describe the division in a general manner (acres, habitats, etc.) Is the area in federal fee title ownership?**

This division, in the Town of Kennebunkport, encompasses 540 acres, plus 1 acre under easement. Three-fourths of this division is 75-percent tidal. Its habitats include salt marsh, river, beach, estuary and coastal shrubland. Smith Brook, Batson River, Goose Rocks Creek, and Sampson Cove are in this division. Piping plovers historically nested at the end of Marshall Point Road. Upland forests contain an overstory of pitch pine, white pine, red maple, and red oak. The understory has dense thickets of serviceberry, bayberry, sweet gale, high bush blueberry, male-berry, and spirea. Some forested areas have an understory of speckled alder, winterberry, honeysuckle, sweet gale, spirea, poison ivy, and Virginia rose (Lortie and Pelletier 1988).

2. **Describe why the division does not meet the roadless criteria (number of roads, total miles). Are the roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use?**

Marshall Point Road, Dyke Road, Kings Highway, Goose Rocks Road, Sunset Lane, Norwood Lane, Whittemore Road, and several paved, private roads cross the division. None of the divisions are undivided, contiguous blocks of habitat.

3. **Is the division of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management?**

No.

4. **Describe why the division does not meet the naturalness criteria (number of structures, including all imprints of mans work). Does the division appear to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable? Are the human impacts substantially unnoticeable in the unit as a whole? Does the division contain significant hazards caused by humans, such as the presence of unexploded ordnance from military activity? Describe the presence of physical impacts of refuge management facilities and activities.**

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5. **Does the area meet the solitude criteria? Does the division provide opportunities for solitude or primitive and unconfined recreation? Does the area offer the opportunity to avoid the sights, sounds and evidence of other people?**

No. Homes and other improvements are visible from most places on this division.

6. **Please address any supplemental values (identified above) that occur in this WIA.**

None.

❖ **Little River Division**

1. **Describe the division in a general manner (acres, habitats, etc.) Is the area in federal fee title ownership?**

This division, in Kennebunkport and Biddeford, encompasses 156 acres, with an additional 59 acres under conservation easement. The Little River runs through the division, which is mostly tidal habitat (about 60 percent); the rest is forested upland and scrubland.

2. **Describe why the division does not meet the roadless criteria (number of roads, total miles). Are the roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use?**

Granite Point Road, Fortunes Rocks Road, Elizabeth Road and numerous private roads cross this division. None of the divisions are undivided, contiguous blocks of habitat.

3. **Is the division of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management?**

No.

4. **Describe why the division does not meet the naturalness criteria (number of structures, including all imprints of mans work). Does the division appear to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable? Are the human impacts substantially unnoticeable in the unit as a whole? Does the division contain significant hazards caused by humans, such as the presence of unexploded ordnance from military activity? Describe the presence of physical impacts of refuge management facilities and activities.**

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5. **Does the area meet the solitude criteria? Does the division provide opportunities for solitude or primitive and unconfined recreation? Does the area offer the opportunity to avoid the sights, sounds and evidence of other people?**

No. Homes and other improvements are visible from most places on this division.

6. **Please address any supplemental values (identified above) that occur in this WIA.**

None.

❖ **Biddeford Pool division**

1. **Describe the division in a general manner (acres, habitats, etc.). Is the area in federal fee title ownership?**

This division, in Biddeford, encompasses 71 acres, with an additional 5 acres under easement. Its Biddeford Pool holdings protect some of the state's most important estuarine habitats. Most of the area is salt marsh, coastal shrubland, and grassland with some pitch pine forest.

2. **Describe why the division does not meet the roadless criteria (number of roads, total miles). Are the roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use?**

Old Pool Road, Salt Marsh Lane, Days Landing, Channel Cove, Lane, Bridge Street, Mile Stretch Road, and Hills Beach Road all cross this division. None of the divisions are undivided, contiguous blocks of habitat.

3. **Is the division of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management?**

No.

4. **Describe why the division does not meet the naturalness criteria (number of structures, including all imprints of mans work). Does the division appear to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable? Are the human impacts substantially unnoticeable in the unit as a whole? Does the division contain significant hazards caused by humans, such as the presence of unexploded ordnance from military activity? Describe the presence of physical impacts of refuge management facilities and activities.**

Each division is located at the wildland-urban interface. However, homes lie next to and, in some cases, within blocks of protected habitat. We believe the Rachel Carson refuge has more neighbors than any other national wildlife refuge. Hundreds of homes lie within a mile of this division. From most places on it, homes and other improvements are visible. It has no known human-created hazards and no known ordnance. Refuge prescribed fire units are located in this division.

5. **Does the area meet the solitude criteria? Does the division provide opportunities for solitude or primitive and unconfined recreation? Does the area offer the opportunity to avoid the sights, sounds and evidence of other people?**

No. Homes and other improvements are visible from most places on this division.

6. **Please address any supplemental values (identified above) that occur in this WIA.**

None.

❖ **Goosefare Brook Division**

1. **Describe the division in a general manner (acres, habitats, etc.) Is the area in federal fee title ownership?**

This division, in the towns of Saco and Old Orchard Beach, consists of 494 acres and an additional 8 acres under easement. It consists of a small beach, salt marshes, and several hundred acres of pitch pine and mixed pine/hardwood forest. Goosefare Brook runs through this area. One pair of nesting piping plovers commonly uses the beach.

2. **Describe why the division does not meet the roadless criteria (number of roads, total miles). Are the roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use?**

Seaside Avenue, Shore Avenue, Cottage Avenue, Marshview Road, Atlantic Way Trail, Palmer Avenue, Pineywoods Road, Meadow Avenue, Richards Way and Wildwood Drive all cross or intersect this division. None of the divisions are undivided, contiguous blocks of habitat.

3. **Is the division of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management?**

No.

4. **Describe why the division does not meet the naturalness criteria (number of structures, including all imprints of mans work). Does the division appear to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable? Are the human impacts substantially unnoticeable in the unit as a whole? Does the division contain significant hazards caused by humans, such as the presence of unexploded ordnance from military activity? Describe the presence of physical impacts of refuge management facilities and activities.**

Each division is located at the wildland-urban interface. However, homes lie next to and, in some cases, within blocks of protected habitat. We believe the Rachel Carson refuge has more neighbors than any other national wildlife refuge. Hundreds of homes lie within a mile of this division. From most places on it, homes and other improvements are visible. It has no known human-created hazards and no known ordnance. Refuge prescribed fire units are located in this division.

5. **Does the area meet the solitude criteria? Does the division provide opportunities for solitude or primitive and unconfined recreation? Does the area offer the opportunity to avoid the sights, sounds and evidence of other people?**

No. Homes and other improvements are visible from most places on this division.

6. **Please address any supplemental values (identified above) that occur in this WIA.**

None.

❖ **Spurwink Division**

1. **Describe the division in a general manner (acres, habitats, etc.). Is the area in federal fee title ownership?**

This division, in the towns of Scarborough and Cape Elizabeth, encompasses 493 acres and another 27 acres under easement. It is centered along the waters of the Spurwink River and Pollack Creek, and consists of upland fields, salt marsh, shrublands, and some mature forest.

2. **Describe why the division does not meet the roadless criteria (number of roads, total miles). Are the roads suitable and maintained for public travel by means of motorized vehicles primarily intended for highway use?**

Spurwink Road, Wiley Way, Starbird Road, Spurwink Avenue, Stanford Lane, Quarry Road, Ivory Hill Road, Heron Point Road, Sawyer Street, and Salt Marsh Way, all cross or intersect this division. None of the divisions are undivided, contiguous blocks of habitat.

3. **Is the division of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management?**

No.

4. **Describe why the division does not meet the naturalness criteria (number of structures, including all imprints of mans work). Does the division appear to have been affected primarily by the forces of nature with the imprint of human work substantially unnoticeable? Are the human impacts substantially unnoticeable in the unit as a whole? Does the division contain significant hazards caused by humans, such as the presence of unexploded ordnance from military activity? Describe the presence of physical impacts of refuge management facilities and activities.**

Each division is located at the wildland-urban interface. However, homes lie next to and, in some cases, within blocks of protected habitat. We believe the Rachel Carson refuge has more neighbors than any other national wildlife refuge. Hundreds of homes lie within a mile of this division. From most places on it, homes and other improvements are visible. It has no known human-created hazards and no known ordnance. Refuge prescribed fire units are located in this division.

5. **Does the area meet the solitude criteria? Does the division provide opportunities for solitude or primitive and unconfined recreation? Does the area offer the opportunity to avoid the sights, sounds and evidence of other people?**

No. Homes and other improvements are visible from most places on this division.

6. **Please address any supplemental values (identified above) that occur in this WIA.**

None.

Summary of Wilderness Inventory Findings

This area has been settled for nearly 400 years. Because of that infringement by humans, mostly taking the form of roads and houses, none of the lands that compose the current, approved refuge acquisition boundary or the lands in the preliminary project proposal are suitable for designation as wilderness.

Conclusion

We find that none of the WIAs at the Rachel Carson National Wildlife Refuge, Wells, Maine, meet the minimum criteria to qualify as a WSA as defined by the Wilderness Act. No further investigation into wilderness designation is needed at the refuge.

Wilderness Review Team

Ward Feurt, Refuge Manager, Rachel Carson NWR, Wells, ME

Graham Taylor, Deputy Refuge Manager, Rachel Carson NWR, Wells, ME

Steve Funderburk, Chief, Division of Conservation Planning and Policy, Hadley, MA.

Barry Brady, Regional Wilderness Coordinator, Hadley, MA.



USFWS

Fishing is a priority public use of the National Wildlife Refuge System

Appropriate Use and Compatibility Determinations

■ Introduction

■ Finding of Appropriateness for

- ◆ Boat Launching D-3
- ◆ Mosquito Control D-5
- ◆ Research Conducted by Non-Refuge Personnel D-7
- ◆ Skiing and Snowshoeing D-9

■ Compatibility Determination for

- ◆ Hunting D-11
- ◆ Fishing D-15
- ◆ Wildlife Observation, Photography, Interpretation, and Environmental Education D-21
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Introduction

❖ About the Appropriate Refuge Uses 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 appropriate before undertaking its compatibility review. This policy clarifies and expands on the compatibility policy (603 FW 2.10D(1)), which describes when refuge managers should deny a proposed use without determining compatibility. If we find a proposed use not appropriate, we will not allow it, and will not prepare a compatibility determination.

By screening out proposed uses not appropriate to the refuge, the refuge manager avoids unnecessary compatibility reviews. By following the process for finding the appropriateness of a use, we strengthen and fulfill the mission of the Refuge System. Although a refuge use may be both appropriate and compatible, the refuge manager retains the authority to not allow it or modify it. For example, on some occasions, two appropriate and compatible uses may conflict with each other. In those situations, even though both uses are appropriate and compatible, the refuge manager may need to limit or entirely curtail one of the uses to provide the greatest benefit to refuge resources and the public. See the compatibility policy (603 FW 2.11G) for information about resolving these conflicts.

For proposed uses not considered during the preparation of this CCP, we will apply the procedure contained in this policy and make an appropriateness finding without additional public review and comment. However, if we find a proposed use appropriate, we must still determine that it is compatible. The compatibility determination includes an opportunity for public involvement. See the planning policy (602 FW 1, 3, and 4) for detailed policy on refuge planning.

❖ About Compatibility Determinations

The Refuge System Improvement Act and its regulations require an affirmative finding by the refuge manager of the compatibility of an activity before it is allowed on a national wildlife refuge. That finding is documented in a report called a “compatibility determination.” A compatible use is one “that will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge” (Refuge Improvement Act). The act defines six priority, wildlife-dependent uses that are to be given enhanced consideration on refuges: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Those priority uses may be authorized on a refuge when they are compatible and not inconsistent with public safety.

At the time the compatibility determination is made, the refuge manager will insert the required maximum 10-year re-evaluation date for uses other than wildlife-dependent recreational uses, or a 15-year maximum re-evaluation date for wildlife-dependent recreational uses. However, the refuge manager may reevaluate the compatibility of a use at any time (602 FWS 2, Parts 2.11 and 2.12). For example, a decision may be revisited sooner than the mandatory date, or even before the CCP process is complete, if new information reveals unacceptable impacts or incompatibility with refuge purposes.

Moreover, not all uses that are determined compatible may be allowed. The refuge manager has the discretion to allow or deny any use based on other considerations such as public safety, policy, or available funding. Nevertheless, all uses that are allowed must be determined compatible. Except for the consideration of consistency with State laws and regulations as provided for in subsection (m) of the act, neither this act or the Refuge Recreation Act require the refuge manager to make any other determinations or findings for wildlife-dependent recreation to occur.

Please note that research on archaeological artifacts or historic structures the Service conducts itself does not need a compatibility determination. However, archaeological research by non-Service personnel on refuge property will need a compatibility determination. Such projects require an Archaeological Resource Protection Act (ARPA) Permit application to the regional historic preservation officer and a special use permit from the refuge manager. Compatibility can be determined at that time.

Finding of Appropriateness of a Refuge Use

Refuge Name: Rachel Carson National Wildlife Refuge

Use: Boat Launching

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes X No

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate Appropriate X

Refuge Manager:  Date: Nov 6, 2008

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence:

Refuge Supervisor:  Date: 11/13/08

A compatibility determination is required before the use may be allowed.

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Rachel Carson National Wildlife Refuge

Use: Boat Launching

Narrative

Rachel Carson is a coastal refuge. Surface waters in the State of Maine are the property of the state and the refuge cannot regulate this activity. Since the refuge is surrounded by water, these facilities are offered to accommodate our wildlife oriented visitors. These activities would be conducted in such a manner to minimize impacts on established programs, including hunting, fishing, wildlife and observation programs, on the rest of the refuge. The refuge fishing program is in its fourth year. Permitting recreational boat launch will benefit fishing. Safety continues to be of paramount importance in all of our management decisions.

Finding of Appropriateness of a Refuge Use

Refuge Name: Rachel Carson National Wildlife Refuge

Use: Mosquito Control

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes X No

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate Appropriate X

Refuge Manager:  Date: 1/6/06

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence:

Refuge Supervisor:  Date: 11/29/06

A compatibility determination is required before the use may be allowed.

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Rachel Carson National Wildlife Refuge

Use: Mosquito Control

Narrative

Rachel Carson may have more neighbors than any other national wildlife refuge. The refuge hosts between 260,000 and 330,000 visitors annually. Many of our neighbors occupy seasonal housing and most of our visitors enjoy the refuge during warm weather, which coincides with the time period when mosquitoes are present.

Arthropods such as mosquitoes pose an annoyance to humans and worldwide can have consequences such as mosquito-borne infections (eastern equine encephalitis, West Nile virus). Service Policy is to allow mosquito control on refuge lands when it is necessary to protect the health and safety of the public or a wildlife or domestic animal population. We will allow management of mosquito populations on Refuge System lands using effective means that pose the lowest risk to wildlife and habitats.

Finding of Appropriateness of a Refuge Use

Refuge Name: Rachel Carson National Wildlife Refuge

Use: Research Conducted by Non-Refuge Personnel

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

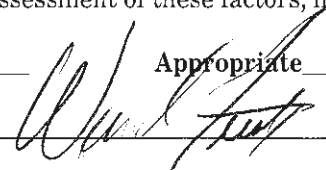
Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes X No

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate Appropriate X

Refuge Manager:  Date: 11/13/06

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence:

Refuge Supervisor:  Date: 11/13/06

A compatibility determination is required before the use may be allowed.

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Rachel Carson National Wildlife Refuge

Use: Research Conducted by Non-Refuge Personnel

Narrative

The Service encourages and supports research and management studies on refuge lands that will improve and strengthen decisions on managing natural resources. The refuge manager encourages and seeks research that clearly relates to approved refuge objectives, improves habitat management, and promotes adaptive management. Priority research addresses information on better managing the Nation's biological resources that generally are important to agencies of the Department of Interior; the National Wildlife Refuge System, and State Fish and Game Agencies that address important management issues, or demonstrate techniques for managing species or habitats.

Researchers will submit a final report to the refuge on completing their work. For long-term studies, we may also require interim progress reports. We expect researchers to publish in peer-reviewed publications. All reports, presentations, posters, articles or other publications will acknowledge the Refuge System and the Rachel Carson refuge as partners in the research. All posters will adhere to Service graphics standards. We will insert this requirement to ensure that the research community, partners, and the public understand that the research could not have been conducted without the refuge having been established, its operational support, and that of the Refuge System.

Finding of Appropriateness of a Refuge Use

Refuge Name: Rachel Carson National Wildlife Refuge

Use: Skiing and Snowshoeing

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

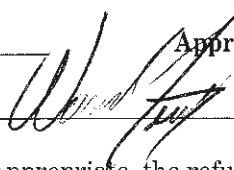
Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes X No

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate Appropriate X

Refuge Manager:  Date: 11/8/06

If found to be Not Appropriate, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the refuge supervisor must sign concurrence.

If found to be Appropriate, the refuge supervisor must sign concurrence:

Refuge Supervisor:  Date: 11/13/06

A compatibility determination is required before the use may be allowed.

Justification for a Finding of Appropriateness of a Refuge Use

Refuge Name: Rachel Carson National Wildlife Refuge

Use: Skiing and Snowshoeing

Narrative

Wildlife observation, photography, and interpretation are priority public uses as defined by the National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57) and if compatible, are to receive enhanced consideration over other general public uses.

Rachel Carson National Wildlife Refuge is located in Maine where the ground can be covered with snow from November to April. In Maine, the traditional means of access to outdoor destinations during winter months is via ski and snowshoe. Refuge trails are open to public use daylight hours year round. Due to the snow cover, visitor impact is minimized during winter months in that trail tread is not being compressed and fewer species and fewer numbers of wildlife are present. These activities are encouraged at Rachel Carson NWR, and year around access requires use of snowshoes or skis.

Compatibility Determination

Use

Hunting

Refuge Name

Rachel Carson National Wildlife Refuge

Establishing and Acquisition Authorities

The Rachel Carson refuge was established on December 16, 1966, under the authority of the Migratory Bird Conservation Act (16 U.S.C. 715–715r).

Refuge Purposes

For lands acquired under the Migratory Bird Conservation Act (16 U.S.C. 715d), the purpose of the acquisition is for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.

For lands acquired under the Refuge Recreation Act (16 U.S.C. 460k-1), “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).

For lands acquired under the Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901(b); 100 Stat. 3583), the purpose of the acquisition is for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide to help fulfill international obligations contained in various migratory bird treaties and conventions.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(a)(1)), the purpose of the acquisition is for the development, advancement, management, conservation, and protection of fish and wildlife resources.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(b)(1)), the purpose of the acquisition is 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, if the Secretary deems such terms to be in accordance with law and compatible with the purpose for which acceptance is sought.

National Wildlife Refuge System Mission

“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-668ee]).

Description of Proposed Use

(a) What is the use? Conduct and allow access for hunting on refuge lands: specifically, for deer, migratory birds and upland game birds in accordance with state regulations. **Is the use a priority public use?** Yes. Hunting is one of the six priority public uses in the National Wildlife Refuge System Improvement Act of 1997 (Pub. L. 105–57).

(b) Where would the use be conducted? Six of the 10 refuge divisions are open for migratory bird hunting and falconry: the Brave Boat Harbor, Lower Wells, Upper Wells, Mousam, Goose Rocks, Little River, Goosefare Brook, and Spurwink River divisions. Eight of the 10 divisions are open for deer and upland game hunting: all the divisions open for migratory bird hunting plus the Little River and Goosefare Brook divisions. Our Hunt Plan, Annual Program, and refuge-specific regulations further identify the areas open to hunting.

(c) When would the use be conducted? The refuge adapts state regulations for species hunted. The state determines hunting seasons annually: usually within a September-to-February time frame.

(d) How would the use be conducted? The refuge permits hunting within state guidelines and in compliance with a hunt program that we adjust each year to ensure safety and good wildlife management. New lands acquired by the refuge that traditionally have been hunted will remain open until we have completed their public

Compatibility Determination for Hunting

use planning. If they cannot biologically, ecologically and safely accommodate hunting within state guidelines, then we will complete a separate public review process.

The refuge ownership in Maine extends to the mean low tidal mark; thus, it encompasses intertidal lands that lie between the high and low tidal ranges. Those intertidal lands are considered Public Trust Lands of the people of Maine, and certain rights (fishing, fowling, and navigation) are held in common by the people of Maine. The Legislature of Maine states that these rights held in public trust generally are derived from English Common Law and from the Massachusetts Colonial Ordinance of 1641–1647 (State of Maine Bureau of Public Lands). Those recreational uses held in trust are among the most important to the people of Maine today. The Service recognizes those rights, and will allow such uses, unless evidence shows that they detract from the Service mission to protect those lands.

(e) Why is this use being proposed? Hunting is a priority public use in the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57) and, if compatible, is to receive enhanced consideration in refuge planning.

Availability of Resources

Costs associated with administering this use include

Preparation of Annual Hunt Plan (24 staff hrs @ \$39.50/hr).....	\$708.00
Preparation of Refuge Hunting Information/maps (16 staff hrs @ \$39.50/hr)	\$632.00
Law Enforcement (80 staff hrs @ \$33.18/hr)	\$2,654.00
News Releases (8 staff hrs @ \$26.87/hr).....	\$215.00
Program Cost	\$4,209.00

FY 2005 Refuge Budget Allocation included

Salaries	\$429,812
Fixed Costs	\$39,602
Annual Maintenance	\$30,184
Total Available Funds	\$499,598

Based on a review of the budget allocated for recreational use management, I certify that funding is adequate to ensure compatibility, administer and manage the recreational use listed.

Sufficient resources are available to continue the existing hunting program. Our existing staff and budget have provided sufficient resources to continue current management, although we anticipate increased capacity necessitated by the addition of new lands for hunting and fishing access. Managing those activities falls within the projected budget and staffing capabilities of the refuge.

Anticipated Impacts of the Use

Hunting is consistent with the purposes of the refuge when it is carried out within established regulations and is a priority use in the Refuge Improvement Act. The *2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation* reveals that 975,000 Maine residents and nonresidents 16 years old and older fished, hunted, or watched wildlife in Maine. Of that total, 376,000 fished, 164,000 hunted, and 778,000 participated in wildlife-watching activities, including observing, feeding, and photographing wildlife (USFWS 2003). The Rachel Carson refuge was an important destination for some of that wildlife-dependent recreation.

Adverse effects on wildlife (waterfowl) populations are not expected because of the hunting regulations and bag limits that have been set in place by the federal and state agencies (USFWS Migratory Bird Office and the Maine Department of Inland Fisheries and Wildlife) that manage the harvest of waterfowl populations. Significant conservation measures and extensive pre- and post-season population monitoring and the institution of Adaptive Harvest Management are safeguards inherent in waterfowl management. Adverse effects on other game species are not expected, because hunting will occur under state regulations. The MDIFW sets harvest limits that take into account game species population data collected by state biologists and wildlife species assessments.

Hunting results in the direct take of the target game up to a daily limit in accordance with state regulations. The direct disturbance of wildlife is expected, as is true for all human-wildlife interactions. Those impacts affect individuals, not populations.

Thirty-six species of shorebirds are reported using the Maine coast primarily as staging areas during long distance migration. The numbers of migrant shorebirds peak from mid-May to early June and from mid-July to mid-September (Tudor 2000), outside hunting seasons. The impacts to wildlife are at a level that will not interfere with wildlife populations. Endangered or threatened species and species of special concern are also present on the refuge. However, no threatened or endangered species are using the areas identified for hunting during hunting seasons. The status of the New England cottontail is being reviewed; its habitat is dense upland thickets. Rabbit hunting is not permitted on the refuge.

Public Review and Comment

As part of the CCP process for the refuge, this compatibility determination will undergo extensive public review, including a comment period of 30 days following the release of the Draft CCP/EA.

Determination

_____ Use is not compatible

 X Use is compatible, with the following stipulations

Stipulations Necessary to Ensure Compatibility

- The refuge employs a hunt permit system to avoid conflicts. Issuing permits to all hunters ensures that all hunters receive a copy of the current refuge regulations and maps of open areas. The maps and regulations are especially valuable in avoiding conflicts with neighbors.
- Compliance with regulations will be achieved through education, signage and law enforcement, which will result in minimizing negative impacts on refuge habitat and wildlife.
- Refuge regulation of hours (daylight hours) and access-restricted areas will be enforced. Some activities are not compatible, and are prohibited on the refuge to protect sensitive habitats and wildlife. Prohibited activities include driving off-road vehicles, camping, building fires, horse-back riding, and mountain biking.

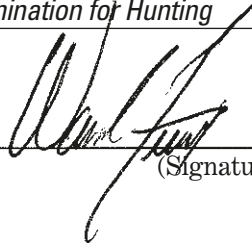
Justification

Hunting is a wildlife dependent priority public use with minimal impact on refuge resources, and is conducted under state regulations, thereby reducing the amount of staff time and effort needed to oversee it. The staff time and resources needed are identified during annual work planning to minimize impacts on other refuge programs. In addition, hunting is consistent with the purposes for which the refuge was established, the Service policy on hunting, the National Wildlife Refuge System Improvement Act of 1997, and the broad management objectives of the National Wildlife Refuge System. Hunting is compatible with and will not detract from the mission of the Refuge System or the objectives of the refuge. Furthermore, hunting on public lands in Maine is a popular, traditional recreation activity that is strongly supported by the Maine Department of Inland Fisheries and Wildlife, which strongly supports hunting on national wildlife refuges in Maine. Allowing hunting within the refuge will not materially interfere with or detract from the mission of the Refuge System or the purposes for which the refuge was established.

Rachel Carson refuge hosts over 250 species of birds, 53 mammals and 40 reptiles and amphibians. Here, too, this species biodiversity provides management flexibility. These activities are not thought to be disturbances which will jeopardize this resource. The refuge hunt program is in its 11th year in current format. Using annual programs, the hunt has been evaluated and modified every year. The hunt is increasingly popular with more hunters every year. This activity does not obviously raise safety issues due to the large size of the hunting opportunity.

Compatibility Determination for Hunting

Project Leader


(Signature)

MAY 29, 2007
(Date)

Concurrence

Regional Chief


(Signature)

June 7, 2007
(Date)

Mandatory 15 year Re-evaluation Date
(for all uses other than priority public uses)

June 7, 2022
(Date)

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U.S. Fish and Wildlife Service. 2005. *Draft Comprehensive Conservation Plan*. Rachel Carson National Wildlife Refuge, Maine.

State of Maine *Hunting and Trapping 2005 Laws and Rules*. Maine.

U.S. Fish and Wildlife Service. 2005. *Hunter Information 2005–2006 Hunting Season*. Rachel Carson National Wildlife Refuge, Maine.

U.S. Fish and Wildlife Service. 2005. *Annual Hunt Program*. Rachel Carson National Wildlife Refuge, Maine.

State of Maine. 2004. *Wells Deer Hunt December 1 – 11, 2004 Regulations*. Maine.

State of Maine. 2005. *Migratory Game Bird Hunting Schedule*. Maine.

State of Maine *Open Water Fishing 2005 Regulations*. Maine.

Office of the Federal Register National Archives and Records Administration. 2005. *Wildlife and Fisheries. Code of Federal Regulations*. U. S. Government Printing Office Washington, D.C.

Compatibility Determination

Use

Fishing

Refuge Name

Rachel Carson National Wildlife Refuge

Establishing and Acquisition Authorities

The Rachel Carson refuge was established on December 16, 1966, under the authority of the Migratory Bird Conservation Act (16 U.S.C. 715–715r).

Refuge Purposes

For lands acquired under the Migratory Bird Conservation Act (16 U.S.C. 715d), the purpose of the acquisition is for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.

For lands acquired under the Refuge Recreation Act (16 U.S.C. 460k-1), “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).

For lands acquired under the Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901(b); 100 Stat. 3583), the purpose of the acquisition is for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide to help fulfill international obligations contained in various migratory bird treaties and conventions.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(a)(1)), the purpose of the acquisition is for the development, advancement, management, conservation, and protection of fish and wildlife resources.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(b)(1)), the purpose of the acquisition is 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, if the Secretary deems such terms are in accordance with law and compatible with the purpose for which acceptance is sought.

National Wildlife Refuge System Mission

“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-668ee]).

Description of Proposed Use

(a) What is the use? Conduct and allow access for fishing on refuge lands. Fishing for bass, salmon, trout, pickerel, whitefish, smelt and other species is permitted in accordance with state regulations. **Is the use a priority public use?** Yes. Fishing is one of the six priority public uses in the National Wildlife Refuge System Improvement Act of 1997 (Pub. L. 105–57).

(b) Where would the use be conducted? All navigable waters on the refuge are owned by the State of Maine and are open to fishing. There are currently nine fishing access points on the refuge. The appendix to this compatibility determination contains the most recent fishing access points.

(c) When would the use be conducted? The refuge adopts state regulations for species fished. The state fishing season traditionally opens on April 1 and closes on September 30, with the exception of Mousam River from Route 1 to tidewater, which is open year-round.

Compatibility Determination for Fishing

(d) How would the use be conducted? All tidal waters of the Refuge are open to fishing and bank fishing is currently permitted in nine areas (appendix contains the most recent fishing access points); both types of fishing are increasingly popular.

The refuge permits fishing by rod and reel or hook and line only, from bank fishing access points, a pier (not yet constructed), and from all Maine state waters. We expect to accommodate a maximum number of 100 users at any given time. It is unlikely that we will reach those numbers except during events such as Fishing Derby Day.

The refuge is building a fishing pier on the Spurwink River. The planned pier design calls for a 12' x 20' wooden, fully-accessible structure. We are improving a parking lot located adjacent to this site. With the possible exception of a kiosk, we do not anticipate any further supporting facilities. Other uses proposed for the site include wildlife observation, photography, and interpretation. The refuge will continue to provide fishing access sites and will improve the nine areas now available to anglers with access and interpretive signs.

(e) Why is this use being proposed? Fishing is a priority public use as defined by the National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57) and if compatible, this activity is to receive enhanced consideration over other general public uses.

Availability of Resources

Costs associated with administering this use include

Annual review of Fishing Plan (24 staff hrs @ \$39.50/hr)	\$708.00
Signing and monitoring fishing access sites (40 staff hrs @\$26.87/hr)	\$1075.00
Law Enforcement (80 staff hrs @ \$33.18/hr)	\$2,654.00
News Releases (4 staff hrs @ \$26.87/hr).....	\$108.00
Program Cost	\$4,545.00

FY 2005 Refuge Budget Allocation included

Salaries	\$429,812
Fixed Costs	\$39,602
Annual Maintenance	\$30,184
Total Available Funds	\$499,598

Based on a review of the budget allocated for recreational use management, I certify that funding is adequate to ensure compatibility and to administer and manage the recreational use listed.

Sufficient resources are available to continue the existing fishing program. Existing staff and budget have provide sufficient resources to continue with current management, although the refuge anticipates increased capacity needs necessitated by the additional of new lands for fishing access. We do not anticipate charging fees to fish.

Anticipated Impacts of the Use

Fishing is consistent with the purposes of the Refuge when carried out within established regulations and is a priority use identified in the Refuge Improvement Act. Some wildlife disturbance is created by fishing activity. Disturbance during the summer is limited to waterfowl, shorebirds, aquatic species, marsh and wading birds. The fishing access points have been selected to coincide with existing uses to help reduce any additional impact.

The 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation revealed that 975,000 Maine residents and nonresidents 16 years old and older fished, hunted, or wildlife watched in Maine. Of the total number of participants, 376,000 fished, 164,000 hunted, and 778,000 participated in wildlife-watching activities, including observing, feeding, and photographing wildlife (USFWS 2003). Rachel Carson refuge was an important destination for some of this wildlife-dependent recreation.

Wetlands will be minimally impacted by construction of the Spurwink River pier which would serve to promote this priority use on the site. We consulted with the Corps of Engineers and Maine Department of Environmental Protection on the wetland impacts. We submitted a Natural Resources Protection Act permit in August, 2005 and

the MDEP accepted the submittal as a complete application. We do not anticipate any permit problems associated with this pier and boardwalk

Endangered and/or threatened species and species of special concern are also present on the refuge. The **piping plover** is federal-listed threatened and state-listed endangered in Maine. They nest above the high tide line on open sand, gravel or shell-covered beaches, especially on sand spits and blowout areas in dunes. Piping plover has traditionally nested at Goosefare Brook. If fishing activities are in conflict with where the birds nest at this beach, the fishing will be curtailed until the young plovers fledge. The plovers and terns are present during the refuge's fishing seasons. Conflicts are avoided by geographically separating the activities. Most fishing pressure is late in the summer and in the fall after plovers and terns have finished nesting. Other threatened and endangered species may be present but will not be affected by this activity.

Public Review and Comment

As part of the CCP process for Rachel Carson refuge this compatibility determination will undergo extensive public review, including a comment period of 30 days following the release of the Draft CCP/EA.

Determination

_____ Use is not compatible

X Use is compatible, with the following stipulations

Stipulations Necessary to Ensure Compatibility

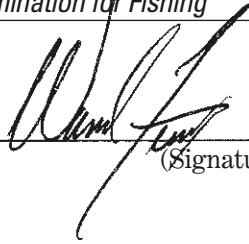
- Fishing will be permitted only in designated areas to prevent erosion and degradation of wetlands and water quality. The refuge provides a handout identifying the fishing access areas.
- Fishing access areas have been designated and signed.
- Compliance with regulations will be achieved through education, signage and law enforcement which will result in minimizing negative impacts to refuge habitat and wildlife.
- Lead sinkers and other lead tackle are prohibited to prevent ingestion, and possible lead poisoning, by wildlife.
- Refuge regulation concerning hours (daylight hours) and restricted access will be enforced.
- Some activities are not compatible and are prohibited on the Refuge to protect sensitive habitats and wildlife. Prohibited activities include using off-road vehicles, camping, building fires, horse-back riding, mountain biking, and collection of any plants or animals not covered by a permit.

Justification

Fishing is a wildlife dependent priority public use with minimal impact on refuge resources. Fishing is conducted under state regulations, so anglers do not have to learn a second set of regulations on the refuge. Staff time and resources needed are identified during annual work planning to minimize impacts on other refuge programs. In addition, fishing is consistent with the purposes for which the Refuge was established; the Service policy on fishing; the National Wildlife Refuge System Improvement Act of 1997; and the broad management objectives of the National Wildlife Refuge System. Fishing is a popular traditional wildlife-dependent activity in Maine. Allowing fishing to occur within the Rachel Carson refuge 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.

Compatibility Determination for Fishing

Project Leader


(Signature)

MAY 29, 2007
(Date)

Concurrence

Regional Chief


(Signature)

June 7, 2007
(Date)

Mandatory 15 year Re-evaluation Date
(for all uses other than priority public uses)

June 7, 2022
(Date)

Attachment: Fishing Sites at Rachel Carson National Wildlife Refuge

References

- U.S. Fish and Wildlife Service. 2005. *Draft Comprehensive Conservation Plan*. Rachel Carson National Wildlife Refuge, Maine.
- U.S. Fish and Wildlife Service. 2000. *Environmental Assessment, Fishing*. Rachel Carson National Wildlife Refuge, Maine.
- State of Maine. 2005. *Open Water Fishing Regulations*. Maine.
- Wells National Estuarine Research Reserve Fish Species of the Wells Reserve. *Checklist of finfish*. Wells, Maine.
- U.S. Fish and Wildlife Service, 2005. *Department of Environmental Protection Natural Resources Protection Act permit application*. Wells, Maine.
- U.S. Fish and Wildlife Service. 2005. *Designated Recreational Fishing Sites*. Rachel Carson National Wildlife Refuge, Maine.

Fishing Sites at Rachel Carson National Wildlife Refuge

The following sites may be used by anglers. All Maine fishing regulations apply. Use of all areas contingent upon user cooperation. Refuge regulations require use of non-lead jigs and sinkers to prevent waterbird poisoning. Areas open dawn until dusk only. Carry out all litter, including monofilament, which can be dangerous to birds and other wildlife. Obey refuge signs and private property. Locations are described from south to north.

Chauncey Creek—Kittery

Carry-in boat access only at the intersection of Cutts Island and Seapoint Roads. Note that tidal changes in this area may cause previously navigable channels to become treacherous or impassable. Park adjacent to the site on Seapoint Road.

Brave Boat Tidal Creek—York

Fishing permitted on north side of stream bank from Brave Boat Harbor Road to the first trestle downstream, approximately 1000 feet. Park at pull-off northeast of Brave Boat Harbor Road, south of Payne Road, adjacent to creek. No refuge parking available.

Ogunquit River—Ogunquit/Wells

Anglers may fish on the north bank of the Ogunquit River, east of Route 1. Access is limited to the marked and posted areas at the refuge boundary corner behind the Ogunquit River Plantation Hotel east (downstream), on the Wells side of the river, for approximately 500 feet. No refuge parking available.

Stevens Brook—Wells

The east side of Stevens Brook is open for fishing from Bourne Avenue to the point where Stevens Brook approaches Ocean Avenue (approximately 1/4 mile). Approach from the public parking lot on Ocean Avenue.

Webhannet River—Wells

Fishing permitted along the west bank of the Webhannet River. The area begins at the north side of Mile Road and continues approximately 400 feet north (downstream), ending at the first tidal creek.

Merriland River/Skinner Mill—Wells

Anglers may fish from the refuge boundary, east (downstream) for approximately 1000 feet, which includes the oxbow. Access is by an existing trail on the south side of the river across private property. Park on Skinner Mill Road; no refuge parking available.

Mousam River—Kennebunk

Fishing permitted east of Route 9, on the north side of the river; west to our posted boundary and east to the point opposite Great Hill Road (approximately 3/10 mile). Access will be from the bridle path along the first tidal creek. Fishing is currently allowed on the opposite bank and at the mouth of the Mousam River. Park on Route 9; no refuge parking available.

Goosefare Brook—Saco

Anglers may fish on the south side of the Goosefare Brook outlet. There is very little parking in the immediate area; use the public parking lot at the end of Bayview Road.

Spurwink River—Scarborough

Fishing permitted along the west bank of the Spurwink River; north of the Route 77 bridge. The area extends approximately 1000 feet, ending at a point near the fork in the river. Limited parking available just off Route 77.

Compatibility Determination

Use

Wildlife Observation, Photography, Environmental Education, Interpretation

Refuge Name

Rachel Carson National Wildlife Refuge

Establishing and Acquisition Authorities

The Rachel Carson refuge was established on December 16, 1966. The authority which established the refuge is 16 U.S.C. 715-715r; The Migratory Bird Conservation Act, as amended.

Refuge Purposes

For lands acquired under the Migratory Bird Conservation Act (16 U.S.C. 715d), the purpose of the acquisition is for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.

For lands acquired under the Refuge Recreation Act (16 U.S.C. 460k-1), “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).

For lands acquired under the Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901(b); 100 Stat. 3583), the purpose of the acquisition is for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide to help fulfill international obligations contained in various migratory bird treaties and conventions.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(a)(1)), the purpose of the acquisition is for the development, advancement, management, conservation, and protection of fish and wildlife resources.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(b)(1)), the purpose of the acquisition is 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, if such terms are deemed by the Secretary to be in accordance with law and compatible with the purpose for which acceptance is sought.

National Wildlife Refuge System Mission

“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-668ee]).

Description of Proposed Use

(a) What is the use? Conduct and allow access for priority public uses (Wildlife Observation, Photography, Environmental Education, and Interpretation) as provided for under the NWRS Improvement Act of 1997. **Is the use a priority public use?** Yes, wildlife observation, photography, environmental education and interpretation are four of the six priority public uses in the National Wildlife Refuge System Improvement Act of 1997 (Pub. L. 105-57).

(b) Where would the use be conducted? The primary public uses will occur as follows: Waysides, overlooks and opportune situations on all divisions will provide the public with chances to observe wildlife. Refuge trails in Brave Boat Harbor, Upper Wells and Goosefare Brook Divisions; shared trails in Mousam and Goosefare Brook Divisions. Interpreted trails such as Carson and Ted Wells trails enhance visitor’s experiences. Schools and other organized groups are the target for environmental education, on and off refuge.

(c) When would the use be conducted? Most public use occurs during the high season, i.e. approximately July 4 to Labor Day. Wildlife observation, photography, environmental education and interpretation are year around activities.

(d) How would the use be conducted? The Carson Trail and Ted Wells trails are currently interpreted with brochures to add wildlife and environmental insights to visitor's experiences. The Cutts Island trail is scheduled for upgrade to an interpreted trail with interpretive panels. Interpretative signs at several locations (Lower Wells, Biddeford Pool, Little River, Goosefare Brook) provide management oriented information to visitors. The trail and observation platform at Goosefare Brook provide information on wildlife observation. Wildlife/nature photography is encouraged on all public use areas of the refuge. Environmental education is conducted on refuge, mainly at Carson Trail, and may be conducted off refuge, such as at local school settings. The CCP contains information on an environmental education center to be located in Saco in the proposed alternative. See chapter 2, alternative B, objective 5.2 for details.

(e) Why is this use being proposed? Wildlife observation, photography, environmental education and interpretation are priority public uses as defined by the National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57) and if compatible, are to receive enhanced consideration over other general public uses.

Availability of Resources

Facilities or materials needed to support these four uses include the following:

Service Standards-Trails:	\$26,000. Upgrading with boardwalks where needed and improving the tread on Cutts Island trail and tread on Goosefare Brook trail.
Carson Trail Restroom:	\$32,000. This is for a double, composting, fully-accessible restroom. This facility will Service visitors to Refuge Headquarters as well.
Supplies and materials:	\$8,500. We will produce 15,000 copies of the Carson Trail. We will produce 3,000 copies of the refuge mammal list. We will produce 10,000 copies of the refuge bird list. We will modify the reptile and amphibian list to fit Service format and produce 1,500 copies of this brochure; we will do this in house, with assistance from the Regional External Affairs office.
Parking area (obligated):	\$55,000. As part of an ongoing project to provide universal fishing access and wildlife observation at the Spurwink Unit. This project is funded through a Visitor Services initiative and these funds are obligated.
Routine maintenance (annual):	\$4,700. This is the expected cost to maintain the parking area at Carson, Goosefare Brook and Spurwink parking lots by grading and filling low spots, repairing handrails and vandal damage, as well as general upkeep and maintenance.
Total:	\$66,500 new funds, plus up to \$4,700 annually; \$55,000 funded through Visitor Services and already obligated.

These facilities will be used by the public engaged in all six priority uses of the Refuge system. With the exception of annual maintenance, all expenditures are enumerated in the Refuge Management Information System. We calculated hunting and fishing program costs in separate compatibility determinations. We have plans to charge entrance fees, and those plans can be found in the CCP, chapter 2, alternative B, goal 5. These fees could help offset annual maintenance costs. Funds for the Spurwink parking lot are already obligated or expended. The refuge anticipates increased capacity with the development of additional wildlife observation, photography, interpretation and environmental education opportunities as projected in the Comprehensive Conservation Plan.

Anticipated Impacts of the Use

Direct disturbance to wildlife is anticipated, as is true for all human – wildlife interactions. United States’ treaty migratory bird obligations will not be adversely affected since actions taken on the refuge can only influence the small proportion of the migratory bird populations which are present on the refuge at any one time and the initiatives described in this determination are designed to minimize impacts on individuals and habitats. We will be satisfying our proposed conservation plan objectives, and a goal of the Refuge System Improvement Act, by providing opportunities for compatible wildlife -dependent recreation. Thirty-six species of shorebirds are reported using the Maine coast primarily as staging areas during long distance migration. Peak numbers of migrant shorebirds occur from mid-May to early June and from mid-July to mid-September (Tudor 2000), which is also the start of the peak visitor use season. Shorebirds using the Maine coast face potential impacts from recreational disturbances to foraging and nesting birds, as well as oil spills, resource extraction affecting shorebird food supplies, habitat loss to development, predators, and contaminants (Clark and Niles 2000). The impacts to wildlife are at a level that will not interfere with wildlife populations. Location of waysides, layout and construction of trails and overlooks will attempt to minimize habitat degradation.

Nearly 100,000 visitors used the one-mile foot Carson Trail at the Wells headquarters; one of four developed trails on the Refuge. There are many times during the summer and fall when the parking lot is full or overflowing. The headquarters trail in Upper Wells is currently the only Refuge Division with an informational kiosk. The two-mile Cutts Island Trail in Brave Boat Harbor Division has trail signs, but no kiosk nor restroom. Carry-in boat access only is available on Chauncy Creek at the intersection of Cutts Island and Seapoint Roads. Parking is available through verbal agreement with Town of Kittery. The Goose Fare Brook Trail and overlook offers parking, a short stone-dust trail and interpreted observation platform with automatic-focus binoculars. The Bridle Path and Atlantic Way and Ted Wells Trails provide views of Refuge habitat in Kennebunk and Saco and Old Orchard Beach. These trails are located on and adjacent to Refuge property and are maintained by municipal or private non-profit organizations. New signs, new trails and other opportunities will continue to impact wildlife and wildlife habitat.

Endangered and/or threatened species and species of special concern are present on the refuge. However, there are no threatened and endangered species known to use the areas identified for wildlife observation, photography, environmental education and interpretation.

Public Review and Comment

As part of the CCP process for Rachel Carson refuge this compatibility determination will undergo extensive public review, including a comment period of 30 days following the release of the Draft CCP/EA.

Determination

- Use is not compatible
- Use is compatible, with the following stipulations

Stipulations Necessary to Ensure Compatibility

- Compliance with regulations will be achieved through education, signage and law enforcement which will result in minimizing negative impacts to refuge habitat and wildlife.
- Refuge regulation concerning hours (daylight hours) and access restricted to permitted areas will be enforced.
- Some activities are not compatible and are prohibited on the Refuge to protect sensitive habitats and wildlife. Prohibited activities include using off-road vehicles, camping, building fires, horse-back riding, mountain biking, and collection of any plants or animals not covered by a permit.

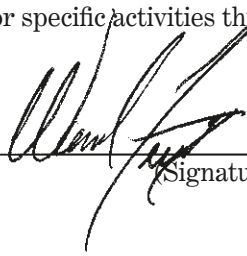
Justification

Environmental education, wildlife observation, interpretation, and photography are four of the six priority public uses of the National Wildlife Refuge System and have been determined to be compatible activities on hundreds of

Compatibility Determination for Wildlife Observation, Photography, Environmental Education, and Interpretation

other refuges nationwide. The Refuge System Improvement Act of 1997 instructs refuge managers to seek ways to accommodate these six activities. A small portion of the refuge is open to general public use, while other areas may be accessible for specific activities through the special use permit process.

Project Leader



(Signature)

MAY 29, 2007
(Date)

Concurrence

Regional Chief



(Signature)

June 7, 2007
(Date)

Mandatory 15 year Re-evaluation Date

(for all uses other than priority public uses)

June 7, 2022
(Date)

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Compatibility Determination

Use

Boat Launching

Refuge Name

Rachel Carson National Wildlife Refuge

Establishing and Acquisition Authorities

The Rachel Carson refuge was established on December 16, 1966. The authority which established the refuge is 16 U.S.C. 715-715r; The Migratory Bird Conservation Act, as amended.

Refuge Purposes

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For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(a)(1)), the purpose of the acquisition is for the development, advancement, management, conservation, and protection of fish and wildlife resources.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(b)(1)), the purpose of the acquisition is 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, if such terms are deemed by the Secretary to be in accordance with law and compatible with the purpose for which acceptance is sought.

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Description of Proposed Use

(a) What is the use? Visitors launch and land non-motorized canoes and kayaks from two locations on the refuge. **Is the use a priority public use?** No. Boating is not a priority public use; however, this launch activity is allowed to support wildlife observation and fishing.

(b) Where would the use be conducted? The launch sites are in the southern- and northernmost refuge divisions; Brave Boat Harbor and Spurwink. 1) the southern refuge car-top launch area is located on Cutts Island, Seapoint Road, Kittery and 2) the Spurwink river boat launch immediately west of Route 77. The use takes place on navigable tidal water within the boundaries of the Refuge.

(c) When would the use be conducted? The Cutts Island and Spurwink launches are open daylight hours, year round. Practically, the areas are open prior to and following freeze-up. Both areas are tidally influenced and will not be suitable (low, high and fast water levels) for launching at all times. Special care is needed at the Cutts Island site where the rapid tidal exchange can effectively prevent users from returning to the launch site.

(d) How would the use be conducted? Both areas are for the launch of recreational crafts. The Cutts Island site requires carrying the boat, canoe or kayak some 30 feet from the parking area (on Town of Kittery property) to the water's edge. The Spurwink launch ramp is suitable for trailer launching small boats directly into the river.

(e) Why is the use being proposed? Rachel Carson is a coastal refuge. Surface waters in the State of Maine are the property of the state and the refuge cannot regulate this activity. Since the refuge is surrounded by water, these facilities are offered to accommodate our wildlife oriented visitors. These activities would be conducted in such a manner to minimize impacts on established programs, including hunting, fishing, wildlife and observation programs, on the rest of the refuge.

Availability of Resources

Both launch facilities directly support priority public uses. Neither site has required, nor is expected to require, extensive maintenance. Continuation of this activity and issuance of this boat launch determination is within the budget and staff capacity of the refuge.

Anticipated Impacts of the Use

Brave Boat Harbor Division – The Brave Boat Harbor Division encompasses approximately 750 acres. This Division is located within the towns of York and Kittery. Oak-pine forest with vernal pools and old field upland habitats surround salt marsh and estuary habitat.

This area was nominated for inclusion in the Maine Ecological Reserves program because of its saltmarsh ecosystem, and presence of oak-pine forest, exemplary white oak-red oak forest and perched hemlock-hardwood swamp communities, acidic fen, shrub swamp, and vernal pool (McMahon 1998). It also lies within a Maine Beginning With Habitat Focus Area (Greater Brave Boat Harbor/Gerrish Island) that is known to harbor rare natural communities including red oak-white oak forest, dune grassland, and spartina saltmarsh (Maine Department of Inland Fisheries and Wildlife). Brave Boat Harbor lies within the Mount Agamenticus to the Sea Conservation Initiative, a region in southern Maine that surrounds the largest coastal forest on the eastern seaboard between Acadia and the New Jersey pine barrens (Mount Agamenticus to the Sea Conservation Initiative).

Threatened and endangered species may be present but will not be affected by this activity.

Spurwink Division, in the Towns of Scarborough and Cape Elizabeth, encompasses 520 acres. This Division is centered along the waters of the Spurwink River, Pollack Creek and several other small waterways. It consists of upland fields, high quality salt marsh, shrublands, and some mature forest.

Direct disturbance to waterfowl, notably wintering black duck, is likely along the refuge waterways as is disturbance to other waterfowl, wading birds and salt marsh species. Both areas are patrolled and visited frequently by refuge staff. Intense levels of use, should they occur, will result in reexamination of this determination. Water quality up and down stream (tidal) could be degraded through bank, or streambed erosion or introduction of potentially toxic materials. Dormant or unavailable toxins or heavy metals could be in existence in the muddy bottom and could be stirred and become available to aquatic species.

In the spring and summer months nesting waterfowl and shorebirds in the immediate area would be affected by launching and paddling. These disturbances, however, would be minimal since restrictions built into execution of this project, i.e. recreational, no-motor boats only, are designed to lessen impacts. Refuge visitors will be inconvenienced by Maine's 9 to 11 foot tidal range.

Refuge visitors could find this activity creates temporary direct disturbance to wildlife and/or habitat which may impact their intended uses. Anglers may take advantage of this launch area to access state-controlled waters. Although the striped bass fishing season is January 1 - December 31, most fishing takes place in the spring and early summer. During peak fishing seasons, any activity can startle or repel fish. Activities in the vicinity of the launch sites can result in compaction of soils, trampled vegetation and erosion to habitats, especially in riparian zones.

Endangered and/or threatened species and species of special concern are also present on the refuge. The New England Cottontail occurs in the Spurwink Division, however, the rabbit does not occur in the immediate vicinity

of the boat launch. Federal-listed threatened piping plover nest on beaches and feed on the mudflats behind the beach, but the birds are not found near either boat launch. Other threatened and endangered species may be present but will not be affected by this activity.

Public Review and Comment

As part of the CCP process for Rachel Carson refuge, this compatibility determination will undergo extensive public review, including a comment period of 30 days following the release of the Draft CCP/EA.

Determination

Use is not compatible

Use is compatible, with the following stipulations

Stipulations Necessary to Ensure Compatibility

- Project will be adequately publicized and accommodations for pedestrians will comply with applicable safety regulations.
- Enforcement will occur on refuge use, taking and disturbance provisions to assure compliance with regulations and minimize negative impacts to refuge habitat and wildlife.
- Refuge regulation concerning hours (daylight hours) and access restricted to permitted areas will be enforced.
- There are countless opportunities for wildlife related experiences on the refuge. Unfortunately, the impact of humans is becoming ever more present. We must all learn how to minimize our damaging effects and how to preserve our natural and wild environment. We can use and enjoy these treasures and so can our grandchildren if we practice the Leave No Trace principles, modified here for the refuge.
 - ◆ Plan Ahead and Prepare
 - ◆ Travel on Durable Surfaces
 - ◆ Dispose of Waste Properly
 - ◆ Leave What You Find
 - ◆ Be careful with Fire
 - ◆ Respect Wildlife
 - ◆ Be Considerate of Other Visitors

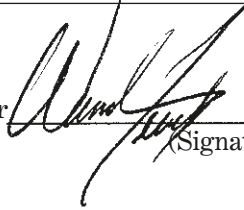
Justification

The fishery resource at Rachel Carson refuge is plentiful and species abundant with native species such as winter flounder (*Pleuronectes americanus*), alewife (*Alosa pseudoharengus*), blueback herring (*A. aestivalis*), pollock (*Pollachius virens*), bluefish (*Pomatomus saltatrix*), American shad (*A. sapidissima*), striped bass (*Morone saxatilis*), as well as stocked species such as brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*). These renewable resources can be utilized and maintained at optimum levels. This species biodiversity, which is important in maintaining a healthy ecosystem, also provides management flexibility. This site specific, time limited disturbance will not jeopardize this resource.

The fishing program is in its fourth year. Permitting recreational boat launch will benefit fishing. Safety continues to be of paramount importance in all of our management decisions. Allowing visitors to launch and land non-motorized canoes and kayaks from two locations within the Rachel Carson refuge 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.

Compatibility Determination for Boat Launching

Project Leader


(Signature)

MAY 29, 2007
(Date)

Concurrence

Regional Chief


(Signature)

June 7, 2007
(Date)

Mandatory 10 year Re-evaluation Date
(for all uses other than priority public uses)

June 7, 2017
(Date)

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Compatibility Determination

Use

Use of *Bacillus thuringiensis* (Bti), a larvacide to control mosquito and flies in emergency public and/or wildlife health situations (hereafter “mosquito control” will include mosquitoes, flies, and similar species).

Refuge Name

Rachel Carson National Wildlife Refuge

Establishing Authority

Rachel Carson National Wildlife Refuge was established on December 16, 1966. The authority which established the refuge is 16 U.S.C 715-715r, The Migratory Bird Conservation Act, as amended.

Refuge Purposes

For lands acquired under the Migratory Bird Conservation Act (16 USC 715d), the purpose of the acquisition is for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.

For lands acquired under the Refuge Recreation Act (16 USC Section 460k-1), 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).

For lands acquired under the Emergency Wetlands Resources Act of 1986 (16 USC Section 3901(b) 100 Stat. 3583, the purpose of the acquisition is for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide to help fulfill international obligations contained in various migratory bird treaties and conventions.

For lands acquired under the Fish and Wildlife Act of 1956 (16 USC Section 742f (a)(1)), the purpose of the acquisition is for the development, advancement, management, conservation, and protection of fish and wildlife resources.

For lands acquired under the Fish and Wildlife Act of 1956 (16 USC Section 742f(b)(1)), the purpose of the acquisition is 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, if such terms are deemed by the Secretary to be in accordance with law and compatible with the purpose for which acceptance is sought.

National Wildlife Refuge System Mission

“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-668ee]).

Description of Proposed Use

(a) What is the Use? Is the use a priority public use? The use is mosquito management which includes surveillance and, if warranted, mosquito control. Mosquito surveillance and control are not a priority public uses of the National Wildlife Refuge System (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 (Public Law 105-57).

Mosquitoes and other insects provide a food source, directly or indirectly, for Service trust species (migratory birds, threatened and endangered species, and anadromous fish).

(b) Where would the use be conducted? The refuge hosts saltwater and freshwater mosquitoes, greenhead flies and black flies. Much of the refuge is saltmarsh, so most mosquito breeding habitat is in areas best suited to saltwater mosquitoes. Because of this, the mosquito control would take place in the saltmarsh areas.

(c) When would the use be conducted? Seasonally, on an irregular and short-term basis when it is necessary to protect the health and safety of humans, wildlife, or domestic animals. We will allow State or local vector control agencies to conduct mosquito control on refuge lands using effective compatible means that pose the lowest risk to wildlife and habitats.

When necessary to protect the health and safety of the public or a wildlife or domestic animal population, we will allow management of mosquito populations on the refuge

The surveillance activities associated with this use would be conducted from April through early October under the conditions of this Compatibility Determination, a Special Use Permit and the Service Mosquito policy. Some mosquito control activities could occur throughout the mosquito/fly season (top minnows, swallows, etc).

(d) How would the use be conducted? The mosquito control will be applied to the marsh by hand spraying or hand dispersal. Except in cases of officially determined health emergencies, any method we use to manage mosquito populations within the refuge will conform with applicable Federal laws such as the Endangered Species Act. Habitat management and pesticide uses for mosquito control will give full consideration to the integrity of non-target populations and communities. They will also be consistent with integrated pest management strategies and with existing pest management policies of the Department of the Interior and the Service.

We will allow pesticide treatments for mosquito population control on Refuge System lands only when local, current mosquito population monitoring data are collected and the data indicate that refuge-based mosquito populations are contributing to a human, wildlife, or domestic animal health threat.

State/local public health or mosquito control agencies will conduct any surveillance, the methods to include dip samples, light/CO₂ traps, and landing rates. *Bacillus thurigiensis* application would be made following the limitations included in the product EPA label, an annual Fish and Wildlife Service Pesticide Use Permit, and an annual Refuge Special Use Permit.

(e) Why is this use being proposed? In rare circumstances mosquitoes can serve as disease vectors presenting a threat to human health. It is the policy of the National Wildlife Refuge System that we will allow native mosquito populations to function unimpeded and we may allow mosquito populations to be controlled only in the following circumstances:

- There is a need to manage a public or wildlife health threat from a specific mosquito-borne disease that mosquito and disease monitoring data have documented as enumerated in Service policy.
- There are tires, tanks, or other similar debris/containers that may serve as artificial breeding sites for native or non-native species of mosquitoes. We may remove these or treat them with pesticides.
- We are enhancing, restoring, or managing habitat for other wildlife species to achieve refuge purposes. This may be in the form of habitat restoration or water level manipulations where there is a definable benefit to other wildlife over not undertaking such actions. We prohibit habitat modifications or management actions designed specifically for mosquito control that impact other wildlife species or habitats and are detrimental to refuge purposes or System goals. These modifications or actions include, but not limited to, inappropriate draining, maintaining high water levels that are inappropriate for wildlife, and the importing or enhancing of non-native predators.
- There is a need to manage a threat to public health and safety from extreme numbers of biting mosquitoes when advised to do so by the Centers for Disease Control and Prevention (CDC) and/or the Federal Emergency Management Agency (FEMA). Such mosquito control may be necessary following natural or human-caused disasters when biting mosquitoes may hamper recovery efforts.

Availability of Resources

Refuge staff time and resources are finite and work is planned annually. The mandate for all national wildlife refuges is to consider wildlife first. The Service provides the refuge with no funds or support for mosquito control.

The preparation of annual Pesticide Use and Special Use Permits, reviewing monitoring reports, and reviewing annual action-reports are functions that can be accomplished with assistance from Regional biologists.

Anticipated Impacts of the Use

Generally, refuges will not conduct or allow mosquito monitoring or control, but these activities may be allowed under special use permits. When necessary to protect the health of a human, wildlife, or domestic animal population, we will allow surveillance and if warranted reduction of mosquito populations on Refuge System lands using effective means that pose the lowest risk to wildlife and habitats.

Mosquitoes, flies and other insects are a food source to wildlife, especially birds, fish, reptiles and amphibians. Mosquito eggs, larvae and pupae provide a significant food source to *Fundulus* living in saltmarsh pools and pannes which in turn compose an important part of the diet for marsh and wading birds such as egrets and herons. These and similar food chain relationships, when combined with the wildlife first mandate, results in a determination against mosquito control on the refuge.

Rachel Carson wrote about the interconnectedness of all living things; each species has its own ties with others and all are related to the earth. This is the message of *Silent Spring* and the earth-sea trilogy. She simply and convincingly explained the connections between humans and all creatures of the earth. Preserving under industry and government pressure to abandon her research, in *Silent Spring*, she linked the unrestrained use of post-World War II chemical pesticides with their disastrous biological consequences. With this book Ms. Carson launched the modern environmental movement. Congress renamed and dedicated this refuge in her honor. Consequentially, this refuge is very conservative concerning pesticides, due to both the direct effects of chemicals on the interrelatedness of all living things and the perception of using pesticides on a refuge named for Rachel Carson.

The resources most at risk can be characterized as follows: Southern coastal Maine is a migration and staging area for much of the North American shorebird population. Thousands of shorebirds feed along coastal beaches and mud flats as they migrate through the State. Biddeford Pool serves as one of the top shorebird staging areas in southern Maine. In 2004, a fall migration shorebird survey was conducted weekly at several spots on the refuge. The survey documented an average of 555 shorebirds per a survey (at 8 sites) with peak numbers (>1400 birds) occurring in late August. Thirty-six species of shorebirds are recorded for the refuge, with five of these considered regular breeders. Most shorebird use occurs during fall migration, beginning in early July and continuing through early November. Utilization occurs in a variety of habitats within the estuarine community, but the greatest use occurs in tidal mudflats and salt pannes. Areas used during major fall migrations include the Webhannet River at low tide, several salt pannes on the Lower Wells and Upper Wells Division, the Batson River and Goose Rocks tidal mudflats, and numerous locations at the Biddeford Pool Division. The great diversity of shorebirds found in these areas compares to only a few other sites in Maine.

Endangered and/or threatened species and species of special concern are also present on the refuge, but will not be affected by this action. The **piping plover** is federally threatened and state endangered in Maine. They nest above the high tide line on open sand, gravel or shell-covered beaches, especially on sand spits and blowout areas in dunes. Fifty to 75% of the Maine piping plover population nests at three sites on or near the refuge, including Crescent Surf Beach, Goosefare Brook, and Marshall Point at Goose Rocks. The **least tern** is a state endangered species in Maine. In 2005, Crescent Surf Beach hosted the largest nesting colony (51 pairs) of least terns in Maine. New England cottontail rabbit status is being reviewed; their habitat is dense upland thickets.

Toxicity and Effects to Non-target Organisms

There is little information available regarding non-target species affects of Bti in salt marsh application (Higgins, 2003, personal communication). Results of a Canadian study, in publication, indicate that salt marsh application of Bti reduced the numbers of some non-target benthic species, but that the numbers of other benthic community species increased so that overall biomass was not affected (Higgins, 2003, personal communication).

From studies conducted in fresh water wetlands, the bacterium Bti is a microbial insecticide that, when ingested, is toxic to mosquitoes, black flies and several other members of the nematocera suborder within the order diptera. The intact toxin is not active against vertebrates (Boisvert and Boisvert 2000). The greatest degrees

of susceptibility are within a few families: the Culicidae (mosquitoes), the Simuliidae (black flies) and the Chironomidae (midges), with mosquitoes and black flies being the most susceptible (Boisvert and Boisvert 2000).

Bti is used widely because of its reportedly high specificity for target species and environmental safety (Ali 1981; Merritt et al. 1989). Laboratory and field studies have shown that Bti is toxic to some larval chironomids, but many factors, such as temperature, water depth, aquatic vegetation and suspended organic matter, may act to reduce its toxicity to chironomids in the environment (Charbonneau et al. 1993; Merritt et al. 1989).

Numerous studies have been conducted on the effects of Bti on fresh water, non-target organisms (anything other than mosquitoes or black flies). A recent comprehensive review of 75 of these studies (Boisvert and Boisvert 2000) found that 37 had documented that some non-target organisms can be affected to a certain extent after a Bti treatment. The other 38 studies show no effects to non-target organisms studied. Some members of the diptera suborder nematocera have been shown to be the most common species susceptible to Bti. The susceptibility of chironomid larvae to Bti could be between 15 to 75 times less than mosquito or black fly larvae, but the studies indicated that a high dosage of Bti will affect chironomid populations. Although many of the studies were done either at high dosage or under laboratory conditions, 9 of the 23 studies reporting an effect on chironomid populations were done using actual operating conditions (in the field at operational doses). Apart from Chironomidae, seven other dipteran families were affected by Bti. During many experiments or trials using higher dosages, some of these families show significant mortalities. All these families are dipteran and may possess the capacity to capture, ingest and digest toxic crystals. In sufficient quantity, this can produce enough toxic proteins to induce cellular damage that could lead to death.

A long-term study on the effects of repeated Bti treatments on non-target organisms in freshwater wetlands was performed by Hershey et al. (1998) over 4 years in Minnesota. Bti was applied for 3 consecutive years using 6 applications each year between mid-April and mid-July at recommended label rates. Boisvert & Boisvert (2000) consider this frequency of applications as “intensive” and “higher than normal.” Highly significant reductions were observed in several insect groups in the second year and eventually the intensive treatments resulted in wetland communities that were depleted of most insects during the third year. Since Bti was likely to be directly toxic to only Nematocera diptera, the effects of Bti on other insect groups may have resulted in disruption of the invertebrate food web (Hershey et al. 1998). Because the application was repeated 6 times per season at 3 week or shorter intervals, non-target insects were much more likely to have been exposed to the direct or indirect effects of Bti. Boisvert & Boisvert (2000) believe that the recent study by Su and Mulla (1999) provides some explanation for these Hershey et al. (1998) results. Su and Mulla (1999) found that shortly after a single Bti treatment the growth of two species of green algae was inhibited for nearly three weeks. Considering the type of habitat treated and the frequency of Bti applications by Hershey et al. (1998), it is likely that primary production of algae was almost totally inhibited for three years resulting in the dramatic changes in diversity indices that they observed. No such food web effects have been documented during “normal” use of the materials or in saline environments (Lawler et al. 1999).

In conclusion, there are little data regarding the effects of Bti in salt marsh applications. In fresh water wetlands, Bti is thought by many to be a selective mosquito control treatment. However, there may be some effects to chironomids under normal operating conditions. Repeating treatments at longer intervals may give the non-target community time to recover in case there are any effects (Mulla et al. 1979). In addition, chironomids were the most abundant group in the freshwater wetlands of that study (Hershey et al. 1998). Thus, the results of that study do not necessarily apply to the saline conditions at the refuge. Therefore, at the level of treatment proposed, adverse impacts to non-target organisms are expected to be negligible or nonexistent. However, Hershey’s study does demonstrate the need for long term research to better understand the consequences of Bti application on the invertebrate food web.

Public Review and Comment

As a part of the CCP process for Rachel Carson refuge, this compatibility determination will undergo extensive public review, including a comment period of 30 days following the release of the Draft CCP/EA.

Determination

_____ Use is not compatible

X Use is compatible, with the following stipulations

Stipulations Necessary to Ensure Compatibility

The refuge will abide by the following national guidance:

- Mosquito management can occur only when local and current monitoring data indicate that refuge-based mosquitoes are contributing to a human, wildlife, or domestic animal health threat.
- Refuges may use compatible non-pesticide options to manage mosquito populations that represent persistent threats to health.
- Refuges will collaborate with Federal, State, or local public health authorities and vector control agencies to identify refuge-specific health threat categories. These categories will represent increasing levels of health risks, and will be based on monitoring data.
- Management decisions for mosquito control will be based on meeting or exceeding predetermined mosquito abundance or disease threshold levels that delimit threat categories.
- In the case of officially determined mosquito-borne disease emergencies, we will follow the guidelines described in this document. Monitoring data are still required to ensure that intervention measures are necessary.
- All pesticide treatments will follow Service and Department of the Interior pest management and pesticide policies. In an emergency, the pesticide approval process can be expedited.
- Refuges must comply with Federal statutes and Service policies by completing the appropriate documentation prior to mosquito management activities taking place.

A modified Open Marsh Water Management is used to manage saltmarshes on the refuge. This management tool uses techniques such as plugging ditches to mimic natural hydrology. Unlike the salt hay harvesting and “mosquito control “ditching in the late 1800’s and early 1900’s, modified OMWM involves plugging or in other ways modifying ditches and excavating shallow ponds. Pond excavation includes a 3+ foot sump to provide over-winter habitat for *Fundulus*. This pond and over-wintering habitat for *Fundulus* increases a food source to wading birds, but it also increases numbers of *Fundulus* which prey on mosquito larvae and pupae.

When necessary to protect the health of a human, wildlife, or domestic animal population, we will allow surveillance of mosquito populations on Refuge System lands by public health personnel. Sites will be checked for the presence of larval or adult mosquitoes through use of standard dip samples, light/CO2 traps, searching for new larval habitat, or noting landing rates to obtain counts of mosquitoes, to obtain samples for viral analyses, and to identify species present.

Only foot access to the salt marsh is allowed. Further stipulations will be contained in the required Special Use Permit.

Copies of monitoring data and lab results will be made available to the refuge manager on a weekly basis or as soon as they are available. Dip counts and enumeration of numbers by species will be required prior to each application of Bti.

Compatibility Determination for Mosquito Control

The Refuge Manager will be contacted at least one day in advance of each application of Bti so that, at his or her discretion, the manager may accompany the applicators during work on the refuge or may delay application for the protection of refuge resources existent at any particular time. The Refuge Manager, in consultation with the public health authorities and Service personnel, may authorize application of Bti in instances where the number of larva present, the species present, the incidence of West Nile Virus positive mosquitoes, EEE positive mosquitoes, or West Nile Virus positive birds indicate there is a potential risk to public health.

Application of Bti will be limited to a maximum of two times per month following the spring tides during the months of June, July, August, and September. Application of Bti will be by hand spraying a liquid formulation or hand dispersal of a granular formulation of Bti. Application will be performed by trained personnel, and will be in strict conformance with the product label.

Application of Bti will be limited to the areas shown on the Special Use Permit map.

The State/local public health officials will provide a written summary report of the season’s work to the refuge manager by December 31 of each year. The report will include the results of all monitoring and surveillance data, as well as a table showing (for each application): the number of acres treated, the rate of active ingredient applied per acre (pounds or ITUs), the target species, and the results (percent effectiveness).

Justification

Rachel Carson refuge is one unit in a system of national wildlife refuges. This system has rules and procedures; in this case, national policy is to allow mosquito control on refuge lands when a human, wildlife or domestic animal health concern can be directly linked to the refuge habitat. Despite anticipated negative reactions due to the teachings of Rachel Carson, and only in the very narrowest interpretation of Service policy will allowing mosquito control to occur within the Rachel Carson refuge not materially interfere with or detract from the mission of the Refuge System or the purposes for which the refuge was established.

Project Leader	 _____ (Signature)	<u> MAY 29 2007 </u> (Date)
Concurrence		
Regional Chief	 _____ (Signature)	<u> June 7, 2007 </u> (Date)
Mandatory 10 year Re-evaluation Date (for all uses other than priority public uses)	_____	<u> June 7, 2017 </u> (Date)

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Compatibility Determination

Use

Research conducted by non-refuge personnel

Refuge Name

Rachel Carson National Wildlife Refuge

Establishing Authority

The Rachel Carson refuge was established on December 16, 1966. The authority which established the refuge is 16 U.S.C. 715-715r; The Migratory Bird Conservation Act, as amended.

Refuge Purposes

For lands acquired under the Migratory Bird Conservation Act (16 U.S.C. 715d), the purpose of the acquisition is for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.

For lands acquired under the Refuge Recreation Act (16 U.S.C. 460k-1), “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).

For lands acquired under the Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901(b); 100 Stat. 3583), the purpose of the acquisition is for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide to help fulfill international obligations contained in various migratory bird treaties and conventions.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(a)(1)), the purpose of the acquisition is for the development, advancement, management, conservation, and protection of fish and wildlife resources.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(b)(1)), the purpose of the acquisition is 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, if such terms are deemed by the Secretary to be in accordance with law and compatible with the purpose for which acceptance is sought.

National Wildlife Refuge System Mission

“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-668ee]).

Description of Proposed Use

(a) What is the use? Is the use a priority public use? The use is research conducted by non-Service personnel. 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.

Rachel Carson refuge supports natural resource research on refuge lands when it does not materially interfere with or detract from the purposes of the refuge or the mission of the National Wildlife Refuge System. All research proposals are required to complete the standard Service special use permit, as amended by the refuge.

Allow colleges, universities, partners and other credentialed researchers the opportunity, by permit, to conduct wildlife, habitat, or human resources related research activities within the Refuge boundary. Research conducted by non-Service personnel is not a priority public use of the Refuge System.

Research may contribute to a body of knowledge and not relate to priority public uses. Wildlife research may compliment hunting or fishing which are primary public uses. Habitat related research may compliment wildlife observation or photography which are primary public uses. Human resources research may compliment environmental education or interpretation which are priority public uses.

As part of the Land Management Research and Demonstration program at the Refuge, identify high-priority estuarine ecosystem management research needs, develop research proposals, and facilitate and implement research projects.

(b) Where would the use be conducted? Research will be conducted throughout the refuge and throughout the year consistent with special use permit conditions. Areas showing signs of impending degradation will be closed or altered to reduce or stop adverse impacts as necessary to protect habitat and populations. If a research project occurs during the refuge hunting season, special precautions will be required and enforced to ensure public health and safety. Individuals will stay within the areas designated by staff and restrictions of SUP.

(c) When would the use be conducted? Research may be conducted at any period of the year. Special Use Permit conditions will limit negative impacts to wildlife, habitat, visitors and other programs. SUP will control numbers of individuals, areas of use, frequency of use, seasonal use, equipment and collections. The timing of each individual research project will be limited to the minimum required to complete the project.

(d) How would the use be conducted? Written research proposals will be required for review and approval before permits will be issued. If approved, access to Refuge lands and waters will be limited to least invasive means required to accomplish the activities. All disturbances will be at the minimal level necessary to accomplish goals of the proposed research. Off-road study areas will be accessed by boat or foot.

(e) Why is this use being proposed? Research by non-Service personnel is conducted by colleges, universities, federal, state, and local agencies, non-governmental organizations, and qualified members of the general public to further the understanding of the natural environment and to improve the management of the refuge's natural resources. Much of the information generated by the research is applicable to management on and near the refuge. Management oriented research results in long-term benefits to the wildlife populations of the refuge. The collection of detailed information on the wildlife, habitats and systems within the Refuge is integral to being able to maximize the habitat benefits of the existing landscape for the wildlife species utilizing the refuge.

The Service will encourage and support research and management studies on refuge lands that will improve and strengthen natural resource management decisions. The refuge will encourage and seek research relative to approved refuge objectives that clearly improves land management and promotes adaptive management. Priority research addresses information that will better manage the nation's biological resources and address important management issues or demonstrate techniques for management of species and/or habitats.

The refuge will also consider research for other purposes which may not be directly related to refuge-specific objectives, but contribute to the broader enhancement, protection, use, preservation and management of native populations of fish, wildlife and plants, and their natural diversity within the region or flyway.

The refuge will maintain a list of research needs that will be provided to prospective researchers or organizations upon request. Refuge support of research directly related to refuge objectives may take the form of funding, in-kind services such as housing or use of other facilities, direct staff assistance with the project in the form of data collection, provision of historical records, conducting of management treatments, or other assistance as appropriate.

Availability of Resources

The staff time for fulfillment of planned development and administration of the refuge is committed and available. The additional time needed to review and monitor research proposals and issue special use permits is flexible, i.e. it is moderated by the value of the research to System and refuge goals. The administrative burden for timely and consistent reporting is placed on the researcher. The Refuge biologists spend an average of two weeks a year reviewing, approving, coordinating and following-up on report requests for research projects conducted by outside researchers. At a rate of \$40.66, the cost is \$3250.00. Additionally, refuge management expends an average of three days a year on research SUPs, for a cost of \$1200. Administrative and maintenance involvement adds another \$800 per year for a total estimated cost of just over \$5,000.

Anticipated Impacts of the Use

The Service encourages approved research to further the understanding of the natural resources. Research by other than Service personnel adds greatly to the information base for Refuge Managers to make proper decisions. Disturbance to wildlife and vegetation by researchers could occur through observation, banding, and accessing the study area by foot or vehicle. It is possible that direct mortality could result as a by-product of research activities. For example, least tern chick mortalities can occur when chicks pile on top of each other and suffer from heat exhaustion and stress. Least terns are territorial and active in nest protection. These birds are easily spooked and will readily fly off their nest when a researcher approaches, even from a long distance. Nest abandonment can leave eggs or chicks vulnerable to heat or predators.

Standardized special use permit conditions are designed to minimize negative impacts to wildlife, habitat and visitors. The impacts to individual wildlife will not interfere with wildlife populations.

Endangered and/or threatened species and species of special concern are also present on the refuge. Special Use Permit conditions prevent negative impacts on threatened and endangered species. The **piping plover** is federal-listed threatened and state-listed endangered in Maine. They nest above the high tide line on open sand, gravel or shell-covered beaches, especially on sand spits and blowout areas in dunes. Fifty to 75% of the Maine piping plover population nests at three sites on or near the Refuge, including Crescent Surf Beach, Goosefare Brook, and Marshall Point at Goose Rocks. The **least tern** is a state-listed endangered species in Maine. In 2003, Crescent Surf Beach hosted the largest nesting colony (157 pairs) of least terns in Maine. Other threatened and endangered species may be present but will not be affected by this activity. New England cottontail rabbit status is being reviewed; their habitat is dense upland thickets. American eel populations are being reviewed, their habitats include the creeks, streams, rivers, salt marsh pools and grasses on the refuge.

Public Review and Comment

As a part of the CCP process for Rachel Carson refuge, this compatibility determination will undergo extensive public review including a comment period of 30 days following the release of the Draft CCP/EA.

Determination

Use is not compatible

Use is compatible, with the following stipulations

Stipulations Necessary to Ensure Compatibility

- All research proposals will be reviewed for their potential benefits to future refuge management activities and impacts to current refuge and system purposes.
- Continuation of each study will be contingent upon acceptable annual review by refuge staff. Review includes impacts to habitat and wildlife populations.
- Active LE program, in addition to SUP, will ensure regulation compliance, protection of refuge resources and promote safe and quality experience
- Some activities are not compatible and are prohibited on the Refuge to protect sensitive habitats and wildlife. Prohibited activities include using off-road vehicles, camping, building fires, horse-back riding, mountain biking, and collection of any plants or animals not covered by a permit.
- We will require all researchers to submit a detailed research proposal that follows Service Policy. Researchers must give us at least 45 days to review proposals before the research begins. If the research involves the collection of wildlife, the refuge must be given 60 days to review the proposal. Researchers must obtain all necessary scientific collecting or other permits before starting the research. We will prioritize and approve proposals based on the need, benefit, compatibility, and funding required for the research.

Proposals


We will expect researchers to submit a final report to the refuge on completing their work. For long-term studies, we may also require interim progress reports. We also expect that research will be published in peer-reviewed publications. All reports, presentations, posters, articles or other publications will acknowledge the Refuge System and the Rachel Carson refuge as partners in the research. All posters will adhere to Service graphics standards. We insert that requirement to ensure that the research community, partners, and the public understand that the research could not have been conducted without the refuge having been established, its operational support, and that of the Refuge System.

We will issue SUPs for all research conducted by non-Service personnel. The SUP will list all conditions necessary to ensure compatibility. The SUPs will also identify a schedule for annual progress reports and the submittal of a final report or scientific paper.

We may ask our regional refuge biologists, other Service divisions, state agencies, or academic experts to review and comment on proposals. We will require all researchers to obtain appropriate state and federal permits.

Justification

The Service encourages approved research to further understanding of refuge natural resources. Research by non-Service personnel adds greatly to the information base for Refuge Managers to make proper decisions. Research conducted by non-Service personnel 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.

Project Leader 
(Signature)

MAY 29 2007
(Date)

Concurrence

Regional Chief 
(Signature)

June 7, 2007
(Date)

Mandatory 10 year Re-evaluation Date
(for all uses other than priority public uses)

June 7, 2017
(Date)

Attachments: Special Use Permits and conditions

SPECIAL USE PERMITS - RHC

Special Conditions – All general permits please initial box (**FDR**) to affirm compliance

- Location of work will be specified to the appropriate level of detail.
- All materials including flagging, transect markers, etc. are to be removed by end of permit period and area restored to pre-permit conditions.
- To protect wildlife and vegetation, disturbances to habitat are to be kept to a minimum.
- Unless excepted in the permit, all refuge regulations apply.

SPECIAL USE PERMITS – RHC FOR COLLECTING BIOLOGICAL SAMPLES

No Manipulation Areas:

- Drakes Island Road and Mile Road
- Spurwink River Division east of Spurwink Road [Rt. 77]

Special Conditions – All Research Permits ***Initial Each Block***

- An update or final report is required from every permittee by December 31.
- USFWS/RHC will be appropriately recognized in all written reports
- Location of work will be specified to the appropriate level of detail. Research sites require GPS coordinates (UTM NAD83 Zone 19).
- All materials including flagging, transect markers, etc. are to be removed by end of research project or permit period and area restored to pre-permit conditions.
- To protect wildlife and vegetation, disturbances [including trampling] to habitat are to be kept to a minimum.
- Unless excepted in the permit, all refuge regulations apply.
- Inform the refuge biologist in advance if there are any changes in your plan of research to maintain the validity of your permit
- You may use specimens collected under this permit, any components of specimens (including natural organisms, enzymes, genetic materials of seeds), and research results derived from collected specimens for scientific or educational purposes only, and not for commercial purposes unless you have entered into a Cooperative Research and Development Agreement (CRADA) with us. We prohibit the sale of collected research specimens or other transfers to third parties. Breach of any terms of this permit will be grounds for revocation of this permit and denial of future permits. Furthermore, if you sell or otherwise transfer collected specimens, any components thereof, or any products or research results developed from such specimens or their components without a CRADA, you will pay us a royalty rate of 20 percent of gross revenue from such sale. In addition to such royalty, we may seek other damages and injunctive relief against you.

We encourage permittees and their assistants to notify the refuge staff of unusual observations or occurrences that they encounter on the refuge. In addition, as part of our efforts to preserve and restore native habitats on Rachel Carson NWR, refuge staff have been identifying and treating infestations of non-native plants, and we encourage permittees and their assistants to report new outbreaks of invasive plants, as well as non-native animal sightings on the refuge. To prevent the transfer of noxious invasives, all boots and other equipment must be rinsed clean prior to use on the refuge.

SPECIAL USE PERMITS – RHC

No Manipulation Areas:

- Drakes Island Road and Mile Road
- Spurwink River Division east of Spurwink Road [Rt. 77]

Special Conditions – Research Permits ***Initial Each Block***

- An update or final report is required from every permittee by December 31.
- USFWS/RHC will be appropriately recognized in all written reports
- Location of work will be specified to the appropriate level of detail. Research sites require GPS coordinates (UTM NAD83 Zone 19).
- All materials including flagging, transect markers, etc. are to be removed by end of research project or permit period and area restored to pre-permit conditions.
- To protect wildlife and vegetation, disturbances [including trampling] to habitat are to be kept to a minimum.
- Unless excepted in the permit, all refuge regulations apply.
- Inform the refuge biologist in advance if there are any changes in your plan of research to maintain the validity of your permit

We encourage permittees and their assistants to notify the refuge staff of unusual observations or occurrences that they encounter on the refuge. In addition, as part of our efforts to preserve and restore native habitats on Rachel Carson NWR, refuge staff have been identifying and treating infestations of non-native plants, and we encourage permittees and their assistants to report new outbreaks of invasive plants, as well as non-native animal sightings on the refuge. To prevent the transfer of noxious invasive species, all boots and other equipment must be rinsed clean prior to use on the refuge.

Compatibility Determination

Use

Skiing and Snowshoeing

Refuge Name

Rachel Carson National Wildlife Refuge

Establishing and Acquisition Authorities

The Rachel Carson refuge was established on December 16, 1966. The authority which established the refuge is 16 U.S.C. 715-715r; The Migratory Bird Conservation Act, as amended.

Refuge Purposes

For lands acquired under the Migratory Bird Conservation Act (16 U.S.C. 715d), the purpose of the acquisition is for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.

For lands acquired under the Refuge Recreation Act (16 U.S.C. 460k-1), “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).

For lands acquired under the Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901(b); 100 Stat. 3583), the purpose of the acquisition is for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide to help fulfill international obligations contained in various migratory bird treaties and conventions.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(a)(1)), the purpose of the acquisition is for the development, advancement, management, conservation, and protection of fish and wildlife resources.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(b)(1)), the purpose of the acquisition is 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, if such terms are deemed by the Secretary to be in accordance with law and compatible with the purpose for which acceptance is sought.

National Wildlife Refuge System Mission

“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-668ee]).

Description of Proposed Use:

(a) What is the use? Facilitate wildlife observation, wildlife photography, and interpretation by allowing skiing and snowshoeing on refuge trails. The use simply involves foot-travel over the surface of the snow with the use of snowshoes and cross country skis on the refuge trail systems. **Is the use a priority public use?** No, however this use would facilitate wildlife observation, wildlife photography, and interpretation during winter months (priority public uses).

(b) Where would the use be conducted? Refuge trails in Brave Boat Harbor, Upper Wells and Goosefare Brook Divisions. Shared trails in Mousam and Goosefare Brook Divisions.

(c) When would the use be conducted? Use would be determined by snow accumulation. Typically in southern Maine, use would be limited to November through March. Wildlife observation, photography, and interpretation are year around activities.

(d) How would the use be conducted? The refuge's Carson, Cutts Island, Goosefare Brook Overlook trails and the Ted Wells, Atlantic Way and Bridle Path which we share with partners, are open to snowshoeing and skiing as a part of the wildlife dependent activities of wildlife observation, photography and interpretation. Interpretative brochures for the Carson and Ted Wells trails are available year-round.

(e) Why is this use being proposed? Wildlife observation, photography, and interpretation are priority public uses as defined by the National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57) and if compatible, are to receive enhanced consideration over other general public uses. These activities are encouraged at Rachel Carson refuge, and year around access requires use of snowshoes or skis.

Availability of Resources

Snowshoeing and skiing on trails has little effect on the trail tread. Costs for trail maintenance are enumerated in a separate compatibility determination (Wildlife Observation, Photography, Environmental Education, Interpretation). Existing staff and budget have provided sufficient resources to manage current uses. These low impact activities are within the projected budget and staffing capabilities of the Refuge to manage.

Anticipated Impacts of the Use

Direct disturbance to wildlife is anticipated, as is true for all human – wildlife interactions. Many trust resources, migratory birds and threatened and endangered species, migrate south during the period of use (November to March). The impacts to wildlife are at a level that will not interfere with wildlife populations. Impacts to habitat are minimal from travel over snow cover.

Nearly 100,000 visitors used the one-mile foot Carson Trail at the Wells headquarters. There are many times during the summer and fall when the parking lot is full or overflowing. During the winter months there are typically just a few automobiles in the plowed parking lot.

Endangered and/or threatened species and species of special concern are also present on the refuge but not on trails during winter months. New England cottontail rabbit status is being reviewed; their habitat is dense upland thickets.

Public Review and Comment

As part of the CCP process for Rachel Carson refuge this compatibility determination will undergo extensive public review, including a comment period of 30 days following the release of the Draft CCP/EA.

Determination


- Use is not compatible
- Use is compatible, with the following stipulations

Stipulations Necessary to Ensure Compatibility


- Snowshoers and cross-country skiers will only use established trails. Public use is limited to designated trails.
- Compliance with regulations will be achieved through education, signage and law enforcement which will result in minimizing negative impacts to refuge habitat and wildlife.
- Refuge regulation concerning hours (daylight hours) and access restricted to permitted areas will be enforced.
- Some activities are not compatible and are prohibited on the Refuge to protect sensitive habitats and wildlife. Prohibited activities include using off-road vehicles, camping, building fires, horse-back riding, mountain biking, and collection of any plants or animals not covered by a permit.

Justification

Wildlife observation, interpretation and photography are priority public uses. Rachel Carson refuge is located in Maine where the ground can be covered with snow from November to April. In Maine, the traditional means of access to outdoor destinations during winter months is via ski and snowshoe. Refuge trails are open to public use daylight hours year round. Due to the snow cover, visitor impact is minimized during winter months in that trail tread is not being compressed and fewer species and fewer numbers of wildlife are present. Allowing Skiing and Snowshoeing to occur within the Rachel Carson refuge 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.

Project Leader  (Signature) MAY 29 2007 (Date)

Concurrence

Regional Chief  (Signature) June 7, 2007 (Date)

Mandatory 10 year Re-evaluation Date
(for all uses other than priority public uses) June 7, 2017 (Date)

References

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Compatibility Determination

Use

Furbearer Management

Station Name

Rachel Carson National Wildlife Refuge

Establishing Authority

Rachel Carson refuge was established on December 16, 1966. The authority which established the refuge is 16 U.S.C 715-715r; The Migratory Bird Conservation Act, as amended.

Refuge Purposes

For lands acquired under the Migratory Bird Conservation Act (16 USC 715d), the purpose of the acquisition is for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.

For lands acquired under the Refuge Recreation Act (16 USC Section 460k-1), “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).

For lands acquired under the Emergency Wetlands Resources Act of 1986 (16 USC Section 3901(b) 100 Stat. 3583, the purpose of the acquisition is for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide to help fulfill international obligations contained in various migratory bird treaties and conventions.

For lands acquired under the Fish and Wildlife Act of 1956 (16 USC Section 742f (a)(1)), the purpose of the acquisition is for the development, advancement, management, conservation, and protection of fish and wildlife resources.

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(b)(1)), the purpose of the acquisition is 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, if such terms are deemed by the Secretary to be in accordance with law and compatible with the purpose for which acceptance is sought.

National Wildlife Refuge System Mission

“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-668ee]).

Description of Proposed Use

(a) What is the use? Is it a priority public use? The use is furbearer management. We consider furbearer management a refuge management economic activity. 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.

(b) Where would the use be conducted? Furbearer management would be conducted on the expansion areas of the refuge, primarily Biddeford and York River divisions. Furbearer management will also be conducted in the Upper Wells, Mousam and Goosefare Brook divisions where the targeted species cause damage to refuge resources, such as raccoons feeding on the eggs and chicks of federally threatened piping plover and State endangered least terns and/or muskrat causing damage to marsh habitats. The proposed locations are where it will accomplish the goals and objectives of our Habitat Management Plan, such as the balance of predator-to-prey levels and marsh ecosystem dependence.

We will work with the Maine Department of Inland Fisheries and Wildlife seasonally to inventory targeted species activity and determine trapping locations. A permit system and refuge law enforcement would ensure that trappers on the refuge comply with state and refuge regulations and that the data submitted to the refuge is accurate. Designating management zones and limiting the number of trappers in each zone may help prevent conflicts among trappers. In addition, designating trapping zones would allow the refuge to either concentrate or reduce trapping in areas where management intervention is desirable. Designating locations where specific trappers are permitted on the refuge will facilitate the enforcement of refuge and state regulations. That zoning may also provide better quality trapping experiences by preventing overlap with other trappers. However, if necessary, trapping may be concentrated or zoning eliminated to meet our goals for protecting refuge resources.

(c) When would the use be conducted? Furbearer management would be conducted in accordance with the Maine state seasons. Maine furbearer management seasons run from late October to the end of March. The annual occurrence of furbearer management on the refuge will be at the discretion of the refuge manager, and will depend on the population size of the targeted species and management objectives.

(d) How would the use be conducted? The refuge will be open to furbearer management for the following species: beaver, coyote, fisher, fox, mink, muskrat, otter, raccoon, skunk, and weasel.

The furbearer management program will closely mimic the Maine Department of Inland Fisheries and Wildlife's sanctuary deer hunt in Wells, Maine. We would conduct furbearer management following Maine state regulations and specific refuge regulations issued through a refuge special use permit (SUP). Only select permitted trappers may participate. The refuge would allow furbearer management during state seasons under state limits for the targeted species. The refuge manager reserves the authority to regulate the numbers of target species taken in any one location. Target species may include but are not limited to: raccoon, mink, opossum, fox, skunk, etc.

We would manage the furbearer management program through the SUP process and, if needed, will work with the State to have special furbearer management regulations or extended seasons. Administering the program under an annual SUP will allow the refuge manager to have a ready list of contacts for requests for specific management needs to accomplish refuge objectives.

We will require a harvest report from each trapper following the close of trapping season but before December 31 each year. The report will include data about the trapping effort, the time span of trapping by species, the number of target and non-target species harvested, the refuge areas trapped, and remarks on observations of wildlife or other noteworthy ecological information. Those data can provide a basis for catch-per-unit and population trend analyses. If the required information is lacking for a trapper from the previous year, we would not issue the SUP for the next year.

(e) Why is this use being proposed? We will conduct furbearer management first as a tool to maintain habitat and keep the predator-to-prey balance. A regulated furbearer management program on the refuge also affords a potential mechanism to collect survey and monitoring information or contribute to research on furbearer (and other wildlife) occurrence, activity, movement, population status, and ecology. By maintaining a trained, experienced group of trappers, the Service can use their skills and local knowledge to perform or assist in valuable management or research functions. Trappers who participate in the refuge program would provide assistance with the implementation of structured management objectives, such as the alleviation or reduction of wildlife damage conflicts, negative interactions among species, and habitat modifications. Refuge trappers typically have a stake in proper habitat and wildlife conservation and protection of the ecological integrity of the refuge so they can continue trapping. Accordingly, they are valuable assets for the refuge manager in providing on-site reports concerning the fundamental status of habitat, wildlife, and refuge conditions.

Furbearers are considered a renewable natural resource with cultural and economic values (Andelt et al 1999, Boggess et al. 1990 Northeast Furbearer Resources Technical Committee 1996, Payne 1980). Several human dimensions studies have documented trapper profiles, cultural aspects of trapping, and the socioeconomic role of trapping in the United States (Andelt et al. 1999, Boggess et al. 1990, Daigle et al. 1998, Gentile 1987). A regulated trapping program on the refuge could also foster the appreciation of wildlife and nature, wildlife observation, environmental education, a greater understanding of ecological relationships, stewardship of natural resources, and inter-generational passage of the methodologies of renewable resource use. Trapping is an activity in which family members and friends often participate and share joint experiences that broaden appreciation of natural resources and ecological awareness (Daigle et al. 1998).

Availability of Resources

The financial resources necessary to provide and administer this use at its current level are now available, and we expect them to be available the future. The refuge manager would provide overall administration of the program. A wildlife biologist, working with State personnel, would be required to evaluate furbearer activity and potential and current impacts on refuge resources. The biologist would also evaluate trapper data and compile trapping reports. An administrative assistant is required to help process SUPs and enter trapping data into a database. A refuge law enforcement officer would be required to check refuge trappers and ensure compliance with state and refuge regulations.

We estimate below the annual costs associated with administering the furbearer management program on the refuge.

Refuge Biologist (GS12) (recommendations, surveys, data analysis)—1 week/yr.....	\$2,000
Deputy Refuge Manager (GS12) (program administration)—1 week/yr	\$2,000
Law Enforcement Officer (GS 9) (trapper compliance)—12 days	\$3,000
Administrative Assistant (GS6) (office administration, permit issuance)—1 week/yr.....	\$900
Total	\$7,900

Anticipated Impacts of the Use

The impacts of furbearer management on the purposes of the refuge and mission of the Refuge System can be either direct or indirect, and may have negative, neutral, or positive impacts on refuge resources.

Indirect impacts may include displacing migratory birds during the pair bonding/nesting season or the destruction of nests by trampling. Direct impacts may include the catch of target and non-target species that are predators on migratory birds or nests, or the removal of species that induce habitat change (e.g., beavers).

Because of the temporal separation of trapping activities and breeding wildlife using the refuge, indirect impacts on those resources by trappers would be negligible. Trappers using the refuge in early March may disturb individual early nesting waterfowl on occasion, and cause their temporary displacement from specific, limited areas. Those impacts are occasional, temporary, and isolated to small geographic areas. Owls initiate nesting activities on the refuge in February, but no evidence suggests that trapping has affected owl nesting success.

Indirect impacts on wildlife nesting and breeding success can result from the removal of animals under a furbearer management program. In many instances, those impacts are positive. Reductions in the populations of nest predators such as raccoon, fox, skunk, and mink have positive impacts on nesting birds. The degree to which predator management benefits migratory bird production can vary widely depending on the timing of the removal of predators, the size of the habitat block, habitat isolation and adjacent land use.

The removal of plant-eating species such as beaver and muskrat can have both positive and negative impacts on refuge resources. Muskrats will dig bank dens into embankments, causing considerable damage and adding costs to the operations of the refuge. Beavers will sometimes plug water control structures, causing damage, limiting access, and could compromise the capabilities of the refuge to manage habitat. Managing beaver and muskrat populations at reasonable levels through a furbearer management program can reduce refuge costs in managing wildlife.

However, those same animals can enhance habitat management. Muskrats build houses and dens using aquatic vegetation, thus creating openings for fish, waterfowl and other migratory birds. Beaver dams create pond habitat, and their lodges are associated with openings in aquatic vegetation beds. Beavers are keystone species for cycling small wetland systems from pond to meadow to scrub-shrub and forested successional stages back to pond. That cycling benefits other species, including woodcock and black duck. Those benefits minimize the need to commit refuge resources to achieve those habitat conditions.

When considering impacts on refuge purposes, the impacts of the furbearer management program obviously include those on the furbearer populations themselves. Trapping harvests and removes individuals of the species. Yet state natural resources agencies indicate that, with exceptions, furbearer populations are stable or increasing. The anticipated direct impacts of trapping on wildlife would be a reduction of furbearer population in those areas where surplus furbearers exist. The removal of excess furbearers from those areas would maintain furbearer

Compatibility Determination for Furbearer Management

populations at levels compatible with the habitat and with refuge objectives, minimize furbearer damage to facilities and wildlife habitat, minimize competition with or interaction among wildlife populations and species that conflict with refuge objectives, and minimize threats of disease to wildlife and humans.

Non-target furbearer species could be taken through this trapping program. Traps will be set specifically around areas of targeted species activity to reduce the risk of taking species other than targeted species. The experience of the trappers and the selection of the appropriate trap size will reduce non-target furbearer captures (Northeast Furbearer Resources Technical Committee 1996, Boggess et. al 1990)

A national program operated under the guidance of the Fur Resources Technical Subcommittee of the International Association of Fish and Wildlife Agencies (IAFWA 1998) systematically improves the welfare of animals in trapping through trap testing and the development of "Best Management Practices (BMPs) for Trapping Furbearers in the United States." The refuge would cooperate with and contribute to the development and implementation of those BMPs by practicing an integrated, comprehensive approach to furbearer management, wherever and whenever possible.

Public Review and Comment

As a part of the CCP process for Rachel Carson Refuge, this compatibility determination will undergo extensive public review including a comment period of 30 days following the release of the Draft CCP/EA.

Determination

Use is not compatible

Use is compatible, with the following stipulations

Stipulations Necessary to Ensure Compatibility

- Permittees must comply with all conditions of the refuge furbearer management special use permit and all state trapping regulations of the state in which the trapping would occur.
- Traps shall be set only where traps or trapped furbearers are not visible from public highways, overlooks, or other visitor facilities.
- Trappers, when requested by federal or state enforcement officers, must display for inspection their state trapping license, refuge trapping permit, trapping equipment, and all animals in their possession.
- One sub-permittee is allowed. The sub-permittee must be listed on the permit and have all applicable state licenses. The sub-permittee may trap the unit without the permittee only if prior approval is granted to the permittee by the refuge manager.
- Ingress to and egress from the refuge shall be only by routes that are currently open for travel. No motorized vehicles are allowed behind gates or off designated routes.
- Permittees shall, no later than 10 days after the last day of the refuge trapping season but in all cases before December 31, submit to the refuge manager the trapping report form provided with the trapper permit on which the number of each species of animals taken and the location where the animal was taken is correctly stated.
- Permittees may cut small trees or brush on the refuge for use only as trap stakes. Cutting is prohibited along public roads and trails or near visitor facilities.

- Unless otherwise stated by the refuge manager, the refuge trapping season will run concurrently with the state season.
- The Fish and Wildlife Service assumes no responsibility for the theft of equipment or animals.
- Failure by permittees or sub-permittees to comply with any of the provisions above or the violation of any refuge regulations or state laws or regulations applicable to trapping on the refuge, shall render him or her subject to prosecution under said laws and regulations and shall be cause for the revocation of this permit and for refusal of a trapping permit for the next 3 years.
- This permit may be terminated at any time by agreement between the issuing officer and the permittee; it may be revoked by the issuing officer for any violation of refuge or state laws or regulations applicable to trapping on the refuge or any conditions of the trapping permit; that permit may be revoked by the issuing officer for non-use.
- Snaring is prohibited.
- The use of exposed bait and setting traps adjacent to naturally occurring carcasses are prohibited.
- Permittees must immediately release non-target species that are uninjured and report those captures by species and number as part of the annual report. Injured species are to be reported to the refuge manager or designee within two business days. Permittees must turn over to the refuge manager or designee within 24 hours non-target species injured or killed through trapping activities.
- Foothold traps set on land must be staked with chains less than 9½ inches equipped with two swivels to prevent an incidentally captured lynx from entanglement around a solid object. Drag sets are prohibited.
- Traps must be checked at least once every 24 hours.
- For land sets, only foothold traps #2 or smaller and 110 and 120 conibear for landsets are permitted to help avoid incidental capture of lynx.
- Leaning pole sets for martin and fisher will be on poles no larger than 4 inches in diameter and set at a 45-degree or greater angle. The use of exposed bait on leaning poles is prohibited. If bait is used with conibear traps set for martin and fisher, bait will be hidden at the back of a box at least 15 inches in depth and the conibear will be set at least 6 inches from the front of the box.

Justification

Furbearer management on the refuge is a useful tool in maintaining balance between furbearers and habitat, safeguarding refuge infrastructure, and preventing the spread of disease. High populations of predators can decrease the nesting success of ground-nesting migratory birds, thus compromising one purpose of the refuge. Furbearer populations, with local exceptions, are stable or increasing in the two states in which the refuge lies. The furbearer management program on the refuge does not have any appreciable negative impacts on furbearer populations.

Furbearer management is a refuge management economic activity, which will not materially interfere with or detract from the purposes of the Refuge or the mission of the Refuge System. In fact, Furbearer management will contribute to the purposes of the refuge and the mission of the Refuge System by maintaining the vigor and health of furbearer populations and safeguarding the refuge infrastructure critical to habitat for scores of fish and wildlife species.

Compatibility Determination for Furbearer Management

Project Leader

(Signature)

5/29/07
(Date)

Concurrence

Regional Chief

(Signature)

June 7, 2007
(Date)

Mandatory 10 year Re-evaluation Date
(for all uses other than priority public uses)

June 7, 2017
(Date)

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Appendix E



USFWS

Habitat restoration

Habitat Management Plan Potential Management Prescriptions

■ Upland Forests, Shrublands, and Grasslands

■ Tidal and Freshwater Wetlands

A. Upland Forests, Shrublands, and Grasslands

❖ Strategy 1. Manipulate Plant Species Composition

1.1 Silvicultural Prescriptions

1.1a Clearcutting

Clearcutting is the removal of an entire stand of trees in one cutting with reproduction obtained naturally or artificially (e.g., by planting, broadcast seeding, or direct seeding). Two common methods of clearcutting are patch or block clearcuts and strip clearcuts. This regeneration method is considered to be even-age management, although somewhat coarse multi-aged stands can be accomplished through progressive patch or progressive strip clearcut systems. Clearcut size does have an effect on regeneration. As clearcuts increase in size, they tend to favor the regeneration of shade intolerant species. As they become smaller, they tend toward encouraging intermediately tolerant and tolerant species. The size and shape of the clearcut can have an effect on bird species richness and influence herbivore use.

Patch Clearcut

Patch or block clearcuts can be many different shapes and sizes, depending on management objectives, forest type, terrain, or boundaries. Natural regeneration from the adjacent stands is not heavily relied upon, but can have varying degrees of influence depending on patch size. All stems 2" dbh and greater should be removed unless some advanced regeneration of desired species exists. Although somewhat difficult to apply, an alternate or progressive patch clearcut approach can be an option. These approaches are more often associated with the strip clearcut method. The application of these options should follow the respective strip clearcut strategy substituting the strips with patches.

Strip Clearcut

Strip clearcutting is used to promote natural regeneration and growth in the harvested strips through the adjacency of the unharvested area. In the harvest areas, all stems 2" dbh and greater should be removed unless some advanced regeneration of desired species exists. The unharvested strips act as a seed source and protection for the harvested areas. As regeneration is established in the harvested areas, the unharvested areas are progressively removed. Concerns related to wind damage are warranted when using this method of clearcutting because of the increase in amount of edge that is exposed. This can be avoided by minimizing the width of the strips being harvested (50–100 feet on stable soil and 30–50 feet on wet soil or questionable sites), ensuring at least one end of the strip is closed, and harvesting as soon as cleared strips are regenerated. Strip clearcuts are more successful when applied to healthy forests found on deep, well-drained soils. These harvests can be designed in an alternate or progressive fashion.

Alternate Strip Clearcut

Alternate strip clearcuts are accomplished in two stages. The first harvest removes vegetation in long narrow clearcuts with unharvested leave-strips in between. The second harvest removes the leave strips once regeneration is established in the first-pass harvest areas. This technique does not allow for much regenerative influence on the second-pass areas, and may require artificial means to accomplish specific regenerative objectives. This requirement can be minimized if a seed source is in reasonable proximity, or advanced regeneration is present. To minimize windthrow, the strips should be oriented at right angles to the prevailing winds. The width of the strips should be influenced by the seed dissemination ability for the preferred species and the potential for wind damage.

Progressive Strip Clearcut

Progressive strip clearcuts accomplish results similar to the alternate strip clearcuts, but in three or more passes rather than in two. Using this method instead of the alternate strip clearcut method offers a number of advantages. One is the strips can be progressively harvested into the prevailing wind, reducing the exposed edge and windthrow. Another is more area has the ability to regenerate naturally,

resulting in less area requiring potential for costly artificial regenerative techniques. To some, this may also have less negative aesthetic impact.

1.1b Single Tree Selection

Single tree selection is the removal of individual trees uniformly throughout a stand. This technique is often used to promote the quality and growth of the remaining trees. It can also result in the regeneration of mostly shade tolerant species due to the small canopy openings created during the harvest. The use of this technique, on a continual harvesting cycle, is considered uneven-aged management. Actively managing a stand in uneven ages can reduce its natural ability to resist insect, disease, and other debilitating health issues. Careful extraction of the trees is necessary to help limit residual stand damage, which can create an opportunity for insects and disease to enter otherwise healthy trees. Root damage by soil compaction also needs to be considered. This technique can also be used during even-aged management and, when done so, is commonly referred to as an intermediate thinning. Single tree selection can be used to mirror a small-scale disturbance. When only large trees are selected, the large opening produced in the canopy typically will be utilized quickly by the crowns of adjacent older trees.

1.1c Group Selection

Group selection is the removal of small groups of trees to maintain an uneven-aged forest. Normally, to be considered a group selection, as opposed to a patch clearcut, the size of the harvest group should be less than or equal to twice the height of the adjacent mature trees. This method will encourage the regeneration of intermediately tolerant and tolerant species, but some intolerant species can appear toward the center of the harvest areas when the groups are at the maximum size. The likelihood of the harvest areas regenerating, combined with the ability to schedule continual harvest entries, results in this technique being a method of choice to convert even-aged stands to uneven-aged stands when desired. Actively managing a stand in uneven ages can reduce its natural ability to resist insect, disease, and other debilitating health issues. Careful extraction of the trees is necessary to help limit residual stand damage, which can create an opportunity for insects and disease to enter an otherwise healthy stand. Root damage by soil compaction also needs to be considered.

1.1d Shelterwood System

Shelterwood is a series of harvests carried out with the intent of regenerating a stand using mature trees that are removed at the end of the scheduled rotation. This technique typically is used to regenerate intermediately tolerant (mid-successional) and tolerant (late successional) species, but in certain instances can be used for intolerant (early successional) species. The use of this technique is considered even-aged management, although variations more often found in the irregular shelterwood system can result in a multi-aged stand. For a shelterwood system to be considered, a stand should be reasonably well stocked with a moderate to high component of the species desired for regeneration. A number of shelterwood system applications exist. The more commonly used is the open shelterwood system. Although less commonly used, the dense shelterwood, deferred shelterwood, irregular shelterwood, natural shelterwood, and nurse tree shelterwood systems are also useful in accomplishing specific regenerative needs and other resource management objectives.

2-Stage Open Shelterwood System

The two-stage open shelterwood system consists of an initial harvest (stage 1) used to encourage regeneration, and an overstory removal harvest (stage 2) once regeneration is established. This technique usually results in regeneration with a higher component of intermediately tolerant species. In a well-stocked stand this translates into removing 30 percent to 50 percent of the stand in the first harvest. Residual crown closure should be between 30 percent and 70 percent. The harvest should focus on undesirable species, suppressed, co-dominant, and unhealthy dominant trees. The residual should be an evenly distributed stand of large crowned, healthy, dominant and co-dominant trees. This will provide the greatest potential for seed production and resiliency to windthrow. Regeneration is considered established when it is found to be, at a minimum, >1 foot tall for softwoods and >3 feet tall for hardwoods and hemlock. A minimum of 5,000 well-distributed seedlings per acre should be established

before the overstory removal (stage 2), which should be conducted in the winter, with adequate snow depth to help minimize damage to the regeneration.

3-Stage Open Shelterwood System

The three-stage open shelterwood system consists of a preparatory harvest (stage 1) to encourage tolerant regeneration, a secondary harvest (stage 2) used to encourage intermediately tolerant and tolerant regeneration, and an overstory removal harvest (stage 3) once regeneration is established. This technique usually results in regeneration with a higher component of tolerant species. In a well-stocked stand this translates into removing a maximum of 15 percent of the stand in the initial harvest (stage 1). The harvest should focus on undesirable species and suppressed stems. An additional 15 percent to 30 percent of the residual stand should be removed in the secondary harvest (stage 2). Residual crown closure should be between 30 percent and 70 percent. The harvest should focus on undesirable species, suppressed, co-dominant, and unhealthy dominant trees. The residual should be an evenly distributed stand of large-crowned, healthy, dominant and co-dominant trees. This will provide the greatest potential for seed production and resiliency to windthrow. Regeneration is considered established when it is found to be, at a minimum, >1 foot tall for softwoods and >3 feet tall for hardwoods and hemlock. A minimum of 5,000 well-distributed seedlings per acre should be established before the overstory removal (stage 2), which should be conducted in the winter to help minimize damage to the regeneration.

Dense Shelterwood System

The dense shelterwood system consists of an initial harvest used to encourage tolerant regeneration, and an overstory removal harvest once regeneration is established. This technique usually results in regeneration with a higher component of tolerant species. In a well-stocked stand this translates into removing 15-30 percent of the stand in the first harvest. Residual crown closure should be around 80 percent. The harvest should focus on undesirable species, suppressed, co-dominant, and unhealthy dominant trees. The residual should be an evenly distributed stand of large crowned, healthy dominant and co-dominant trees. This will provide the greatest potential for seed production and resiliency to windthrow. Regeneration is considered established when it is found to be, at a minimum, > 1 foot tall for softwoods and > 3 feet tall for hardwoods and hemlock. A minimum of 5,000 well-distributed seedlings per acre should be established before the overstory removal (stage 2), which should be conducted during the winter, with adequate snow depth to help minimize damage to the regeneration.

Deferred Shelterwood System

The deferred shelterwood system consists of an initial harvest (stage 1) to encourage regeneration, and a delayed overstory removal harvest (stage 2) once established regeneration is well advanced. This technique can be tailored to encourage a high regenerative composition of either intermediate or tolerant species by adjusting the intensity of the initial harvest. In a well-stocked stand this translates into removing 15 percent to 50 percent of the stand in the first harvest. Residual crown closure should be between 30 percent and 80 percent. The harvest should focus on undesirable species, suppressed, co-dominant, and unhealthy dominant trees. The residual should be an evenly distributed stand of large-crowned, healthy, dominant and co-dominant trees. This will provide the greatest potential for seed production and resiliency to windthrow. Regeneration is considered well advanced when it is found to be, at a minimum, >10 feet tall for softwoods and >15 feet tall for hardwoods and hemlock. A minimum of 5,000 well-distributed seedlings/saplings per acre should be established before the overstory removal (stage 2) is conducted.

Irregular Shelterwood System

The irregular shelterwood system consists of an initial harvest to encourage regeneration, optional intermediate harvests to encourage supplemental regeneration, and an overstory removal harvest once regeneration is established. This system usually results in regeneration with a higher component of intermediately tolerant or tolerant species. It differs from other shelterwood systems by introducing the concept of leaving a component of the original stand that either can be removed during subsequent harvests or can be left throughout the series of harvests and beyond. The long-term residual component can be left singly or in groups. Harvests can be applied in a variety of ways, including harvesting uniformly, in groups, or in strips. The harvest should focus on undesirable species, suppressed, co-

dominant, and unhealthy dominant trees. This will provide the greatest potential for seed production and resiliency to windthrow.

1.1e. Seed Tree System

The seed tree system is the removal of most of a stand while retaining a minority of seed-producing trees, left standing to retain some component of the desired species in the regenerating stand. Seed trees can be left singularly and/or in groups, and should be distributed as uniformly as possible throughout the stand. This system usually is prescribed when desired species are lacking as a seed source in the overstory (negating shelterwood as an option), or regeneration composition is not a primary objective. It could also be used, somewhat more unpredictably, to convert species composition to an earlier successional variety while retaining a small component of desired species (e.g. softwood to mixed wood). Desired species that are healthy, dominant, large-crowned, and well-rooted should be targeted to leave standing. The rest of the stand should be removed in its entirety (2" dbh and greater). The residual trees/groups can be removed after regeneration is established, or may be left to accomplish other stand objectives. Residual trees are subject to harsh environmental conditions with very little protection. Sudden exposure to light can stimulate epicormic sprouting in hardwoods, which should be expected and addressed. A common approach to reduce epicormic sprouting is to leave adjacent trees that will provide immediate shade to the bole of the seed tree. The more shallow-rooted softwoods have the least resilience to wind and other environmental factors, and are less likely to perpetuate until natural resilience is reestablished with the regenerating stand.

1.2 Stand Improvement

Stand improvement consists of entering an even- or uneven-aged stand at any stage of development with the intent of tending to habitat needs through thinning, weeding, cleaning, liberation, sanitation, or other improvement methods. The primary function of this system is to control species composition and reduce an overabundance of stems per acre to a more desired stocking level. Another function should be to consider other habitat needs during these stand entries, and introduce methods to help meet desired criteria. This translates into thinning young stands (pre-commercially) to control species composition, conducting intermediate thinnings in middle-aged stands to maintain accelerated growth and remove unwanted vegetation, and controlling the stocking levels of habitat features such as snag trees, cavity trees, den trees, downed wood and other features.

1.3 Herbivore Control

Selective feeding or browsing by wild herbivores can negatively affect woody plant species composition and stand structure. Deer are the most common species that causes impacts of concern to wildlife and forest managers. Methods to reduce negative impacts include deterrents, exclusion, or population reduction. Deterrents (e.g., chemical application, scare devices) and exclusion (e.g., fencing, seedling tubes) are labor-intensive and costly to employ. Chemicals can create environmental hazards, and both methods usually are not practical or satisfactory except in small-scale situations such as nurseries or small plantations. Population reduction methods include reproductive controls (e.g., chemosterilants, contraceptives) that are costly and require continual reapplication, and public hunting. Hunting is the most widely practiced tool for reducing the negative impacts of herbivory in these settings. Hunting must be regulated (e.g., hunting methods, timing of seasons, hunting pressure) and the harvests monitored to prevent negative impact on the long-term survival of target herbivore populations.

In some situations, beavers can conflict with certain refuge management objectives through the excessive felling and girdling of trees and the flooding of sensitive habitats. Beavers can also create wonderful wetland habitats. Installing anti-flooding/damming devices (e.g., "beaver bafflers") at culverts, water control structures, or bridges can sometimes be effective in mitigating undesired flooding.

1.4 Mechanical and Herbicidal Treatments for Native Vegetation

Many treatments and numerous types of equipment are available for mechanically manipulating upland sites from one cover type to another. The selection of the type of mechanical treatment often depends on your habitat goals. Do you want to have all vegetative material left on the ground, have it removed from

the site, piled in slash, broadcast spread, burned or chipped? If an area is cut from young forest, and with the intention of creating a permanent shrubland, should the stumps be removed?

Strategies and tools:

- Drum mowers for removal of small trees
- Hydro-Axe—This piece of equipment consists of an articulated tractor with a mower mounted on the front. It is generally able to cut trees up to approximately 6–8” dbh. Woody material is reduced to fine chips, often finer than those resulting from a roller mower.
- Roller Chopper Mower
- Mowing and brush hogging—Mowing is an appropriate treatment for grass, forbes and small shrubs and saplings. Vegetation >4 inches often needs a higher powered machine.
- Girdling—Girdling can be appropriate to kill single trees to create snags and open up the canopy for further development of understory. It can also cause stump sprouting.
- Chainsaws—Saw work can be appropriate to remove single trees or groups of trees and pen up the canopy for further development of understory. Stump sprouting may occur.
- Coarse Woody Debris Management—Different prescriptions will leave differing amounts of woody debris. Objectives will drive the best management technique for dealing with the debris. Often, it can be left to decay on the forest floor. However, if conversion to another habitat type (grassland or shrubland) is desired, the woody materials left must not complicate future management actions (e.g., leaving large logs in a unit may make it hard to brush hog).
 - ◆ Chipping—Materials can be chipped and broadcast onsite. Their depth should not exceed 2–3 inches.
 - ◆ Piling—Native vegetation may be piled on site and left for habitat or burned in a slash pile.
 - ◆ Removal from site—Materials can be chipped and removed from the site or removed as whole logs or shrubs
 - ◆ Spreading small slash will not make future treatments difficult, and returns nutrients to the soil.
- Herbicides for stable shrublands—In some cases where the structure of a stable shrubland is desired, selective herbicides are applied to tree species. This eventually results in the selection of a dense shrub overstory and the development of a minimal amount of trees. This can create habitat that will remain in the shrub stage longer than that of most other management techniques.

Maryland Partners in Flight Committee. 1997. *Habitat Management Guidelines for the benefit of landbirds in Maryland*. Maryland Partners in Flight.

1.5 Invasive Plant Control

Manual and Mechanical Control

The mechanical removal of plants can be effective against some herbaceous plants, shrubs and saplings, and aquatic plants, especially if they are annuals or have a taproot. Care should be taken to minimize soil disturbance to prevent creating conditions ideal for weed seed germination. Repeated cutting over a growing period is needed for effective control of many invasive plant species. Care should be taken to properly remove and dispose of any plant parts that can re-sprout. Treatments should be timed to

prevent seed set and re-sprouting. The following methods are available: hand-pulling, pulling with hand tools (weed wrench, etc.), mowing, brush-hogging, weed-eating, stabbing (cutting roots while leaving in place), girdling, mulching, tilling, burning using a hand-held tool, smothering (black plastic or other means), and flooding.

The advantages of mechanical treatment are the low cost for equipment and supplies and the minimal damage to neighboring plants and the environment. The disadvantages are higher costs for labor, increased soil disturbance, and the inability to control large areas. For many invasive species, mechanical treatments alone are not effective, especially for mature or well-established plants, or those with extensive rhizomes. Mechanical treatments are most effective when combined with herbicide treatments (e.g., girdling and treating with herbicide).

Prescribed Fire

Fire can either suppress or encourage any given plant species, so great care must be taken to understand the ecosystem and the life histories of the native and invasive plants before using this tool. It is most successful when used to mimic natural fire regimes. The proper timing of prescribed burns is essential for controlling target invasive species. The most effective fires for controlling invasive plants occur just before they flower or seed set, or at the young sapling/seedling stage. Repeated burns or a combination of burning and herbicide treatments may be needed to effectively control the invasive plant and seedlings that may sprout after the burn.

This tool requires a good deal of pre-planning (including permitting) and requires a trained crew available on short notice during the burn window. Spot burning using a propane torch can be a good method of controlling small infestations of invasive plants. It can be advantageous where conditions are too wet or there is little fuel to carry a prescribed fire.

Biological control

Biological control is the use of animals or disease organisms that feed upon or parasitize the target invasive species. Usually, the control agent is imported from the invasive species' home country, and/or artificially high numbers of the control agent are fostered and maintained. There are also "conservation" or "augmentation" biological control methods where populations of biological agents already in the environment (usually native) are maintained or enhanced to target an invasive species.

The disadvantage of biological control is the small chance that an introduced control agent can itself become an invasive species. Great care is taken in selecting appropriate biocontrol agents; they are regulated by the USDA. Control agents appropriate for all invasive species may not even exist. The advantages of this method are that it avoids the use of chemicals and can provide relatively inexpensive and permanent control over large areas. More effort is placed on using a "conservation" approach to biological control; and this has great promise as an effective, long-term control method. If biological control methods are used, ensure that all state and federal permits are in place.

Herbicides

A wide variety of chemicals are toxic to plant and animal species. They may work in different ways, and be very target-specific, or they may affect a wide range of species. Herbicides may be "pre-emergent," that is, applied before germination to prevent germination or kill the seedling, or "post-emergent," and may have various modes of action (auxin mimic, amino acid inhibitor, mitosis inhibitor, photosynthesis inhibitor, lipid biosynthesis inhibitor). Products may come in granular, pellet, dust or liquid forms. Liquid herbicides commonly are diluted to an appropriate formula and mixed with other chemicals that facilitate mixing, application or efficacy. Common application methods include foliar spray, basal bark, hack and squirt, injection, and cut stump.

The advantages are that the correct chemicals, applied correctly, can produce desired results over a large area for a reasonable cost. The disadvantages are that the chemicals may affect non-target species at the site (including the applicator) and/or contaminate surface or groundwater. Proper planning includes using the most target-specific, most effective, chemical that is least hazardous to humans and the environment.

In addition, attention to protective gear, licensing requirements and other regulations is essential. Herbicides are most effective when used in combination with the non-chemical methods described above.

1.6 Planting or Seeding

Planting or seeding areas can change the species composition. Some examples are converting fields of cool season grass to warm season grass through planting, restoring areas that have been damaged either by wildfire or by erosion, introducing native ground cover to out-compete non-native plant species, or jump-starting areas to a new habitat type by planting shrubs or trees. The use of locally adapted plant species, e.g., local genotypes, is preferable, but this locally propagated plant stock is often difficult to locate, unless you grow or salvage your own. When purchasing plant stock from a nursery it is critical to use a reputable dealer and ensure the stock you purchase is indeed a native and not derived from another source. There have been many instances where either a cultivar, or a similar species from another country, has been sold as a native plant. Care must also be taken to ensure nursery stock does not contain unwanted diseases or pests.

Tools and Equipment

The tools and equipment chosen will depend on the type of planting stock you are using. Warm season grass mixes may be broadcast seeded or a seed drill may be used. If seeds are broadcast spread, the field should be lightly disced or packed to incorporate seed. Attachments on tractors can assist with shrub or tree planting. To minimize soil disturbance, a large auger may be used to dig planting 18" holes. For bare root seedlings or whips, dibble sticks can be used manually to plant.

Site Preparation

Many native grass species are not good competitors with aggressive weedy species. The seed bed should be free of weeds and noxious plants before seeding. For native trees and shrubs, grass competition should be reduced by mowing and invasive shrubs and trees removed before planting. Minimizing soil disturbance during planting will help prevent the establishment of new nonnative plants. Follow up control of undesirable plants may be necessary.

Planting Technique

Stock

Season: Planting is best completed during times when there will be ample precipitation, either in early spring or fall. Avoid summer planting when possible as new transplants and tender seedlings are prone to drought damage.

Monitoring

Appropriate monitoring plans must be in place to measure plant survivorship and establishment of communities.

Pfaff, S. and M.A. Gonter. *Florida Native Plant Collection, Production and Direct Seeding Techniques*. 1996. US Department of Agriculture. 61 pgs.

❖ Strategy 2. Maintain or Provide Structural Components of the Woody Uplands

2.1 Retain or Provide Coarse Woody Debris

Snags or live trees that fall to the forest floor are known as coarse woody debris (CWD). CWD ranging in size from branches to bole to entire trees adds structural diversity and serves as hiding and thermal cover, den sites, foraging substrate, and winter access to subnivean (i.e., below the surface of the snow) habitats. As the wood decays, it releases essential nutrients such as sulphur, phosphorous, and nitrogen. The need for creating CWD depends on the forest type, stage of succession, and management history. Allowing snags to fall naturally, felling and leaving live trees, or leaving non-merchantable tops, limbs, and products other than logs during commercial logging can augment the levels of CWD.

2.2 Retain or Create Snags

Snags play an important ecological role for at least 149 avian, 73 mammalian, and 93 herpetile species (Thomas et al. 1979). Based on the state of decomposition, snags can be hard (sound sapwood, rotting heartwood) or soft (rotting sapwood and heartwood). Because they are considered safety hazards, the abundance of snags can be compromised in commercially managed forests. There are several ways to “create” snags, or initiate the decomposition process. Each is an effort to damage a healthy tree’s integrity by creating a pathway for fungal infection. They include girdling, topping, removing branches, inoculating with fungi, and injecting herbicides. The density and size of suitable snags depends on the individual forest types and natural disturbance patterns. Snag retention must be done in appropriate places (e.g., not within felling distance of public paths).

Thomas, J. W. 1979. *Wildlife habitats in managed forests, the Blue Mountains of Oregon and Washington*. USDA, Forest Service, Agriculture Handbook No. 553.

2.3 Patch Retention

Patch retention is leaving groups within a stand with the primary purpose of satisfying structural or other non-regenerative objectives. This can be applied in combination with other silvicultural systems. Patch size can vary, and should be determined on how effectively it will meet the objective. Trees can be left singly, but should be left in conjunction with groups to form a mosaic as opposed to uniform singular use that will resemble other silvicultural systems. Patches can be removed in a variety of scheduled intervals; but, to set this method aside from variations that can be found in other silvicultural systems, longevity is vital.

2.4 Control Deer Populations

Selective feeding or browsing by deer in particular can negatively affect woody plant species composition and stand structure in Northern Forest habitats. Methods of reducing negative impacts include deterrents, exclusion, or population reduction. Deterrents (e.g., chemical application, scare devices) and exclusion (e.g., fencing, seedling tubes) are labor-intensive and costly to employ; chemicals can create environmental hazards; and both methods usually are not practical or satisfactory except in small-scale situations such as nurseries or small plantations. Population reduction methods include reproductive controls (e.g., chemosterilants, contraceptives) that are costly, require continual reapplication, and often are ineffective except within island environments, and public hunting. Hunting is the most widely practiced tool for reducing the negative impacts of herbivory in these settings. Hunting must be regulated (e.g., hunting methods, timing of seasons, hunting pressure) and the harvests monitored to prevent negative impact on the long-term survival of target herbivore populations. In general, shotgun seasons are more effective than bow seasons when the goal is to reduce deer populations. However, bow hunting is more acceptable in heavily developed areas. Doe-only harvests are effective at reducing and controlling populations. The harvest of bucks will do little to control population growth.

❖ Strategy 3. Manipulate Site Conditions

3.1 Site Preparation

See 1.6. These techniques can be applied at a smaller scale to increase structural objectives.

3.2 Prescribed Fire

Ecological Role of Fire

The Southern New England Partners in Flight physiographic area (PIF Region 9) spans parts of northern New Jersey, southern New York including Long Island, most of Connecticut, Rhode Island, eastern Massachusetts, the southeastern corner of New Hampshire, and south-coastal Maine (figure E.1). It roughly corresponds to the upper half of NABCI Bird Conservation Region 30. Urban land covers about one-third of this highly developed physiographic area; about one-quarter remains in agriculture (Dettmers and Rosenberg 2000). The fragmented forests that remain are predominantly

hemlock-white pine and northern red oak-white pine vegetation alliances, although a variety of other mixed oak-hardwood forests are widely represented and distributed, especially in southern and coastal areas. Patches of sugar maple-beech-birch (i.e., northern hardwood) and red spruce transition forest grow in some highland/hill areas. Rarer, ecologically significant forests include pine-oak woodlands or “barrens” on coastal or xeric sites. Non-forest habitats include maritime dune communities and tidal marshes (Dettmers and Rosenberg 2000).



Figure E.1. Partners In Flight (PIF) physiographic area 9, covering 4,425,100 ha across NJ, NY, CT, RI, MA, NH, and ME (Dettmers and Rosenberg 2000).

coastal New York, restoring natural fire regimes is a logical approach to help restore and maintain biological integrity, diversity and ecosystem health on refuges in this region, especially in habitats that normally would have burned frequently, such as oak-hickory forests, pine-oak barrens, maritime heathlands/grasslands, and coastal salt marshes. Each of the following sections contains background fire ecology information and summary fire regime data that may be used to derive fire prescriptions for habitat management units that include those fire-dependent ecosystems. Summary tables contain (1) estimates of the proportions of the historic landscape that were in specific successional stages for each ecosystem (Vegetation Type and Structure Classes), and (2) hypothesized natural fire regimes for those successional stages. This information comes from draft reference conditions models being developed by the interagency Fire Regime Condition Class (FRCC) Program by the USFWS, USDO, TNC, and Systems for Environmental Management. Models are available for downloading at the FRCC website: <http://frcc.gov/index.html>. The Rachel Carson refuge lies at the northernmost boundary of this area, and supports habitats common to both PIF Area 9/BCR 30 and PIF Area 27/BCR 14. The overall historical fire frequency is assumed to have been somewhat lower in some of our plant communities is southern Maine than in the habitats to our south discussed below.

In contrast to its role in northern forests (i.e. PIF Regions 27 and 28), fire historically played a major role in shaping the ecosystems of coastal and southern New England, particularly the oak-dominated forests in the south and in barrens coastal marsh habitats. Several natural historians have concluded that wildfires and fires set frequently by native peoples were important ecological factors in New England, especially in oak forests and pine plains (Bromley 1935, Day 1953, Motzkin et al. 1996). In reconstructing pre-European North American fire frequencies¹, Frost (1998) estimated that pre-settlement fire frequency regimes in PIF Region 9 were approximately 7–12 years in the more fire-prone habitats of the coastal plain, while on plains with hills or low mountains farther inland, fire-prone areas burned approximately every 13–25 years. Fire-prone areas in New England usually coincide with soils derived from glacial outwash sands and gravels, fractured or loose rock, or shallow soils over bedrock (DeGraaf et al. 2005). Davis (1996) reports that fire was the major historic disturbance that shaped the vegetation of coastal MA, CT, RI and NY.

Restoration of Fire-Dependent Ecosystems

• Natural Fire Regimes

Because fire was an historic, significant ecological factor in southern and coastal New England and

¹ Frost (2000) used a synthesis of physiographic factors (land surface form and topography), fire compartment size, vegetation records, fire-frequency indicator species, lightning ignition data, composite fire scar chronologies, remnant natural vegetation communities, and published fire history studies.

- *Oak-Hickory Forests*

Oaks have been an important component of eastern deciduous forests since the end of the last glaciation. The recognition is growing that oaks are “highly fire adapted, and fire played an important role in the ecology of oak forests...particularly in promoting the dominance of oak in regeneration layers” (Sutherland and Hutchinson 2002). According to Abrams (1998), “Presettlement oak forests of southern New England...must have burned at some intermediate frequency (e.g., 50- to 100-year intervals) that promoted the dominance and stability of oak.” Forest ecologists now recognize that fire suppression activities in the last half of the 20th century have had significant impacts on the natural processes and vegetation composition of forests with oak-hickory components (Dodge 1997, Abrams 1998, Hutchinson et al. 2005).

Oaks have adapted to fairly frequent fire occurrence through mechanisms such as thick bark, rot resistance, deep roots, prolific sprouting ability, and increased post-fire germination. Oaks have also adapted to the dry and “high light” conditions that exist post-fire: thick leaves, rapid hydration, increased photosynthesis, high stomate level, and low wilting point. In contrast, thin-barked hardwood competitor species such as red maple, or softwoods such as white pine, are more susceptible to fire damage and post-fire mortality due to drought and disease.

Recent surveys by the USFS in the eastern United States indicate that in many eastern oak-hickory forests, less disturbance-dependent, competitor species (e.g., red maple, sugar maple, and yellow poplar) are growing faster than oaks and, as a proportion, oaks are decreasing (Moser 2005). Forests shift to dominance by competitor species (Abrams 1998) as shade-tolerant trees and shrubs invade the understory, oak recruitment fails under conditions of decreased light, and overstory disturbance (e.g., disease, wind-throw) leads to displacement by competitors (Hutchinson et al. 2006).

Forestry experts hypothesize that prescribed fire and, in some cases, selective cutting may be necessary to regenerate oaks in areas previously dominated by oaks and hickories. Recommended treatments generally involve (1) thinning to reduce stand density (especially non-oak species in the midstory) and increase light conditions on the forest floor; coupled with (2) applying prescribed fire *in the understory* to reduce non-oak seedlings and favor oak resprouting and seedling establishment (Brose et al. 1999, Hutchinson 2006).

If habitat management goals and objectives call for restoring historic oak-dominated conditions and stimulating oak regeneration in stands showing signs of shifting dominance, restoring a natural fire regime, possibly in combination with selective cutting, may be necessary. Those tools may give a competitive edge to oak and hickory seedlings and saplings by increasing light, decreasing available moisture, and directly impacting competitor species with fire. As a guide for re-establishing a prescribed fire regime in oak forests, see table E.1 for estimates of the proportions of the historic landscape that were in specific seral stages and hypothesized estimates of natural fire regimes for eastern oak-hickory forests.

- *Oak-Pine Barrens*

Barrens are areas of restricted tree growth, often, but not always found on coarse-textured, droughty soils in the eastern United States and usually maintained by fire (Anderson et al. 1999). In the northeast, these rare communities often are characterized by significant cover of Pitch pine (*Pinus rigida*), scrub oak (*Quercus ilicifolia*), and other oak species. Healthy oak-pine barrens communities generally have at least a partially open canopy, little to no mid-story, and a fairly diverse understory of short, ericaceous (heath) shrubs (e.g., huckleberry [*Gaylussacia spp.*], blueberry [*Vaccinium spp.*]), and drought-tolerant grasses (e.g., hairgrass [*Deschampsia spp.*], little bluestem [*Schizachrium scoparium*]) (Raleigh et al. 2003). An example of an oak-pine barrens community classified at the NVCS Alliance level is “Pitch Pine Woodland.” Barrens communities are globally rare, and often contain state-listed plants and animals (Raleigh et al. 2003). Important federally listed barrens species include sandplain gerardia (*Agalinis acuta*) and Karner blue butterfly (*Lycaeides melissa samuelis*).

Table E.1. Estimates of the proportions of the historic landscape that were in specific successional stages for eastern oak-hickory forests and estimates of natural fire regimes (FRCC 2004[a]).

Vegetation Type and Structure				
Class*	Percent of Landscape	Description		
A: early seral - prairie	2	Grassland prairie maintained by frequently recurring fire (1-2 yrs) age class-0-1 years		
B: early seral - grass	6	Early tree regeneration (root and stump sprouts) phase; fire frequency about 3-9 yrs. Age class - 2-9 years		
C: mid-seral open-savanna & woodland	34	Oak-hickory savannas and woodlands. Fire return interval of 5-15 yrs. Age class- 10-200+ years		
D: late-seral - oak forest	54	Oak-hickory forests. Fire-return interval of 15 to 30 yrs. Open understories of oak seedlings exist. Age class - 50+ years		
E: late-seral - mixed forest	5	Mixed (maple) forests develop during the absence of fire. Dense understories of shade-tolerant species develop. Age class - 150+ years		
Total	100			

*Formal codes for classes A-E are: AESP, BMSC, CMSO, DLSO, and ELSC, respectively.

Fire Frequency and Severity				
Fire Severity	Fire Frequency (yrs)	Probability	Percent All Fires	Description
Replacement Fire	50	.02	22	Occurs primarily in A and B
Non-Replacement Fire	14	.07	78	Maintains C and D
All Fire Frequency*	12.5	.09	100	

*All Fire Probability = sum of replacement fire and non-replacement fire probabilities. All Fire Fire Frequency = inverse of all fire probability (previous calculator).

Because these rare habitats historically occurred near the coast in southern New England and New York (figure E.2), a large proportion has been lost to urban development. Fire suppression has caused further degradation, including colonization by invasive or exotic plants, conversion to unnaturally dense stands of close-canopied pitch pine or scrub oak thickets and, subsequently, suppression or extirpation of populations of rare, disturbance-dependent, barrens plants and animals. Fire suppression also increases the likelihood of severe crown fires in these habitats as fuels accumulate and the density of fire-prone overstory vegetation increases (Patterson and Crary 2006).



Figure E.2. Select northeastern United States barrens habitats (Raleigh et al. 2003).

Over the past few decades, ecologists and restorationists have constructed models of vegetation dynamics for northeastern oak-pine barrens habitats. Various fire regimes and soil types and moisture regimes have emerged as the most important factors driving barrens ecosystem changes (figure E.3). Barrens specialists generally agree that prescribed fire, possibly in combination with mechanical treatments to simulate fire effects, is crucial in maintaining healthy barren ecosystems, including a range of successional types and a diversity of rare species (Raleigh et al. 2003). See table E.2 for estimates of the proportions of the historic dry soil landscape that were in specific successional stages for oak-pine barrens, and hypothesized natural fire regimes estimates that may assist in developing fire prescriptions for this vegetation type.

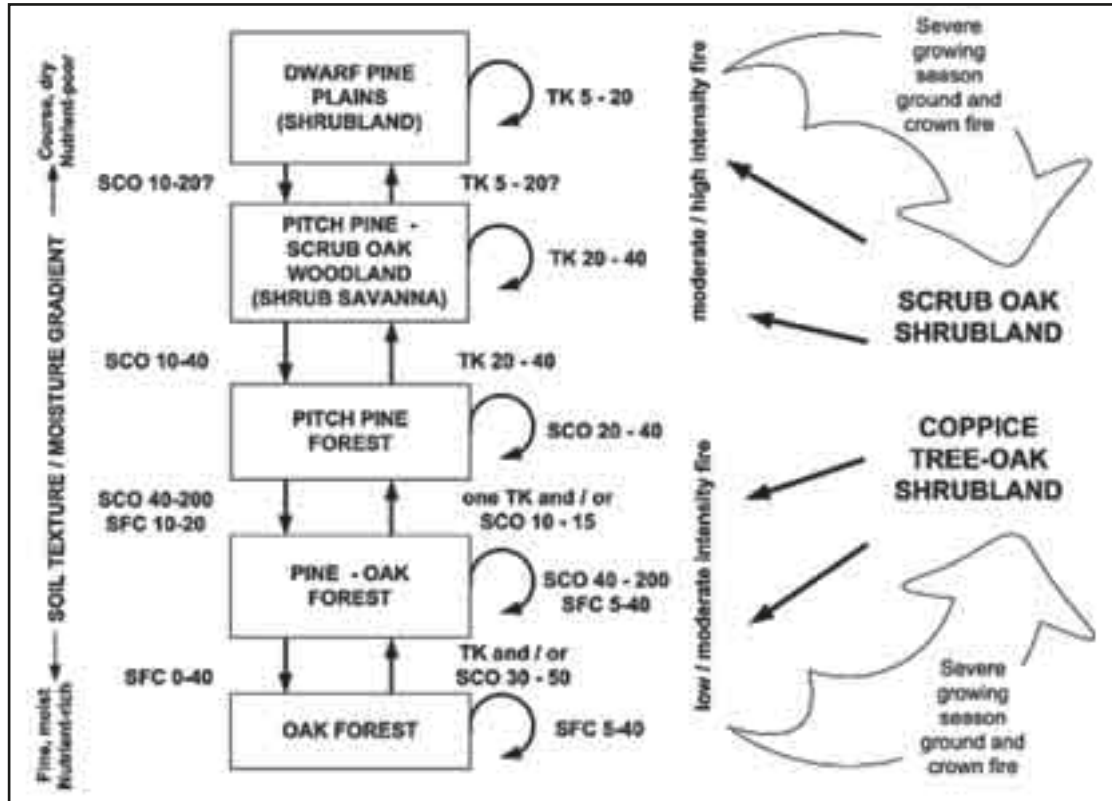


Figure E.3. Conceptual model for pine barrens ecological community types. This model depicts fire regimes that maintain vegetation types, or that result in transitions from one type or another: TK is a top-killing, high intensity (temperatures) surface or crown fire, sometimes with an associated ground fire. SCO is a scorching, moderate intensity surface fire that may heat-kill small-medium size trees. SFC is a surface fire, typically low intensity in the dormant season, that top-kills only the smallest woody stems, and burns only surface fuels above the duff layer. Ground fire burns the forest floor duff layer (From Jordan et al. 2003).

- *Maritime heathlands/grasslands*

In the northeastern United States, sand barrens are a subset of barrens ecosystems occurring in dry sandy areas such as outwash plains. These areas often are classified as maritime heathlands or grasslands, and are found on coarse-textured, outwash soils along the Atlantic coasts of New England/New York (Raleigh et al. 2003). An example of a maritime heathland community classified at the NVCS Alliance level is “Woolly Beach-heather/Coastal Panicgrass Dwarf-shrubland.” Those are non-forested, coastal communities, characterized by short, ericaceous (heath) shrubs (e.g., short blueberry species, pine barren golden heather [*Hudsonia ericoides*]), and drought-tolerant grasses (e.g., hairgrass, little bluestem). These heathlands and grasslands are highly dependent upon frequent disturbance, and would succeed rapidly to less diverse shrub-scrub cover in the absence of frequent fire, grazing, or salt spray (Vickery and Dunwiddie 1997, Raleigh et al. 2003). Like oak-pine barrens, maritime heathlands and grasslands are also geographically rare, have been decimated by development, and often contain federal- or state-listed taxa.

Open habitat specialists agree that prescribed fire, also possibly in combination with mechanical treatments to simulate fire effects, is critical in maintaining maritime heathlands/grasslands, suppressing aggressive shrubs, and in some cases, helping to suppress invasive exotic plants (Vickery and Dunwiddie 1997, Raleigh et al. 2003). The reader should refer to the early successional stage “post-replacement” in table E.2 of the previous section on oak-pine barrens for estimates of the proportions of the historic New England landscape on sandy soils that were in heath or grass cover. According to the FRCC barrens model in table E.2, heath or grass cover was historically an ephemeral stage in barrens habitats, occurring for only a short duration immediately after severe, stand-replacing fires, approximately every 20 years. However, in a conceptual model for

Table E.2.
Estimates of the proportions of the historic landscape that were in specific successional stages for oak-pine barrens and estimates of natural fire regimes (FRCC 2004 [b]).

Vegetation Type and Structure		
Class ^a	Percent of Landscape	Description
A: post replacement	5	Grass and/or shrubland, can include <i>Carex</i> and <i>Flanicum</i> spp., mixed oak or pine/oak seedling mixture, heaths or dwarf pine plains
B: mid-seral closed (open?)	25	Pitch pine dominant with scrub oak dominant in the understory (<i>Quercus ilicifolia</i> , <i>Quercus prinoides</i> , <i>Quercus stellata</i>)
C: mid-seral open	30	Pure pitch pine forest; heaths may or may not be present, depending on fire history
D: late-seral open	30	Pitch pine – oak codominant; canopy oak species include <i>Quercus velutina</i> , <i>Quercus coccoinea</i> , <i>Quercus alba</i> , <i>Quercus stellata</i>
E: late-seral closed	10	Oak-hickory forest – <i>Garya</i> spp., <i>Quercus velutina</i> , <i>Quercus rubra</i> , <i>Quercus alba</i> ; some heath and scrub oak present
Total	100	

Fire Frequency and Severity				
Fire Severity	Fire Frequency (yrs)	Probability	Percent All Fires	Description
Replacement Fire	50	0.02	17	Primarily in A (20-year replacement fire) and B (20-year replacement fire)
Non-Replacement Fire	10	0.1	83	Maintains B (30-year surface fire), C (5-year surface fire), D (5-year surface fire and 100-year mosaic fire, which returns D to B) and E (100-year mosaic fire maintaining E)
All Fire Frequency ^a	6.3	0.12	100	

^aAll Fire Probability = sum of replacement fire and non-replacement fire probabilities. All Fire Frequency = inverse of all fire probability (previous calculation).

Model assumptions

Class A represents a number of possibilities at this point – anything from pine plains to shrublands to mixtures of oak and pine or just mixed oak. Needs clarification.

In the absence of a pitch pine seed source, class B will automatically progress to class E.

Class D represents the climatic climax community with fire. Should no fire occur in class D for 200 years (3 cumulative fire cycles? –65 years for each cycle if adding all fire probabilities), it will climax at E, an oak-hickory forest.

Long Island barrens communities, Jordan et al. (2003) hypothesize that frequent (every 1–5 years) ground fires in the growing season may maintain herbaceous cover or cover by low shrubs in barrens on outwash soils (figure E.4).

• *Coastal marshes*

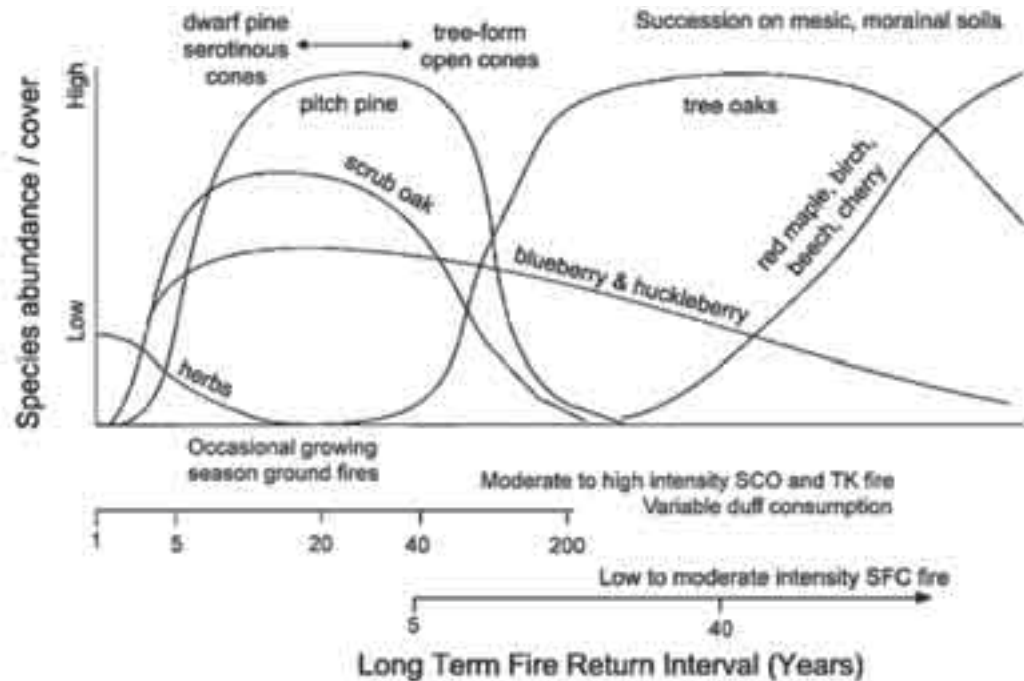
Fire ecologists estimate that the pre-colonial fire return intervals on tidal marshes from the mid-Atlantic northward to the Maine coast were short (Frost 1998, FRCC 2004[c]). In the FRCC BpS model, Dr. Cecil Frost describes the hypothetical, natural fire regime for this ecosystem as follows:

Fire regime type II, frequent replacement², mostly 2–10 years, occurred where marshes were contiguous with uplands burned by Native Americans.... Fires are moderate in intensity, consuming the above-ground herbaceous vegetation and top-killing most woody plants when present. This model represents an average of widely varying fire regimes, because ignition probability is affected strongly by the presence of open water channels...connection to uplands, and the natural fire regime of adjacent upland vegetation.

² Stand-replacement fire regime means that fires kill aboveground parts of the dominant vegetation, changing the aboveground structure substantially.

A. Upland Forests, Shrublands, and Grasslands

Figure E.4. Conceptual model of species response to fire regime in pine barrens habitats. Note that growing season ground fires, from 1-5 year return intervals, maintain herbaceous cover or cover by low shrubs (Jordan et al. 2003).



An example of a coastal tidal marsh community classified at the NVCS Alliance level is “Saltmarsh Cordgrass Tidal Herbaceous.”

In the pre-settlement landscape, marsh plant species diversity increased as fire frequency increased, but decreased as salinity increased (Frost 1995). Salt marshes had little woody cover, because woody species cannot tolerate the multiple stresses of frequent flooding, frequent fire, and high salinity. In the salinity mid-range, brackish marshes resisted woody invasion; in the absence of fire, those with salinity less than 10 parts per thousand may have succeeded over time to nearly closed shrub cover with species such as wax myrtle (*Myrica cerifera*), silverling (*Baccharis halimifolia*), sea elder (*Iva frutescens*) and small red cedar (*Juniperus virginiana*), while the margins may have developed canopies of red cedar, loblolly pine, pitch pine and red maple. In the freshwater to oligohaline range, marshes contained, at least on their margins, mildly salt-tolerant shrubs and tree saplings whose cover may have increased dramatically in the absence of fire (Frost 1995, FRCC 2004[c]).

In general, coastal tidal marshes have undergone succession to woody vegetation and, possibly, a loss of vegetation diversity following the termination of Native American burning activities. Many lands managers now apply prescribed fires in marshes for the purposes of reducing woody plant cover, re-mineralizing litter, and increasing marsh productivity and plant community diversity. From the standpoint of restoring historic conditions, prescribed burning is probably more advisable in areas that normally would have burned frequently, i.e., large marsh areas that are not sheltered from the wind. See table E.3 for estimates of the proportions of the historic tidal marsh landscape that were in specific successional stages for northeastern tidal marshes and the hypothesized natural fire regime estimate for this vegetation type.

Note that prescribed fire should be applied carefully, using an experimental approach (e.g., exhaustively measure resource response to management actions), in salt marshes, especially because those habitats harbor endemic salt-marsh vertebrates (e.g., salt-marsh sharp-tailed sparrow (*Ammodramus cauducutus*), seaside sparrow (*A. maritimus*)) and other resources of concern (e.g., black rail (*Laterallus jamaicensis*)), who may be sensitive to particular fire regimes (Mitchell et al., in press). Fire should also be applied cautiously because *Phragmites australis* has invaded many oligohaline marshes, greatly increasing the risk of intense, dormant season wildfires; burns also may exacerbate *Phragmites australis* invasion by causing nutrient pulses (S. Adamowicz, Rachel Carson refuge, pers. comm.).

Table E.3. Estimates of the proportions of the historic landscape that were in specific successional stages for tidal marshes and estimates of natural fire regimes (FRCC 2004 [c]).

Fire Frequency and Severity				
Fire Severity	Fire Frequency (yrs)	Probability	Percent All Fires	Description
Replacement Fire	7 years	0.15	83	Light to moderate surface fires
Non-replacement fire	Never except in stage C: 35 yrs	0.03	17	Light to moderate surface fires
All Fire Frequency*	5.8	0.18	100	

*All Fire Probability = sum of replacement fire and non-replacement fire probabilities. All Fire Frequency = inverse of all fire probability (previous calculation)

Vegetation Type and Structure		
Class ¹	Percent of Landscape	Description
A: wet-seed	34	Recently burned marshes (0-4 years). More diverse herb layer when burned frequently and with lower salinity. Flammable litter sufficient to carry fire accumulates after only 1 or 2 years depending upon the dominant species.
B: wet-seed	47	4-15 years since fire. Dense herb layer dominated by medium and tall species, with heavy litter buildup except where removed by storms. Invading shrubs and trees where salinity less than 1‰
C: wet-seed	19	16 years + since fire. Herb layer dominated by tall species, with deep, loose litter buildup with dense shrubs and young trees where salinity permits. Age and structure of woody vegetation depends more upon irregular salinization events during storm surge rather than fire.
Total	100	

Strategies

Hazardous fuel reduction

Prescribed fire may be used to reduce scattered concentrations of dead-down woody materials, which pose a significant wildfire hazard to natural resources of concern (e.g., habitats for endangered species) or cultural resources of concern (e.g., historic buildings or archaeological sites), public resources (such as refuge administrative buildings or facilities), or adjacent private lands. Heavy fuel loads may be caused by natural events, such as ice storms, blow-downs, or insect outbreaks, yet may pose significant threats to these important and often irreplaceable resources.

Fire is used to reduce hazardous fuel threats by focusing burns in significantly altered habitats, such along the wildland urban interface (the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels) along roads, or along existing or constructed fuel breaks. Controlled burns in such areas may reduce the Crowning Index (the wind speed at which active crown fire is possible) and fire intensity, and facilitate vehicular access for suppression actions, when unplanned ignitions occur.

Prescribed fire is used generally in conjunction with other forestry treatments to reduce hazardous fuels. For example, projects to reduce the threat to housing communities in Massachusetts of wildland crown fire in pitch pine forests involve first thinning mature mixed pine/hardwood stands, reducing original stocking densities from 100–170 ft² basal area/acres to 25–30 ft² basal area/acre (fuel objectives), increasing the crowning index from 30 to 60 mph. Heavy equipment is used to grind or pile slash after thinning; then, prescribed fire is used to consume slash and dramatically reduce wildfire behavior. Fire generally is reapplied on a short-term rotation (~5 years), to maintain low canopy density, well-spaced understory woody shrubs and saplings, and low downed fuel loads (Patterson and Crary 2004).

- *Even-aged stand management*

Prescribed fire may augment even-aged silvicultural prescriptions: for example, to create or maintain stands with trees representing one age class or a narrow range of age classes. Most northern hardwood forests were dominated by old-growth forest in pre settlement times, with young forest habitat (up to 15 years old) occupying <1% to 13% of the landscape (Lorimer 2001). Therefore, even-aged stand management, through a combination of cutting and fire, is likely to be applied in small patches, simulating the scale of natural disturbances that historically shaped the Northern Forest: the deaths of single-trees (gaps) and blowdowns (larger gaps). The intended composition of these forests is thick, young, woody growth in full sunlight dominated by shade-intolerant trees (e.g., jack pine, red pine, aspen) and shrubs (e.g., willow and cherry, *Prunus*

spp). Management for temporary shrubby openings and young forests, on the order of 1–2 ha, creates ephemeral habitats important for early successional forest species such as woodcock, eastern towhee, and yellow-breasted chat (Ehrlich et al. 1988, Dessecker and McAuley 2001, NatureServ 2005).

In this context, prescribed fire is used mainly in post-cutting treatments, once small patches of softwoods (red/white/black spruce, balsam fir, hemlock, northern white cedar, eastern tamarack, eastern white and red pines) or hardwoods (aspen species, paper birch, gray birch, red maple, silver maple, sugar maple, red/white oak, ash, and beech as principal species or associates) have been harvested through clearcut, shelterwood, or seed-tree methods (Dessecker and McAuley 2001, USFWS 2001). Timber harvest treatments remove sufficient canopy to promote dense sapling and shrub growth, while follow-up prescribed fire may be used to remove logging residue and slash. After a few years, most clearcuts become too thick for early successional forest birds. At that point, a prescribed burn may be used to thin out the understory vegetation but leave enough patchiness for species such as woodcock (Krementz and Jackson 1998). Fire should be applied at regular return intervals (approximately 10 years), to provide a disturbance to maintain low residual basal areas, on the order of <4.9 m² (Dessecker and McAuley 2001).

- *Forest Restoration*

Prescribed fire may be used to prepare degraded sites (e.g., heavily logged areas, former forest roads, or mined sites), for natural and artificial tree regeneration. In general, burned-over surfaces and mineral soil are excellent sites for seed germination. In contrast, unburned organic layers on the forest floor, depending on their moisture content, provide less favorable sites for seed germination and, depending on their composition, can impede the planting and development of artificial regeneration. Undisturbed organic materials often favor the establishment of heavy-seeded plants (with seeds that can penetrate the heavy organic layers) and advance regeneration. Conifers and deciduous tree species have differential responses to forest floor disturbance, as do shrub and forb species. Some species become established primarily from seed (e.g., jack pine, pitch pine), whereas others regenerate from sprouts (aspen). Prescribed fires that remove organic layers from the forest floor can be used to influence the composition and quantity of regenerating trees, favoring early-successional species such as pines (Graham et al. 1998).

- *Early successional habitats*

Fire historically has been used on refuges in BCR 30 to maintain grassland openings such as abandoned pastures, old fields, and blueberry barrens for grassland birds and woodcock. Prescribed fire may be used to increase grass biomass (e.g., by eliminating woody shade plants, extending the growing season by removing litter; and buffering soil chemistry); selectively control tall forbs or fire-sensitive woody plants (by topkilling or causing mortality); mineralize litter; and, increase community diversity (by altering the composition of early-flowering or late-flowering plants). Prescribed fire also may be used to maintain an interspersion of shrub- and grass-dominated communities attractive to shrubland passerines, by topkilling shrubs in old fields and allowing them to resprout into thickets. And finally, fire may be used to help eradicate exotic, invasive plants from open habitats, in some cases precluding the need for chemical herbicides.

When using prescribed fire to alter woody plant cover in early successional habitats, it is important to consider that many woody plants, especially shrubs, are adapted to disturbance, regenerating new shoots prolifically. Fire can increase or decrease shrub stem density in a habitat. Thus, fire can either help eliminate (through direct mortality) or maintain shrub-scrub habitat structure (by pruning tall woody plants back, killing less fire-adapted trees, encouraging shrub sprouts). The key to predicting fire effects on woody plants is fire regime (the frequency, seasonal timing, severity, and geographic size of fire). The fire regime will affect differential shrub and sapling mortality (which species dies, which doesn't); mortality vs. top-kill effects; and, post-fire vegetative regeneration.

Several principles should be considered in using prescribed fire to control woody plants in early successional habitats:

1. Plant mortality is strongly tied to the death of “growth points” (i.e. meristems/buds), which are more sensitive to heat damage when actively growing and tissue moisture is high (Miller 2000).

Therefore, applying fire in the spring, when target woody plants are mobilizing water and nutrients and breaking the dormancy of leaf or flower buds, or during fall cold-acclimation periods, is more likely to kill growth points than prescription fire during dormant periods.

2. Total plant mortality is often the result of injury to **several different** parts of the plant, (e.g., crown damage coupled with stem tissue mortality). Many prescribed fires, often executed in the dormant season, “top-kill” shrubs, but fail to kill the entire plant, which re-sprouts from dormant buds. New shoots can originate from dormant buds located both above the ground surface (e.g., epicormic sprouts, root collar sprouts), and from various levels within the litter, duff, and mineral soil layers (e.g., rhizomes, root crowns). The severity of fires (depth of fire and ground char) directly affects shrubs’ re-sprouting ability from those buds. Moderate-severity fires (moderate ground char; consumes litter layer, partially consumes duff layer) frequently cause the greatest increase in stem numbers from root sprouters, such as rhizomatous shrubs, by pruning rhizomes below the surface, causing several new shoots develop per rhizome. High-severity fires (deep ground char; removes duff layer and large woody debris) are more likely to eliminate species with regenerative structures in duff layer or at the duff-soil interface. In such fires, resprouting is eliminated from shallowly buried tissues, often delayed from deep rhizomes or roots (Miller 2000).

Therefore, if the goal is to increase the density of shrub stems, a moderate-severity, dormant-season fire is probably preferred. If the goal is to decrease shrub stems, a high-severity, growing-season fire is probably best. If a management unit contains shrubs to be controlled as well as shrubs to be maintained, no single burn prescription is going to accomplish that, and selective treatments will be necessary.

3. Concentrations of metabolic compounds, e.g., sugars, salts, and lignins, vary seasonally, and have been shown to relate to seasonal effects on shrubs. Consequently, the timing of the treatments may be more important than the type (cutting versus burning) in controlling shrubs. To maximally reduce woody stems, fires should be applied during periods of low below-ground carbohydrate storage (i.e., immediately after spring flushing and growth), and should be followed with a second growing-season treatment (such as mowing, herbicide, or more prescribed fire) before total non-structural carbohydrate (TNC) levels are replenished. Repeated burning in several consecutive years during the low point of a plant’s TNC cycle can amplify the negative effects of the treatment (Richburg and Patterson 2003, 2004).

4. Fire reduces the cover and thickness of organic soil layers; this can increase light and, seasonally, temperatures at the soil surface, causing an increase in sprouting from woody rhizomes (Miller 2000). Thus, to control shrubs, a follow-up treatment (herbicide, mowing) is almost always required post-fire (Patterson 2003).

5. Invasive plants are well-adapted to disturbance, often surviving fire and spreading rapidly through a disturbed landscape. Studies in northeastern successional habitats have shown generally that fire alone *will not* remove invasive shrubs. Additional herbicide and/or cutting treatments are necessary (Patterson 2003).

6. In general, drought conditions (either normal lows in precipitation in summer/fall, or abnormal winter/spring droughts) dry large fuels and duff, increasing the potential for duff consumption, subsurface heating, and mortality for buried shrub regenerative structures (Miller 2000). Burning when litter layers, duff, and upper soil layers are saturated (winter and early spring) is not likely to suppress shrub stems.

7. Prolonged heating, as in a slow, backing fire versus a fast-moving head-fire, causes greater burn severity and plant tissue death. In general, slow, backing fires cause more woody tissue damage than rapid head-fires (Miller 2000). However, the warmer the Wx conditions, the shorter the heating duration necessary to cause shrub tissue death, and the greater the likelihood of suppressing shrub stems.

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A. Upland Forests, Shrublands, and Grasslands

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B. Tidal and Freshwater Wetlands

Vickery, P. D. and P. W. Dunwiddie. 1997. *Introduction*. Pages 1-13 in P. D. Vickery and P. W. Dunwiddie, editors. *Grasslands of Northeastern North America: Ecology and Conservation of Native and Agricultural Landscapes*. Massachusetts Audubon, Lincoln, MA.

❖ Strategy 4. Allow Natural Succession and Processes

Natural disturbances such as wind throw, herbivory, beaver activities, native disease and insect outbreaks, major wind or ice storms, succession and flooding may provide the desired structure for many upland habitats. Natural processes like succession and wind throw may result in the development of micro-habitats, while other natural processes such as outbreaks of native insects and hurricanes may result in stand-replacing events. Often, those can assist managers reach their desired habitat type. However, monitoring those habitats is important to ensure that those hands-off approaches result in high-value habitats for wildlife.

For many habitats freshwater marshes, shrublands and grasslands, natural processes may drive them toward more mature stages. Site capacity, soil types, aspect ratio, climate, and prior management will influence their stability. Some may require infrequent management (vegetation occurring on sandy or stressed soils like pine barrens and native shrublands), while other types, such as old field thickets, may progress rapidly. The monitoring and adaptive management of habitats where natural processes are the primary management tool is critical.

B. Tidal and Freshwater Wetlands

❖ Strategy 1. Restore tidal hydrology to salt marshes

Restricted tidal flow can result in severe tidal marsh degradation, as demonstrated by expansion or domination by invasive *Phragmites australis*, surface subsidence, conversion to open water, or conversion to brackish or freshwater plants (Roman et al. 1984). Such degradation can result in the loss of habitat for salt marsh fish species, particularly *Fundulus heteroclitus*, and decreased use by shorebirds and wading birds. The restoration of tidal hydrology must proceed cautiously, accounting for changes in marsh elevation (subsidence) that developed since the occurrence of restricted flow; the immediate restoration of full tidal volumes could result in creating mud flats or permanent open water. Full tidal restoration could also result in negative impacts, such as flooding human structures built on low-lying elevations during the time of tidal restriction, and flooding sharp-tailed sparrow and seaside sparrow nests (DiQuinzio et al. 2002). The installation of self-regulating tide gates has been used to address the potential flooding of human structures (Roman et al. 1995). The benefits of tidal restoration include restoring salt marsh habitat, controlling invasive *Phragmites*, increasing the number and abundance of nekton species, and increasing the use by shorebirds, wading birds, and sharp-tailed sparrows. Techniques used to achieve restoration of tidal flow include replacing undersized culverts with properly sized ones set at an appropriate elevation or replacing culverts with bridges and removing fill. Water control structures, such as flap gates, self-regulating tides gates and the like, should be employed with extreme caution; they generally do not represent landscape equilibrium conditions, require monitoring and, necessarily, need maintenance.

DiQuinzio, D. A., P.W.C. Paton, and W.R. Eddleman. 2002. *Nesting ecology of saltmarsh sharp-tailed sparrows in a tidally restricted salt marsh*. *Wetlands* 22:179-185.

Roman, C.T., Garvine, R.W., and J.W. Portnoy. 1995. *Hydrologic modeling as a predictive basis for ecological restoration of salt marshes*. *Environmental Management [ENVIRON. MANAGE.]*. Vol. 19, no. 4, pp. 559-566.

Roman, C.T., Raposa, K.B., Adamowicz S.C., Pirri M.J., and J.G. Catena. 2002. *Quantifying vegetation and nekton response to tidal restoration of a New England salt marsh*. *Restoration Ecology* 10:450-460.

❖ Strategy 2. Control native aquatic vegetation community composition

- Altering Salinities - Freshwater species such as cattail can be controlled by allowing salt water into an area or an impoundment to increase its salinity levels. That can set back vegetation either temporarily, in the case of impoundment management, or permanently, in the case of tidal restoration. Changes in salinity can result in fish kills and, if done during the summer months, can cause botulism. Changes in salinity likely will impact all freshwater biota, and should be undertaken with caution. The Rachel Carson refuge does not manage impoundments, and is unlikely to alter salinities in freshwater environments.
- Setting back succession -
 - ◆ Prescribed burns, herbicides or mechanized equipment may be used to set succession back in areas where vegetation is too rank for wildlife use. This approach may be appropriate in cattail marshes that are so dense they are reverting to upland vegetation types. Mechanized equipment for use in wetlands is specially adapted with a low ground pressure so that habitats are not damaged.

❖ Strategy 3. Restoring natural hydrology in the salt marsh

The natural hydrology of the salt marshes has been altered since colonial times through ditching and diking. Over 90 percent of all eastern marshes have been ditched by 1938, although that percentage is somewhat lower in Maine. Ditches have been constructed for salt haying, mosquito control and other purposes. Ditches drain surface water and groundwater from this tidally flooded habitat, and have also been found to impound water on salt marshes by forming peat spoil levees and clogging ditches with debris and slumped peat blocks.

Natural, unditched salt marshes are characterized by large, highly sinuous creek and runnel systems. Those drainage features remove surface water from a marsh without draining natural pools. Although the restoration of tidal flow *to* a marsh is often restricted to one small area (such as a culvert), restoring natural hydrology *within* a marsh is complicated by the direct (surface water drainage) and indirect (impoundment, peat drainage) effects of ditching as well as their physical size and number.

Although techniques historically employed to “restore” ditched marshes, such as filling and plugging, have increased surface water habitat, they have not restored pre-ditching hydrology. Ditch plugging also has led to the saturation of peat up to 15 m perpendicularly away from a ditch, resulting in the conversion of high marsh vegetation to low marsh vegetation. Although that outcome may be desirable in some circumstances, it does highlight the need to develop new techniques to restore ditched marshes. Public health officials in the late 1930s noted that ditching replaced one form of marsh hydrology (creeks) with another (ditches). In order to *restore* salt marshes, we must consider the need to restore natural creek hydrology, i.e., remove ditches and return panne and pool habitat. In addition, restoration to date has highlighted the unique nature of each marsh site. Extensive site investigations and measurements must be part of the *planning* process to increase the likelihood of the project’s success and move the science of restoration forward.

Small impoundments, whether constructed incidentally as part of the ditching process or purposefully through diking for agriculture or other ends, also represents an alteration of natural hydrology within the marsh. The restoration of impounded or diked areas must proceed with the same cautions noted in strategy 1.

Pools are common features on unditched marshes, but not on ditched sites. They occur throughout New England and the mid-Atlantic coastal marshes. Ditching has led to their filling, drainage or loss. The restoration of pool habitats is a significant concern, since they provide important habitat for fish, invertebrates, mammals and birds. Creating pools by excavation does increase surface water habitat on marshes. Careful consideration must be given, however, to the correct dimension of each pool, particularly its size, sidewall slope, and depth. Most natural pools contain less than 30 cm of water; and have soft organic sediment bottoms. When creating pools, it is imperative not to excavate through the peat to underlying sediments; otherwise, the pools will not retain water. Furthermore, natural pools

B. Tidal and Freshwater Wetlands

exist in a variety of depths—though few over 100 cm. The construction of sumps in man-made pools may be desirable, but should be executed judiciously. Because the excavation of peat results in acute redox conditions deleterious to nekton, naturally formed pools should be left intact.

Adamowicz, S.C. and C.T. Roman. 2005. *New England salt marsh pools: A quantitative analysis of geomorphic and geographic features*. *Wetlands*: 25:279-288

Bourn, W.S. and C. Cottam. 1950. *Some biological effects of ditching tidewater marshes*. Fish and Wildlife Service, U.S. Department of Interior, Washington, D.C. USA. Research Report 19.

Rozsa, R. 1995. *Human impacts on tidal wetlands: history and regulations*. P. 42-50. In G.D. Dreyer and W. A. Niering (eds.) *Tidal Marshes of Long Island Sound: Ecology, History and Restoration*. The Connecticut Arboretum Press, New Lond, CT, USA. Bulletin No. 34.

Miller, W.R. and F.E. Egler. 1950. *Vegetation of the Wequetequock-Pawcatuck Tidal-marshes, Connecticut*. *Ecological Monographs* 20: 144-172.

Taylor, J. 1998. *Guidance for meeting U.S. Fish and Wildlife Service trust resources needs when conducting coastal marsh management for mosquito control on Region 5 National Wildlife Refuges*. U.S. Fish and Wildlife Service. 20 pp.

❖ Strategy 4. Restore freshwater or salt water wetland native vegetation

4.1 Planting or seeding

The successful restoration of native marshes in New England depends on hydrology, salinity regime (for estuarine environments), and the relative competitive strengths of native versus invasive plants. Planting or seeding a salt marsh restoration area is more expensive than allowing natural reseeding to occur, but has several advantages. Planting or seeding provides a competitive advantage to native vegetation by occupying a space first. That is particularly important if a natural native seed source is at some distance. Purchased plant and seed stock should be carefully selected to ensure correct province, temperature tolerances, and other local genetic features. Plant material should be installed at the beginning of the growing season to allow the plants sufficient time to establish before winter. One drawback of planted material is that it is often attractive to grazers such as snow geese and Canada geese.

4.2 Fill Removal

Salt marshes often have been used as dumping grounds for dredge, sanitary landfill, and toxic materials. The removal of that material can range from simple and straightforward to highly regulated and complex. As in restoring tidal flow, establishing the correct elevations for tidal input and restored marsh surfaces is imperative. Because of the disturbed nature of many of these sites, hydrology and elevation are critical in controlling the invasion of nearby *Phragmites*. The benefits of removing fill material can be significant: the conversion of a disturbed fill area to high quality salt marsh habitat. Because fill areas often occur in urbanized locations, restored areas substantially increase available salt marsh habitat by a large percentage.

Niedowski, N.L. 2000. *New York State salt marsh restoration and monitoring guidelines*. New York State Department of State, Division of Coastal Resources and New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources. 172 pp.

Thunhorst, G., and D. R. Biggs. 1993. *Wetland planting guide for the Northeastern United States*. Environmental Concern, Inc. 179 pp.

4.3 Control invasive plants

Most of the techniques for controlling invasive plants in uplands are appropriate for wetlands, with the caveat that required wetland permits are in place, and chemical control methods are labeled for wetland use.

❖ Strategy 5. Manage tidal marsh dieback

The occurrence of tidal marsh dieback appears to be a new phenomenon in the Northeast. Dieback can occur gradually over the course of decades, as in Jamaica Bay, NY, or rapidly, over the course of one growing season, as in several locations in Connecticut, Massachusetts and Maine (Adamowicz and Wagner 2005). Successful strategies to manage dieback depend on identifying the causal agent(s) in each case. No specific causes have yet been identified in the Northeast. Decontaminating all footwear, gear and machinery after visiting a dieback site has been recommended as a minimum precaution until causal agents and remedies have been determined (Adamowicz and Wagner 2005). For additional information see www.brownmarsh.net and www.NEERS.org.

Adamowicz, S. C. and L. Wagner. 2005. *Northeast sudden wetland dieback workshop proceedings*. U.S. Fish and Wildlife Service. 69 pp.

❖ Strategy 6. Manage contaminants

In addition to toxic materials (organic chemicals, heavy metals), salt marsh contaminants include nutrient and freshwater runoff (introducing reduced salinity regimes). Nutrient additions commonly occur through both atmospheric deposition and stormwater runoff. Successful strategies for controlling stormwater runoff include offsite treatment; correct location of discharge point; and maintenance of an adequately wide, naturally vegetated upland buffer (Bertness et al. 2004). Freshwater marshes also can have contaminant issues based on their location or prior uses.

Bertness, M., B. R. Silliman, and R. Jefferies. 2004. *Salt marshes under siege*. *American Scientist* 92: 54-61.

Schueler, T.R. 1987. *Controlling urban runoff: a practical manual for planning and designing urban BMPs*. Metropolitan Washington Council of Governments, Washington, DC.

Schueler, T.R., P.A. Kumble, and M.A. Heraty. 1992. *A current assessment of urban best management practices - techniques for reducing non-point source pollution in the coastal zone*. Metropolitan Washington Council of Governments, Department of Environmental Programs, Anacostia Restoration Team, Washington, DC.

❖ Strategy 7. Allow Natural Succession and Processes

Many natural wetland types are relatively stable and are driven by natural processes, tides, soil type, surface water runoff, ground water and precipitation collecting in depressions or slopes. Seasonal changes in hydrology, or changes through the tidal cycle, create a fluctuating water table, resulting in wetland vegetation development. When these systems are functioning naturally, are devoid of invasive plants, and are not heavily impacted by human development, they often are not actively managed.

Tiner, R.W. 1994. *Maine Wetlands and Their Boundaries*. Institute for Wetland and Environmental, Education and Research. Sherborn, Massachusetts.

❖ Strategy 8. Mimicking Natural Freshwater Wetland Processes in Impoundments

The Rachel Carson refuge has one 1-acre impoundment, a former fire pond, which currently is not managed as a moist soil unit. Due to management constraints, the size of the impoundment, and invasive plants, the refuge will not manage this unit for moist soil vegetation at this time. If conditions or management constraints are alleviated, we may consider managing the impoundment for fall migration by lowering water levels in the spring and slowly bringing them up after moist soil vegetation grows. The construction of new impoundments at the refuge is not likely.

Appendix F



USFWS

Construction projects

Refuge Operations Needs System (RONS) and Service Asset Maintenance Management System (SAMMS)

- **Refuge Operations Needs System Databases**
- **Proposed Projects Not Currently in the RONS Database and Their Relationship to Respective CCP Alternatives and Refuge Goals**
- **Service Asset Maintenance Management System Database**

Refuge Operations Needs System Databases

Table F.1. Proposed projects currently in RONS Tier 1 database (FY04) and their inclusion in respective CCP alternatives.

<i>Project #</i>	<i>Project Description</i>	<i>Staffing (FTE's)</i>	<i>Cost Year 1 (x1000)</i>	<i>Cost Recurring (x1000)</i>	<i>Project Duration (years)</i>	<i>Alt A</i>	<i>Alt B</i>	<i>Alt C</i>
98034	Improve Refuge ID and Boundary Posting - Hire LE officer	1.0	148		15	X	X	X
99008	Restore Coastal Habitats & Associated Water quality – Hire Facility Manager	1.0	123		15	X	X	X
98056	Increase Biological knowledge of Refuge Species and related habitat	0	37		15	X	X	X
97005	Improve Public Understanding of refuge goals and mission - Hire ORP	1.0	110		15	X	X	X
98022	Expand exotic plant eradication and monitoring program on the refuge	0	51		15	X	X	X
98060	Improve ability to effectively and efficiently accomplish station and service goals - Hire Administrative assistant	0.5	58.5		15	X	X	
98040	expand bird studies and banding program	0	33		15	X	X	
98052	Develop and print brochures to increase outreach and educational opportunities	0	105		15	X	X	

Table F.2. Proposed projects currently in RONS Tier 2 database (FY05) and their inclusion in respective CCP alternatives.

<i>Project #</i>	<i>Project Description</i>	<i>Staffing (FTE's)</i>	<i>Cost Year 1 (x1000)</i>	<i>Cost, Recurring (x1000)</i>	<i>Project Duration (years)</i>	<i>Alt A</i>	<i>Alt B</i>	<i>Alt C</i>
02005	Control and monitor invasive species with partners	0	48	20	15	x	x	x
03001	Manage habitat for New England cottontail - Hire biologist	1.0	139	84	15		x	
01001	Piping plover and least tern management	0	52	18	15	x	x	x
01007	Improve baseline data collection of surveys for priority bird species	1.0	61	45	15			x
99007	Restore salt marsh habitat	0	56	20	15	x	x	x
99009	Ecology of salt marsh and Nelson's sharp-tailed sparrows	0	70	30	15	x	x	
98017	Manage grasslands effectively throughout the refuge	0	17	4	15		x	
03002	Rachel Carson partners for Wildlife Program - Biologist	1.0	147	92	15		x	x
01004	maintain early successional scrub/shrub habitat	0	73	15	15		x	x

Table F.2. Proposed projects currently in RONS Tier 2 database (FY05) and their inclusion in respective CCP alternatives (continued).

<i>Project #</i>	<i>Project Description</i>	<i>Staffing (FTE's)</i>	<i>Cost Year 1 (x1000)</i>	<i>Cost, Recurring (x1000)</i>	<i>Project Duration (years)</i>	<i>Alt A</i>	<i>Alt B</i>	<i>Alt C</i>
99017	Restore refuge grasslands to native grasses	0	45	3	15		x	
01003	Restore early successional scrub/shrub habitat	0	47	15	15		x	x
01005	Conduct fish surveys of refuge rivers	0	66	13.5	5		x	
98043	Conduct aerial waterfowl and habitat surveys	0	22	15	5			x
98054	Maintain and update refuge GIS database	1.0	160	90	15			x
02007	LMRD Program - Hire assistant Biologist	1.0	144	79	15		x	
03003	Protect and Manage Water and Wetlands	0	100	30	15		x	x
02004	Expand awareness of refuge and NWRS	0	100	30	15		x	x
99010	Restoration and management of freshwater wetlands	0	90	11	15			x
02006	Establish the Rachel Carson NWR marine Protected Area (MPA)	0	20	15	5			x
99014	Improve community relations and understanding of refuge's presence	0	36	8	15		x	x
98011	Improve visitor services	1.0	140	100	15			x
98014	Investigate the ecology and importance of vernal pools and associated wildlife	0	35	5	5		x	
98075	Provide opportunities for visually impaired visitors	0	32	0	1		x	x
98033	Review project proposals for refuge and adjacent lands-Hire Secretary	1.0	80	46	15			x
98005	Develop a water quality monitoring plan	0	85	10	15		x	
03004	Secure station facilities, equipment and staff safety	0	44	10	15	x	x	x
98027	Manage 3000 acres of Forest Habitats	0	50	30	15			x
98029	Improve and evaluate habitat through the use of prescribed fire	0	90	25	15		x	
00201	Inventory resources and apply adaptive management techniques	0	45	15	15		x	x
01002	Implement water quality monitoring program	0	75	20	15		x	x
01008	Protect refuge resources and visitors - Hire LE Officer	1.0	144	71	15		x	
98003	Expand refuge fire management program	0	45	20	15		x	x

Table F.2. Proposed projects currently in RONS Tier 2 database (FY05) and their inclusion in respective CCP alternatives (continued).

<i>Project #</i>	<i>Project Description</i>	<i>Staffing (FTE's)</i>	<i>Cost Year 1 (x1000)</i>	<i>Cost, Recurring (x1000)</i>	<i>Project Duration (years)</i>	<i>Alt A</i>	<i>Alt B</i>	<i>Alt C</i>
00202	Protect resources and ensure public safety	1.0	136	66	15			x
00203	Manage Habitat/Maintain Facilities - Hire Maintenance Worker	1.0	128	54	15			x
02003	Implement a Youth Conservation Corps Program	0.3	50	31	15		x	
97004	Expand planning efforts for the station visitor center	6	1129	335	15			x
98002	Expand archaeological survey to additional refuge lands	0	96	0	1		x	
98032	Improve cooperative resource management opportunities on tribal lands	0	10	0	1			x
98053	Increase volunteer efforts at the refuge	0	20	10	15	x	x	x
98024	Investigate relationship between deer density and the incidence of Lyme disease	0	17	0	1	x		
98041	white-tail deer studies	0	35	22	1			x
98021	Increase waterfowl surveys of refuge lands throughout the year to weekly	0	19	5	5	x		
97002	Improve trust resource protection by improved oil spill prevention planning	0	70	17	15		x	x
99006	Implement Wells Harbor Dredge Interagency agreement	0	67	11	5	x		
02001	Visitor and resource protection improvement	0	60	10	15		x	x
02002	Law enforcement equipment	0	26	2	15	x	x	x
98073	Improve efficiency and cost effectiveness of refuge habitat management operations	0	73	10	15	x	x	x
00002	Enhance wetland restoration capabilities	1	114	56	15			x
98016	Improve water quality and restore wetland habitat on the refuge	0	36	5	15		x	x
99004	Provide watchable wildlife viewing stations	0	75	5	1		x	
01006	Construct a fire equipment storage building	0	68	3	1		x	x
99005	Develop wheelchair accessible fishing platform and observation platform	0	129	4	1		x	x
05001	Manage 10,000 acres of Uplands - Hire Assistant Manager	1	109	67	15		x	x

Proposed Projects Not Currently in the RONS Database and Their Relationship to Respective CCP Alternatives and Refuge Goals

Table F.3. Goal 1. Perpetuate the biological integrity and diversity of coastal habitat to sustain native wildlife and plant communities, including species of conservation concern.

<i>Project Description</i>	<i>Staffing (FTE's)</i>	<i>Cost Year 1 (x1000)</i>	<i>Cost, Recurring (x1000)</i>	<i>Project Duration (years)</i>	<i>Alt A</i>	<i>Alt B</i>	<i>Alt C</i>
Conduct monitoring and research of salt marsh to address marsh die, back, sea level rise, and other issues, function of vegetated shoreline buffers	0	40	20	15		x	x
Stormwater management and control with partners,	0	25	20	15		x	
Determine mercury and other contaminant exposure, and pathways and the effects on sharp-tailed sparrows	0	30	18	15		x	
Shorebird Management including ISS and PRISM surveys, turnover rates, roosting sites	0	25	15	15		x	x
Waterfowl Management including evaluate level of surveys required	0	20	9	15		x	
Manage Dune Grasslands to maintain ecological integrity, and educate recreational users	0	15	7	15		x	x
Use agreements, easements, and acquire to protect dune grassland habitat, piping plovers, least terns	0	10	5	15		x	x
Investigate the ecological and management requirements of tidal rivers for anadromous, catadromous fish species and other species of concern	0	30	20	15		x	
Maintain ecological integrity of coastal Maine watersheds with partners by promoting land conservation efforts and working collaboratively on management initiatives; identify and protect critical habitats with partners	0	35	18	15		x	x
Manage tidal habitats including identifying, monitoring and restoring SAVbeds	0	25	9	15		x	x
Manage and monitor Maritime Shrub habitat with partners; conduct avian surveys during migration and breeding, broaden land conservation initiatives	0	40	20	15		x	x
Document and understand legal jurisdiction for protecting trust resources within the Marine Protected Area; evaluate implications of energy development (i.e., wind turbines)	0	25	9	15		x	
Manage and Monitor Biodiversity; conduct botanical surveys, working with state agencies implement surveys for listed plants, animals, and invertebrates on refuge; identify and protect rare natural communities and features; sponsor "bioblitz"	0	35	12	15		x	x
Manage and monitor pitch pine bog communities, conduct flora and fauna surveys, work with neighbors to maintain the habitat	0	20	9	15		x	x

Table F.3. Goal 1. Perpetuate the biological integrity and diversity of coastal habitat to sustain native wildlife and plant communities, including species of conservation concern (continued).

<i>Project Description</i>	<i>Staffing (FTE's)</i>	<i>Cost Year 1 (x1000)</i>	<i>Cost, Recurring (x1000)</i>	<i>Project Duration (years)</i>	<i>Alt A</i>	<i>Alt B</i>	<i>Alt C</i>
Expand Shorebird Management and surveys	0	15	8	15			x
Hire seasonal technicians to manage/monitor piping plover and least terns	0	45	35	15			x
Establish multi-state least tern monitoring network, conduct banding studies	0	40	18	15			x

Table F.4. Goal 2. Perpetuate the biological integrity and diversity of freshwater habitats to sustain native wildlife and plant communities, including species of special concern.

<i>Project Description</i>	<i>Staffing (FTE's)</i>	<i>Cost Year 1 (x1000)</i>	<i>Cost, Recurring (x1000)</i>	<i>Project Duration (years)</i>	<i>Alt A</i>	<i>Alt B</i>	<i>Alt C</i>
Work with municipalities on educating landowners on shoreland protection	0	15	7	15		x	x
Stormwater management including discharge, BMP's	0	25	15	15		x	x
Partner with water companies to identify areas to work together to protect aquatic resources	0	30	18	15		x	x
Work with the state to map distribution, protect and manage Blanding's and wood turtles	0	15	8	15		x	x
Manage and Monitor Biodiversity; conduct botanical surveys, working with state agencies implement surveys for listed plants, animals, and invertebrates on refuge; identify and protect rare natural communities; sponsor "bioblitz"; survey dragonflies and damselflies	0	25	13	15		x	x
Evaluate fish barriers and work with partners to enhance fish passage; evaluate impacts to rivers and streams from boating; work with partners to influence upstream land uses to improve water quality	0	45	20	15			x
Survey all vernal pools, enhance turtle and wildlife crossings with partners	0	15	8	15			x

Table F.5. Goal 3. Perpetuate the biological integrity and diversity of upland habitats to sustain native wildlife and plant communities, including species of conservation concern.

<i>Project Description</i>	<i>Staffing (FTE's)</i>	<i>Cost Year 1 (x1000)</i>	<i>Cost, Recurring (x1000)</i>	<i>Project Duration (years)</i>	<i>Alt A</i>	<i>Alt B</i>	<i>Alt C</i>
Manage New England Cottontail (NEC); survey known and potential sites; establish NEC populations at two new sites; evaluate role of invasive plants on habitat and feasibility of replacing invasives with native shrubs	0	50	30	15		x	x
Evaluate and refine bird and vegetation monitoring in grassland units	0	7	7	15		x	
Manage and Monitor Biodiversity; conduct botanical surveys, working with state agencies implement surveys for listed plants, animals, and invertebrates on refuge; Continue with New England Wildflower Society/state rare plant monitoring; sponsor "bioblitz"; conduct bat and owl surveys	0	12	12	15		x	x
Conduct surveys for black racers, research nest productivity of shrubland birds	0	5	5	15			x
Establish nursery for propagating native shrubs and other native plants	0	12	12	15			x
With landowners monitor grassland nesting birds, evaluate restoration of native warm season grasslands	0	15	15	15			x
remove all invasives from deciduous forest, monitor hemlock stands for wooly adelgid	0	45	45	15			x
Restore pitch pine habitats lost to succession since the 1947 fire	0	30	30	15			x

Table F.6. Goal 4. Develop the Rachel Carson National Wildlife Refuge as an outstanding center for research and demonstration emphasizing land management techniques for restoring and sustaining healthy estuarine ecosystems in concert with the National Land management Research and Demonstration (LMRD) program.

<i>Project Description</i>	<i>Staffing (FTE's)</i>	<i>Cost Year 1 (x1000)</i>	<i>Cost, Recurring (x1000)</i>	<i>Project Duration (years)</i>	<i>Alt A</i>	<i>Alt B</i>	<i>Alt C</i>
Identify, continue, and expand partnerships and collaborations to: further research in estuarine ecosystem restoration, management and conservation; provide financial support to research projects	0	80	30	15		x	x
Fund graduate student program, field assistants, interns	0	50	30	15		x	x
Review existing work and develop an electronic repository of information on the function and management of estuarine habitats; establish a library of materials and holdings available to managers and researchers	0	75	20	8		x	x
Identify existing SAV and macroalgae sites and evaluate for restoration potential	0	50	25	8		x	x
Establish research projects on refuges and other sites to test habitat-specific restoration techniques; develop and test new techniques and insure that findings are documented and published.	0	80	40	15		x	x
Identify facility needs including administrative, research, and housing needs	0	10	10	1			x
Conduct outreach for managers and others through workshops; develop and produce scientific and lay publications, posters, and videos; use the Internet to provide and disseminate habitat management information	0	20	20	15		x	x
Conduct inreach to the refuge and NWRS about the LMRD program	0	15	7	15		x	x
Develop and Implement automated remote monitoring of salt marshes	0	100	75	15			x
Conduct field studies, analyze samples, work with visiting scientists - Hire Resource Specialist	1.0	109	67	15			x
Manage and analyze data, maintain and manage GIS data, conduct field studies - Hire Biologist/GIS specialist	1.0	144	79	15			x
Establish inter-agency restoration team for salt marsh restoration	0	50	25	15			x
Establish mentoring program and details for NWRS employees on LMRD	0	10	5	15			x

Table F.7. Goal 5. Increase appreciation and stewardship of coastal Maine wildlife and their habitats by providing positive wildlife-dependent experiences for Refuge visitors.

<i>Project Description</i>	<i>Staffing (FTE's)</i>	<i>Cost Year 1 (x1000)</i>	<i>Cost, Recurring (x1000)</i>	<i>Project Duration (years)</i>	<i>Alt A</i>	<i>Alt B</i>	<i>Alt C</i>
Evaluate existing and future fees for hunting and other uses	0	3	2	15		x	
Install interpretive signs, kiosks; develop and install interpretive signs at existing trails on management and trust resources	0	50	20	15		x	x
Develop and host interpretive programs on a variety of subjects	0	35	15	15		x	x
Maintain and expand internship program, YCC program, volunteer program including Friends group	0	50	40	15		x	x
Develop trails on newly acquired land using existing infrastructure, and connecting to partner facilities where possible	0	70	30	15		x	x
Meet with decision makers in the 12 town region on issues of joint interest/concern; utilize new administrative facility for public meetings and educational programs	0	15	10	15			x
Sponsor and support regional environmental education programs including Envirothon;	0	15	10	15		x	x
Utilize proposed donated environmental education facility at the Goosefare Brook division	0	25	10	15		x	
Develop and distribute refuge specific lessons for use in schools or at the refuge, interact with teachers to ensure that refuge specific lessons meet Maine Learning Results and teacher needs	0	30	15	15			x
Manage Refuge hunting program by continuing to coordinate with the state, adjusting the program for safety and sound wildlife and habitat management, to provide opportunities for disabled and youth hunters, and to host education classes annually.	0	10	5	15		x	x
Manage Refuge fishing program by providing on-site information to anglers, evaluating additional sites, developing partnerships with local interest groups, and hosting a second fishing event annually	0	10	5	15		x	x
Manage wildlife observation and photography program by improving trails where needed, constructing a new observation platform/blinds on identified units, and by promoting activities through regular media contact	0	20	10	15		x	x
Provide year round ecologically sound rest room facilities at the Carson Trail	0	65	12	15		x	
Install interactive displays about wildlife, develop brochures and/or signs for all trails, develop interpretive panels at all overlooks	0	100	30	5			x
Develop educational curriculum for additional grade levels	0	20	10	5			x
provide hunting blinds and stands, teach BLIP course	0	20	10	15			x
Sponsor fishing workshops and provide commercial fishing access	0	15	8	15			x
Teach wildlife photography classes, and establish a reference library on wildlife in the area	0	5	2	15			x

Table F.8. Goal 6. Foster off-Refuge cooperative actions and partnerships to promote wildlife conservation and further Refuge goals.

<i>Project Description</i>	<i>Staffing (FTE's)</i>	<i>Cost Year 1 (x1000)</i>	<i>Cost, Recurring (x1000)</i>	<i>Project Duration (years)</i>	<i>Alt A</i>	<i>Alt B</i>	<i>Alt C</i>
Participate as a member of regional initiatives to further land conservation, habitat management, and wildlife management for trust species and species of conservation concern	0	8	5	15		x	x
Facilitate watershed wide invasive species control programs	0	30	15	15		x	x
Restore a minimum of 50 acres annually of various habitats	0	50	40	15		x	
Sponsor or co-sponsor with partners regional natural resource workshops	0	10	6	15		x	x
Host one local or statewide annual contest such as the Junior Duck Stamp contest	0	10	5	15		x	x
Develop and staff exhibits at four or more major regional or state events annually	0	25	5	15		x	
Develop and host an annual Rachel Carson Festival beginning in 2007	0	25	10	14		x	
Develop and staff exhibits at ten more major regional or state events annually	0	25	9	15			x
Restore a minimum of 100 acres annually of various habitats	0	70	45	15			x
Expand Rachel Carson Private Lands Program - Hire Biologist	1	85	60	15			x

Service Asset Maintenance Management System Database

Table F.9. Projects currently backlogged in the Service Asset Maintenance Management System (SAMMS) database (FY05) for Rachel Carson NWR

<i>Project #</i>	<i>SAMMS Work Order #</i>	<i>Project Description</i>	<i>Cost Estimate (\$1,000)</i>
97004	97110304	Construct Visitor Contact Station	1200
99016	99104248	Replace Kiosks	29
03001	03126303	Construct Facility to Replace SAMMS 10024177	1253
98530	98104237	Rehabilitate Boat Ramp/Fishing Pier	78
99003	99123773	Construct year round Restrooms at Carson Trail	45
98513	98104245	Replace Carson Trail Observation Platforms	34
99004	99	Construct 4 wildlife viewing overlooks	78
98529	98104234	Rehabilitate Hiking Trails	27
99005	99	Construct accessible fishing and observation platform	135
01010	01	Construct a fire equipment storage building	157
99001	99123772	Construct Trail and Restroom at Brave Boat Harbor	161
01002	01113370	Replace Marooka MST-600 Dump Carrier	31
98073	98	Construct Storage Facility	125
98524	98104252	Replace damaged Ford explorer	37

Table F.9. Projects currently backlogged in the Service Asset Maintenance Management System (SAMMS) database (FY05) for Rachel Carson NWR (continued)

<i>Project #</i>	<i>SAMMS Work Order #</i>	<i>Project Description</i>	<i>Cost Estimate (\$1,000)</i>
03004	03130707	Construct "Environmentally Green" Rachel Carson/Saco Trails EE building	63
00002	00104236	Replace International Tractor Truck	175
03005	03130712	Construct Pre-fabricated pedestrian bridge for Bridle Path along Mousam River	63
92009	92104242	Replace Signs and posts	26
99012	99104240	Remove rubbish on refuge lands	26
99011	99104260	Rehabilitate Access Roads	37
01003	01113371	Replace supplemental equipment, trailers, attachments	26
98544	98104255	Replace old 1988 snowplow and snow blower	26
98517	98104258	Replace 4x4 Chevrolet Truck and trailer	99
00003	00104253	Replace worn 1994 Ford explorer	38
00001	00104254	Replace unstable lowboy trailer	55
98537	98104251	Rehabilitate office/sub-headquarters HVAC and replace oil tanks	58
98515	98104249	Replace identification/directional signs	26
98500	98104235	Replace culverts	32
94013	94109430	Rehabilitate trails, boardwalks at Carson Trail	26
02014	02121126	Rehabilitate Harts Road East	80
01007	01113574	Replace Duranautic Boats, outboard motor and trailer	26
01008	01113601	Replace 1977 gasoline fork lift	69
01009	01113603	Replace Big Joe 1 ton electric lift	11
02005	02120582	Replace 1987 20 ton dump truck	52
02008	02121068	Rehabilitate Carson trail public use road and parking area	26
02012	02121093	Rehabilitate public use parking lots	33
02009	02121071	Rehabilitate Spurwink River Road and parking lot	31
04010	04134036	Replace 1988 Dodge Dakota 4x2 with cab	30
01006	01113386	Replace 1992 1 ton diesel crewcab pickup	31
02001	02120574	Replace 1998 Jeep Grand Cherokee	31
02003	02120580	Replace 2000 Ford expedition 4x4	33
02013	02121100	Rehabilitate Mousam River public access parking lots	26
02004	02120581	Replace 2001 Ford 4x4 Regular Cab pickup	29
02011	02121082	Rehabilitate Oxcart lane	34
02006	02120586	Replace 2002 Ford Escape 4x4	26
02010	02121076	Repair brave Boat Harbor West Public Use road	104
03002	03126310	Repair Truck with a towed/transport body	26
02007	02120880	Replace 1996 John Deere 310SE Backhoe/loader	63
02015	02121128	Rehabilitate Furbish Road parking lot	30
02002	02120576	Replace 1998 Ford Stake body truck	47
04001	04133750	Replace Trimble Model TSC1 GPS unit	15
04006	04133782	Repair and rehab Houston Garage/Storage building	47
04002	04133751	Replace 2004 Honda Civic hybrid	20
04004	04133766	Replace 2003 John Deere 6420 tractor	55
04005	04133767	Replace ASV 2810 Posi Track	70
05001	05137479	Replace 2004 Dodge 2500 pickup	33
Grand Total			5,302

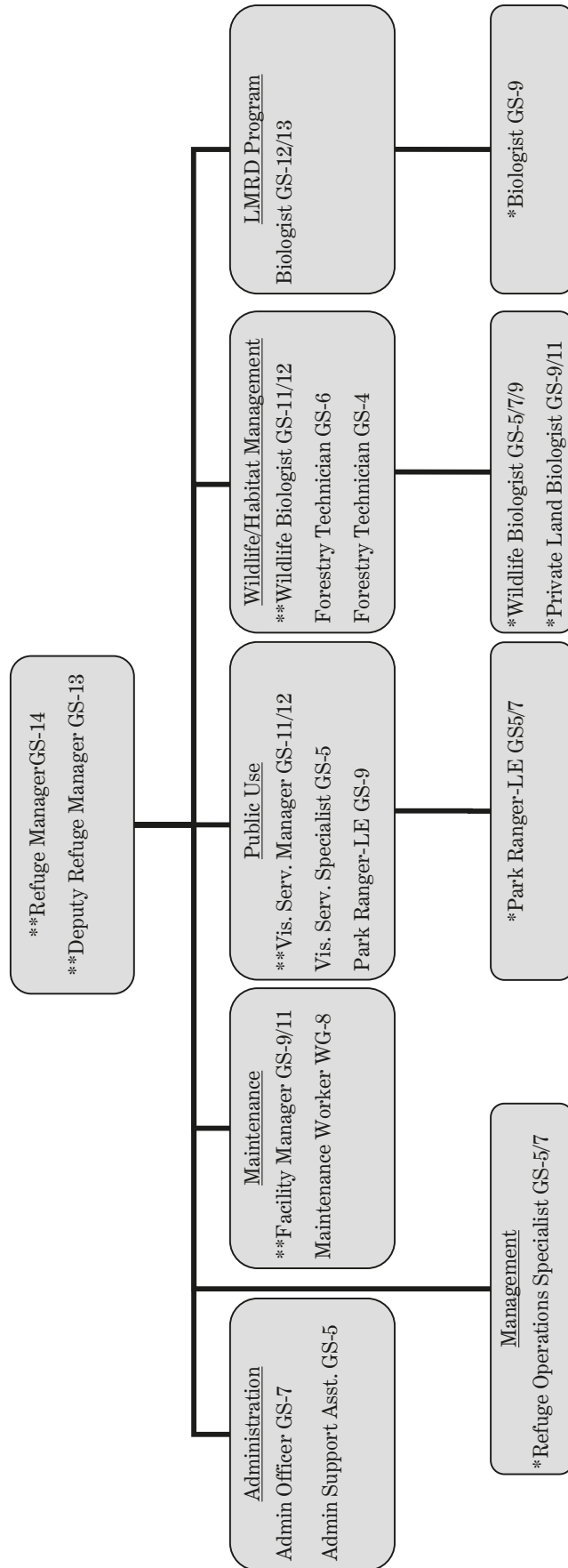
Appendix G



Jordan Perkins/USFWS

Least tern chick

Staffing Chart



** New grade level or title for existing position
 * New position for CCP Alternative B
 All other positions are current and approved.

Appendix H



USFWS

Fall colors at the refuge

Cultural Resources Report

- Introduction
- Geologic Setting
- Prehistoric Setting
- European Contact and History

Written by Victoria Jacobson, U.S. Fish and Wildlife Service

Introduction

Humans have played an integral role in the environment within and beyond the boundaries of Rachel Carson National Wildlife Refuge since the deglaciation of the Northeast about 13,000 years ago. The refuge contains diverse ecosystems that have provided humans with wide ranges of flora and fauna for them to subsist upon. The landscape at Rachel Carson has been dynamic, as a result of changes in the environment during the end of the Pleistocene and throughout the Holocene. Humans have also caused anthropogenic changes upon the landscape throughout history by their choices about where and how to foster their livelihood. They have been active agents in species representation in the biosphere through choosing which flora and fauna they exploit, clearing land by fire to provide fresh, green forage for deer, and clearing large expanses of land for farming in historic times. Each generation has acted upon those landscapes differently than the previous, creating subtle or obvious changes which affect future environments.

Because professional archaeologists have surveyed less than 1 percent of the refuge, only 49 archaeological sites have been recorded. Of those, 13 are eligible for inclusion in the National Register of Historic Places. One study (Will et. al. 1995) identified several land forms that may contain archaeological resources dating as long ago as 11,500 years. The various periods described below outline the cultural periods that are either directly represented in archaeological site records, or most likely exist within the refuge boundary, but have yet to be identified. Each section identifies cultural attributes that can be extrapolated to represent what occurred on the refuge through time.

The Maine coastline has never been static. It will be slightly different tomorrow and next year, and was vastly different 5,000 and 12,000 years ago. Toward the end of the Pleistocene glacial epoch, the Laurentian ice sheet flowed south-southeast across the present coastline to reach a terminal position in the Gulf of Maine at Georges Bank some 18,000 to 20,000 years ago (Hughes et. al. 1985). The ice began wasting, and is believed to have receded to the present coast, sometime between 13,800 and 13,200 years ago (Stuiver and Borns 1975).

Geologic setting

As the ice receded from a landscape that was still isostatically depressed by that colossal glacial weight, marine waters flowed well into the interior of present-day Maine. Plumes of fine rock flour flowed from the ice margin, spreading and blanketing the till with silty clay sediments across much of the refuge area. Those deposits have been termed the “Presumpscot Formation,” and their internal characteristics, fossil assemblages and chronological relationships with other surficial materials have greatly enhanced understanding of the evolution of the present landscape.

Moraines mark standing positions of ice retreat in areas of the refuge, such as along Goosefare Brook (Clinch and Thompson 1990a). Proglacial sandy outwash moved out of the ice in meltwater streams, filling valleys or forming deltas in areas such as the refuge center at Little River. Finally, as landscape rebound exceeded sea level rise, the retreating ice sheet was grounded (Thompson 1982, Smith and Hunter 1989), and the retreating sea produced shoreline features as well as a sandier surface to the Presumpscot Formation throughout much of the refuge (Clinch and Thompson 1990a, 1990b; Hildreth 1990a, 1990b; O’Toole et al. 1988).

The refuge Falls within the “arcuate embayment” compartment of coastal Maine that extends from Portland into New Hampshire (Tuttle 1960, Kelley et. al. 1988). That unique coastal area is composed of a series of arcuate (curved like a bow) sandy beaches separated by rocky headlines. In this sand-rich region, barrier beach spits and tombolos separate low water energy pools and salt marshes from the ocean. Salt marsh growth began to keep pace with slowing sea level rise during the Mid-Holocene. As a result, most existing salt marsh peat began to grow around 3,500 to 4,000 years ago (Kelley et. al. 1989). Thus, human living surfaces and water oriented activity areas created since that period may have been capped by landward accreting and vertically accumulating marsh peat in quiet environments.

The dynamic nature of the Maine coast has provided a challenging and exciting environment for humans during the past 11,500 years. The changing landscape upon which humans acted required intimate knowledge of flora, fauna, climatic and hydrologic cycles for survival. Human subsistence strategies adapted to new environments,

expressed in their tools and social structures, which are somewhat preserved in the archaeological record. We can understand that variation by looking at each archaeological time period to analyze those changes expressed through the material culture.

Prehistoric setting

❖ *Paleoindian (11,500-9,500 years before present (BP))*

The first inhabitants of Maine are labeled Paleoindians. The Paleoindian tradition is widespread throughout the Americas from Alaska to Tierra del Fuego. In some parts of the Americas, Paleoindians hunted now extinct mega fauna such as Mammoth, Mastodont, and *Bison antiquus*. In the Northeast, although available for part of the time, no mega fauna bones have been recovered from archaeological sites, only fish and smaller mammal bones, including woodland caribou and beaver. Recently, at the Nevers Site in northern New Hampshire, various kinds of water tuber type plants were recovered by Dr. Lucinda McGweeney, in a Paleoindian hearth (personal communication). Those finds, plus the lack of mega faunal remains at Northeastern Paleoindian sites, indicate that they were not practicing the subsistence strategies of their western counterparts, but were rather adapting to a more generalized subsistence pattern and exploiting the various flora and fauna of the Northeast. As more information is acquired and data recovery techniques improve, the Paleoindian diet will be better defined.



Most Paleoindian sites in the Northeast represent small numbers of people (5–15) traveling together. Those groups would have been composed of women, children and men, probably related to each other. They would live in areas for short periods of time and practiced a gathering and hunting subsistence strategy. In addition to gathering and hunting, they produced various kinds of tools to process their foods, plus items to express ideology, such as bone or stone beads (Gramly 1998). Their stone for making tools, would be acquired from sources as much as 500 miles distant. The most notable Paleoindian tool is the fluted point, unique to the Americas and, specifically, to Paleoindians. Therefore, it is useful to identify a site when other means, such as a reliable radio-carbon assay, are not available. By the end of the Paleoindian period, fluted spearpoints were replaced by smaller styles that lacked basal fluting.

There are a few very large Paleoindian sites that are unique to the Northeast. Those areas may have been staging camps for large groups initially arriving into the area. Large groups of people could travel into unknown terrain, and then subsequently disperse into smaller bands. Other theories on the nature of those large sites include aggregation camps for people to acquire mates, exchange exotic lithic raw materials, or perhaps communally hunt herd species, such as caribou (Dincauze 1995).

In Maine, archaeologists have identified only smaller sites. They consist of campsites that vary in size from less than 300 m² to 18,000 m². Some of the best reported sites include Michaud, located in Auburn (Spiess and Wilson 1987), Vail and Adkins, located on the shores of Aziscohos Lake in western Maine (Gramly 1982, 1988), and Hedden, located on the Kennebunk Plains not far from the refuge (Spiess and Mosher 1994, Spiess et. al 1995). Shared characteristics among them include the use of very fine-grained crypto-crystalline rocks, such as chert, and a preference for a well-drained, sandy living area.

There is very little published evidence for late Paleoindian sites in Maine. Two sites recently have been found: one in the town of Turner, along the Nezinscot River, and the other in Oxford, near the Little Androscoggin River. They were excavated in 1993 and 1994, and have yet to be fully published. Both overlook small river drainages, and their sizes suggest short-term occupation by a band (Will et. al. 1995).



❖ The Archaic (9,500–2,800 BP)

Archaeological sites representing the Early and Middle Archaic periods (9,500–6,000 BP) are uncommon in Maine. In fact, archaeologists argued for many years about their existence in Maine at all (see Sanger 1977, Spiess et. al. 1983). During these periods, mixed softwood and hardwood began to replace conifer forests. Recent improvements in archaeological excavation methods and a growing awareness of regional geology have allowed archaeologists to identify Early and Middle Archaic sites.

Early and Middle Archaic sites are most commonly present in deeply buried alluvial deposits. In fact, many are found at depths of more than 1.5 meters (Peterson 1991). An Early Archaic site radiocarbon dated to 8,470 +/- 110 years BP (Beta 75010), and excavated by Dr. Richard Will in 1994, was discovered at a depth of 2 meters below ground surface along the Little Ossipee River in East Limington, Maine.



The Early Archaic assemblages in Maine differ from those found elsewhere in the Northeast. Many of the tool forms recovered are chipped and ground into shape from relatively soft rocks such as phyllite. Those tools contrast sharply to Paleoindian tools and Early Archaic tools elsewhere in both style and material type. Their projectile points usually have a stem on the base that has been ground and flaked. Some also have a notch in the center, creating a bifurcate base. Assemblages of ground-stone tools in association with pecking or hammering stones are fairly diagnostic and particular to Maine. Based on the distribution and frequency of Early Archaic sites, most likely the settlement pattern involved people traveling in small bands exploiting wetland-type environments where the most predictable food supplies could be harvested.



The Middle Archaic is more archaeologically visible than its predecessor, and sites are distributed both along the coast and the interior (Bourque and Cox 1981). The stone tools are similar to those found in other parts of New England. The first cemeteries appear during this time, indicating that people may be starting to identify a set territory. Visible cemeteries are clear markers that the land is associated with a certain group when visited by outsiders. The burials contain red ochre and grave offerings of ground stone tools, including woodworking gouges, celts, slate spear points and ground stone rods.



Based upon the diversity of the materials found at Middle Archaic sites, archaeologists can infer the people were building things such as dug-out canoes and sturdy dwellings. People had probably begun to establish seasonal rounds for gathering and hunting. They also were becoming more reliant upon coastal resources such as shell fish and fish. The population is also beginning to increase during this time.

Late Archaic sites are more numerous in Maine and they have been documented in York County (Will and Cole-Will 1985). During that period, between 6,000 and 2,800 years ago, an environmental transformation changed forest composition and the kinds of wild food plants and animals available for gathering and hunting (Will et. al. 1995). The best known archaeological group in Maine during that time is the Moorehead Phase, more commonly known as the "Red Paint People." That term was coined by Warren Moorehead who conducted extensive excavations throughout Maine in the early twentieth century (Moorehead 1922). He used the term to describe the extensive use of red ochre for burial ceremonialism, perhaps a tradition that began during the Middle Archaic. Numerous cemetery sites from this time period are known (see Willoughby 1898, Moorehead 1922, Snow 1969, Sanger 1973, Bourque 1976), but their interpretation of cultural affiliation and significance vary. Habitation sites are also recorded from a variety of locations including coastal shell middens, lake margins and along large and small waterways. The appearance of larger sites indicates that the population is rising and the people are living in one place for longer periods



of time. During the Late Archaic, there is evidence for marine resource exploitation, including the taking of swordfish (Bourque 1976), which also indicates that people are making vessels capable of short-term sea ventures.

During the Terminal Archaic period, another archaeological assemblage appears, which suggests that a new group of people moved into the region. Their material culture suggests a different life style than the Moorehead phase culture. This tradition has been identified as the Susquehanna tradition. This culture often cremated corpses rather than buried them, and their diagnostic tool kit included large chip-stone spear points rather than ground stone tools. Their subsistence economy seems to have been more focused on terrestrial rather than marine sources (Will et. al. 1995).



The relationship among the various cultures of the Late Archaic continues to be controversial among archaeologists. What is clear is that more than one distinct culture is present in terms of style of artifacts, population is increasing, a wide range of plants and animals are being exploited, and people are living in areas for longer periods of time. Territories are being established and expressed through culturally unique mortuary practices, and cultures are becoming economically stratified, in that some individuals are buried with prestigious grave goods, while others are not. Other questions regarding the cultural change are whether it was an indigenous change or if a new group of people moved into the region. What is definite is that a highly visible change occurred 3,900 years ago.

❖ Ceramic Period (2,800-500 BP)

The Ceramic Period refers to the time when pottery-making first appears in the archaeological record. In the Northeast and other parts of the country, this is referred to as the Woodland Period. Ceramics first appear in the Maine archaeological record around 2,800 years ago, and they persist until the time of European contact, when they were replaced with copper and iron kettles.

The environment during this time was very similar to modern-day environments (Davis and Jacobson 1985). Ceramic period sites are abundant, indicating a high population density that was semi-sedentary (Sanger 1979). The most visible type of Ceramic Period site is shell middens along the coast. Those contain the discarded shells of clams, oysters, mussels and quahogs, in addition to broken bone and stone tool implements, pot sherds and food bone remains, and sometimes human and dog burials (e.g. Spiess and Hedden 1983). Shell midden sites have been reported in several areas of York County including York Harbor and the York River (Mercer 1897, Will and Cole-Will 1985,1986, Will 1995).

Ceramic period sites are also common in the interior along waterways and around ponds and lakes (e.g. Sanger 1979). They have also been found in upland areas in the foothills of western Maine (Eldridge et. al 1999). People during the Ceramic Period were living in villages and trading with people to the north, west and south. That long-distance trade is evidenced by the presence of Rhama Chert, which is only found in Labrador, and other exotic items present at Ceramic Period sites. By the end of the Ceramic period, historical evidence shows that the people of Maine were practicing horticulture. While their diet continued to include marine resources, game and wild plants, plants such as maize, beans and squash were grown. The Ceramic Period ends with European contact around 450 years ago.

European Contact and History

Southern coastal Maine did not become the target of explorers until the first decade of the seventeenth century, although in the sixteenth century, a few Europeans probably traveled along the coast of Maine (Churchill 1978). The first explorer to extensively travel and record the coast of Maine was Samuel de Champlain in 1604. Sailing along the coast, Champlain observed that the Kennebec River was a major political and economic boundary for the natives of Maine. East of that line lived the Etchemin, a group who subsisted by hunting and gathering. West of that boundary lived the Almouchiquois, farmers who congregated in large villages (Will et. al. 1995).

The Almouchiquois were the northernmost Indians who planted the native trilogy of corn, beans and squash. In the 1600s, agriculture was not viable north of the Kennebec River, probably because of the shortened growing season due to the Little Ice age (1350–1650 AD). Although their settlement appeared to be a stable, traditional



situation to Champlain, in actuality it was not. Corn agriculture had only arrived about 700 years earlier, coming in from the south and west. At the time of introduction, it might have spread well east and north of the Kennebec River. However, the climatic cooling condition by 1600 meant that the northern limit of agriculture moved south to the Kennebec River.

Champlain drew a map of the lower Saco River, describing in detail the native settlement pattern of that time (Champlain 1880). A large, principal village was surrounded by agricultural fields. The habitation included a palisaded compound to protect the villagers and their crops from raiding tribes, principally the Micmac of present-day Nova Scotia and New Brunswick. Smaller villages or hamlets were strung along the shoreline, each with its own fields. Champlain indicated that Choacoet, the name of the village on the Saco, was a permanent establishment. However, other lines of evidence suggest groups may have dispersed upriver and into the interior from time to time during the year to take advantage of deer, moose, anadromous fish runs, and other seasonal natural resources (Baker 1986a:10-33).

The active village life depicted by Champlain quickly came to an end. A major intertribal war between the Indians of Maine and the Micmac devastated Choacoet and other settlements. The war seems to have ended about 1615, only to be followed by an even greater disaster. From 1616 to 1619, a European-introduced epidemic that rampaged through New England included the coastal tribes of northern New England. As a result of warfare and disease, the native population of coastal York County may have been reduced by as much as 70 percent from 1600 to 1620 (Snow and Lanphear 1988:15-33).

A smallpox outbreak in 1634 made further inroads on the population. The effect of these epidemics was so great that in 1640 John Winter observed that, aside from the natives at the mouth of the Saco River, there were no Indians within 40 or 50 miles of his post at Richmond's Island (Baxter 1884:III, 461). Aside from a greatly reduced village at Choacoet, only a relict population survived, scattered across the area. As early as 1623, Christopher Levett observed that along the banks of the York River was "good ground, and much already cleared, fit for planting of corn and other fruits, have heretofore been planted by the savages who are all dead" (Levett 1988:39).

The fields were not abandoned for long. A large influx of English settlers in the early 1630s began settlements in present-day Kittery, York, Biddeford, Saco, and Scarborough. Wells was first occupied in the early 1640s. The settlers principally occupied the land directly adjacent to the ocean and along other bodies of navigable waters. Although an occasional early settler did move into the interior to trade furs or cut timber, virtually all inhabitants live at or below the fall line of the numerous rivers until the eighteenth century (Will et.al. 1995). The refuge is located completely within this coastal margin, an area that has remained an important landform for settlement.

Most of this territory was the Province of Maine, granted to Sir Ferdinando Gorges. Gorges never visited his colony, relying instead on a series of lieutenant governors and agents to act in his stead. As a result, settlement and the formation of a sound government in the region suffered. Gorges divided Maine into a series of patents,

which were given to proprietors. Usually, there were two or more proprietors per lot, who were given the lands on the condition that they could plant a certain number of settlers within a specified time limit. In the 1630s, settlement proceeded slowly (Reid 1981).

In the 1640s, the English Civil Wars stopped migration to New England and led to a depression in Maine. Some settlers left for more prosperous colonies, or to return home. Indeed, in 1642 Lieutenant Governor Thomas Gorges returned to England to accept a commission in the Parliamentary Army. The Civil Wars also took the time and energy of Sir Ferdinando Gorges. When he died, his colonies were in a state of disarray (Baker 1994).

From 1652 to 1658, the Massachusetts Bay Colony established authority over Maine, a position which it held with several brief interruptions until statehood in 1820. Settlers rapidly moved into the Bay Colony's newest county of York. In fact, the large number of new arrivals in the late 1650s, 1660s and 1670s may in large part explain why hostilities broke out between the English and native Indians of Maine in 1676 (Baker 1986a). That conflict, generally known as King Philip's war, raged until 1678. During that time, all settlements in Maine north of Biddeford Pool were abandoned or burned by the Indians, and raids burned parts of other settlements as well.

Peace after 1678 was short-lived. In 1688, King William's War started, a series of colonial conflicts in which the French allied with Native Americans against the English. A lasting peace did not return until 1713. During this period, some settlements north of Wells were burned. Salmon Falls (present-day Berwick) was burned in a raid in 1690, and much of York was destroyed in the Candlemas Raid of 1692 (Reid 1981: 164-83). Later in 1692, the settlers of Wells held off a large combined force of French and Indians, but apparently only a small number of garrison houses actually survived that and subsequent attacks (Mather 1853).

The wars were equally disastrous for the Indians, whose village and fields were repeatedly destroyed by colonial militia units. Many natives died in combat or by starvation. Others migrated out of the area, seeking refuge in French-protected reserves on the St. Lawrence, or among their kinsmen on the Kennebec and Penobscot Rivers. A very limited native population had survived in parts of the region until the 1690s. After 1713, the only ones who remained were a small band on the Saco River, who apparently spent most of their time far upriver (Day 1981).

The time after 1713 is generally referred to as the Resettlement Period, when English families returned to abandoned homesteads and new settlers arrived in great numbers as well. Indian raids still occurred, and several wars would occur until the fall of France in 1760 (Clark 1970). That constant threat meant that settlement remained largely below the fall line in the coastal zone.

The coastal zone below the fall line was abundant in resources for the European settlers to make an adequate living. Saw and grist mills were constructed in strategic spots along the fall line and at tidal outlets. Coastal mud flats became prime spots for shipyards. River and stream banks were accessible, and thus became the first areas to be logged. Until better road networks were developed in later colonial time, the sea, rivers and beach served as the principal thoroughfares. Fishermen gathered along these rocky harbors, and farmers also used the area, harvesting salt water hay off the marshland and planting the adjacent uplands. Milling, shipbuilding, and salt water hay farming remained important economic activities until well into the nineteenth century. Thus, a variety of economic resources attracted people to the coastline (Will et. al 1995:14).

In 1760, the Maine frontier rapidly opened, with people pushing far inland (Leamon 1993). The process ceased during the American Revolution, but resumed in the 1780s and continued through the early nineteenth century (Smith 1988). Timber cleared in the interior made its way to the coast, where it was sawn into limber or used in the booming shipbuilding industry of York County. As settlers pushed inland, the coastal trading towns grew in size and importance. The conditions in Portland magnified that effect. Burned by the British in 1775, it took several decades for Portland to reestablish itself as the principal port of Maine. In the meantime, the coastal York County towns took advantage of their opportunity to become important regional economic centers (Butler 1986).

President Jefferson's Embargo in 1808 and the ensuing war of 1812 signaled the beginning of the end of the glory days of the York County ports. Still, some remained fairly active as either trading or shipbuilding ports until the 1840s. At that point, the shipbuilding industry began decline. The demand of increasingly larger ships shut out shipyards located in coastal York County, which did not have deep enough harbors or large enough facilities to build bigger craft. Farming also went into decline in the nineteenth century because small Maine farmsteads

could not compete with the growing agribusiness of the Midwest and West. The principal remaining business of coastal Maine was fishing.

By the late nineteenth century, tourism was beginning to replace most traditional economic activities in the refuge study area. Summer visitors were drawn to the coast for its cool climate, beaches, scenic shores, and relative lack of development (Brown 1992). As twentieth century tourism has thrived, the pace of development has quickened and closed in on the coastal margin that comprises the refuge.

The refuge contains 49 recorded archaeological sites, 13 of which are eligible for inclusion in the National Register of Historic Places. Only a small percentage of refuge lands have been evaluated for the presence of archaeological resources. The number of sites is surely going to increase as more archaeological surveys are completed. The land forms and various environments within the refuge have the potential to yield archaeological sites from Paleoindian through late colonial times. The refuge has provided habitats vital to humans for their livelihood, demonstrated by the artifacts they have left behind, whether a shell midden, a colonial farm site, or the remains of a nineteenth-century wharf or railway trestle.

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Appendix I



Dave Menke/USFWS

Female and male common eider

Privately Owned Lands Within the Acquisition Boundary

- Upper Wells Division—Town of Kennebunk
- Upper Wells Division—Town of Wells
- Brave Boat Harbor Division—Town of York
- Brave Boat Harbor Division—Town of Kittery
- Spurwink River Division—Town of Cape Elizabeth
- Goose Rocks Division, Little River Division—Town of Kennebunkport
- Goosefare Brooks Division—Town of Old Orchard Beach
- Goosefare Brooks Division—Town of Saco

Table I.1. Upper Wells Division–Town of Kennebunk

<i>Map Lot</i>	<i>Acres</i>	<i>Map Lot</i>	<i>Acres</i>
20 11	43.63	11 5	11.74
20 8	5.71	11 3	10.67
30 3A	12.77	12 1	62.41
20 11B	1.25	12 3A	47.25
21 13	43.90	11 7	6.09
20 11A	1.64	12 102	1.84
30 2	1.40	12 6	45.31
21 1	15.67	12 12	5.59
21 9	79.31	12 10	0.98
21 14	10.93	12 6C	32.75
21 19	4.46	12 11	3.61
21 12	11.06	12 6D	5.31
21 19B	8.21	12 13	10.60
21 3	4.02	12 14	7.94
21 2	0.82	12 22	11.95
21 2A	6.47	12 21	13.54
21 19E	6.25	12 20A	6.36
21 2	13.94	12 20	6.21
21 19D	6.44	12 6F	6.96
21 11	8.86	14 12A	4.44
21 14	8.60	14 12C	3.82
21 2	0.91	14 12B	3.57
21 9	0.29	14 12	3.73
21 7	1.67	14 13A	2.04
21 19C	3.04	14 13	2.01
21 7	3.07	13 1	3.63
21 8	9.27	13 2	14.39
11 3A	3.06		

Table I.2. Upper Wells Division–Town of Wells

<i>Map Lot</i>	<i>Acres</i>	<i>Map Lot</i>	<i>Acres</i>
00154-007. -	0.107	00148-002.3 -	0.142
00154-008. -	0.083	00148-002. -	0.073
00154-009. -	0.088	00148-001.1 -	1.946
00153-022.EXE-	0.059	00148-002.5 -	0.123
00154-033. -	0.073	00148-002.4 -	0.165
00154-036. -	0.071	00147-023.B -	0.229
00154-037. -	0.144	00148-005. -	1.215
00151-001. -	0.064	00154-040.EXE-	0.021
00151-002. -	0.049	00148-001.EXE-	13.143
00151-003. -	0.018	00148-003. -	0.339
00151-003. -	0.027	00148-005.10 -	0.006
00151-002.11 -	0.124	00148-004. -	0.468
00148-001.2 -	6.286	00147-023. -	0.235
00151-002.10 -	0.032	00147-025. -	0.250
00147-018. -	2.549	00149-001.EXE-	13.734
00148-002.1 -	0.198	00149-001.EXE-	13.734
00148-002.2 -	0.153		

Table I.3. Brave Boat Harbor Division–Town of York

<i>Map Lot</i>	<i>Acres</i>	<i>Map Lot</i>	<i>Acres</i>
202-097	0.866	202-127	14.470
202-099	3.511	202-121	6.144
201-005	3.077	202-123	40.780
202-103	0.482	201-019	80.263
202-131	14.617	201-023	19.348
202-129	4.951	201-025	5.535
202-119	16.139	201-027	1.250
201-001	7.912	201-029	17.431

Table I.4. Brave Boat Harbor Division–Town of Kittery

<i>Map Lot</i>	<i>Acres</i>	<i>Map Lot</i>	<i>Acres</i>
69_10	2.5	57_25	2.9
69_14A	5.5	45_14	2.6
69_14C	0.9	45_26	5.4
69_14B	0.2	45_28B	3.5
69_12	0.7	64_27	0.7
69_13	0.2	58_06	7.5
69_14E	1.1	64_26	1.9
69_14	2.4	58_07	3.4
63_44D	5.3	58_09	3.8
63_44A	18.2	45_29	1.1
63_44F	2.3	64_25	2.1
63_45	4.3	58_09-3	2.0
63_46	7.5	58_38	36.9
63_49	4.4	45_30B	0.5
64_12	22.6	58_05	0.1
63_54	2.9	58_09-2	13.7
64_WATER	0.1	58_04A	0.4
63_54A	1.3	45_30	0.8
64_08	5.1	58_37	7.7
63_64	10.8	58_04	2.7
63_54C	2.4	58_09-1	2.6
63_54B	1.3	58_02-1	2.2
64_05	17.4	58_38A	1.5
64_09	5.4	58_38F	1.2
64_13	1.0	58_38B	1.1
64_11A	0.7	58_38D	1.1
63_65	2.6		

Table I.5. Spurwink River Division–Town of Cape Elizabeth

<i>Map Lot</i>	<i>Acres</i>	<i>Map Lot</i>	<i>Acres</i>
U21,12	62	R06,1	122
U54,9	7	R05,45	4
R05,2	32	R05,54	6
U45,4	5	R05,47	3
R05,56	29	R05,11	168
U45,6	4	U20,11	19
R05,31	47	R05,33	8
U21,12	33	U20,3	3
R05,33	21	U20,11	2
U45,4	1	U20,6	1
U45,7	6	U20,6	0
R05,51	3	U19,19	5
R05,36	15	U19,17	1
R05,51	2	U19,16	1
R05,41	3	U19,15	3
R05,41	4	U19,18	2
R05,41	2	U19,14	2
R05,41	2	R05,13	41
R05,38	2	U19,13	1
U45,9	7	U19,12	2
R05,39	2	U19,11	2
R05,41	2	U44,34	2
R05,55	9	U19,9	2
R05,44	2	U44,33	2
U52,1	3	U44,32	2
R05,10	82	R06,45	511
U52,3	6	U44,31	2
U52,2	4	U44,30	2
R05,45	1	U44,29	2

Table I.6. Goose Rocks Division, Little River Division–Town of Kennebunkport

<i>Map Lot</i>	<i>Acres</i>	<i>Map Lot</i>	<i>Acres</i>
22,8,28	2.2	33,3,28	0.6
22,8,34	1.6	33,3,20	9.0
23,6,36B	4.9	33,3,30	6.4
23,6,36A	28.6	33,2,9	5.0
23,6,6	1.5	33,2,1	1.2
23,6,4	0.8	34,2,24	1.4
24,4,2	30.8	34,2,26	0.3
24,3,1	0.5	37,1,3	4.0
24,3,2	0.5	41,6,1	15.7
24,3,3	0.7	41,2,44	7.2
24,4,27	1.6	41,2,38	59.0
24,4,6	9.9	42,2,1A	4.1
24,4,26	1.4	42,2,1B	4.4
24,4,5	1.3	42,2,1D	4.0
30,3,13A	3.5	42,2,1E	3.4
30,3,13C	2.8	42,2,1C	4.4
30,3,13D	1.9	42,2,12	5.1
30,3,38	5.7	42,2,12A	5.0
33,2,4	1.9	42,2,14	3.0
33,2,2	6.4	42,2,13	7.3
33,2,3	1.1	42,2,15	7.0
33,2,27	2.0	42,2,11D	32.5
33,3,27	0.5	42,2,19	5.5

Table I.7. Goosefare Brooks Division–Town of Old Orchard Beach

<i>Map Lot</i>	<i>Acres</i>	<i>Map Lot</i>	<i>Acres</i>
108-1-4	108.1	108-1-3	6.0
108-1-2	103.1	108-1-1	23.4
108-1-7	0.1	108-1-12	7.0
325-4-3	0.8		

Table I.8. Goosefare Brooks Division–Town of Saco

<i>Map Lot</i>	<i>Acres</i>	<i>Map Lot</i>	<i>Acres</i>
024006000000	3.5	011026000000	0.1
016002000000	17.7	011001001000	1.0
016001000000	5.4	011004001000	0.2
011126000000	2.9	011001000000	0.5
011126000000	0.5	009003012000	3.1
011029000000	0.3	010005002000	1.6
011126000000	0.5	010005000000	3.0
011032000000	0.1	009003013000	0.5
011027000000	0.3	009003014000	0.6
011024000000	0.1	009003015000	0.5
011025000000	0.1		

Appendix J



Steve Maslowski/USFWS

Prairie warbler

Breeding Landbird Survey Data

The data in the table below was compiled by reviewing the landbird survey data for Brave Boat Harbor and Upper Wells (1994-1998) and Spurwink River and Goosefare Brook (2000-2002) and grassland bird data (1999-2002) and cross referencing it with the list of priority birds for BCR 30 and BCR 14.

It is important to note that surveys were conducted for landbirds in forests and grasslands, and are biased towards those habitats and species within those habitats. Waterfowl, marsh and wading birds, and salt marsh bird numbers are not included in this analysis. Saltmarsh sharp-tailed sparrows, Nelson's sharp-tailed sparrows, piping plovers, least terns, black ducks, common eider and willets are common occurrences on the Refuge and are some of the birds of highest conservation concern within BCR 30 and/or 14. Separate survey efforts document their usage of Refuge lands.

<i>Species</i>	<i>BCR 30</i>	<i>BCR 14</i>	<i>Habitat</i>	<i>Refuge Relative Abundance</i>	<i>BBH Frequency</i>	<i>U. Wells Frequency</i>	<i>GFB Frequency</i>	<i>Spurwink Frequency</i>
American Redstart		High	MD/MF	0.58%	16.36	4.27	0.00	0.00
Baltimore Oriole	High		MD/MF	0.69%	12.93	0.37	0.00	35.29
Black and White Warbler	High		MD/MF	1.62%	17.69	29.30	41.67	47.06
Black-billed Cuckoo		Moderate	MD/MF	0.03%	1.36	0.00	0.00	2.94
Blackburnian Warbler		Moderate	MD/MF	0.02%	0.00	1.10	0.00	0.00
Black-throated Blue Warbler		High	MD/MF	0.04%	0.00	0.73	2.38	0.00
Black-throated Green Warbler		Moderate	MD/MF	3.68%	34.22	64.1	21.43	3.13
Bank Swallow		Moderate	FW, G/A	0.09%	0.00	4.27	0.00	0.00
Barn Swallow		Moderate	FW, G/A	1.03%	10.95	12.82	0.00	0.00
Bobolink		High	G/A	0.27%	2.38	7.25	0.00	5.88
Brown Creeper		Moderate	MD/MF	0.34%	6.84	7.27	4.76	0.0
Canada Warbler	Moderate	Highest	MD/MF	0.64%	7.48	13.55	7.14	11.76
Chestnut-sided Warbler		High	SPP	0.71%	7.55	14.1	3.57	21.88
Chimney Swift	High	High	U/S	0.07%	4.75	1.83	0.00	2.94
Eastern Towhee	High		SPP	0.09%	21.77	11.36	22.62	47.06
Eastern Wood-pewee		High	MD/MF	0.96%	28.57	13.19	2.38	17.65
Eastern Kingbird	High		SPP	0.7%	8.88	8.12	5.95	28.13
Gray Catbird	Moderate		SPP	0.06%	31.5	18.38	3.57	37.5
Great crested Flycatcher	High		MD/MF	0.07%	23.88	14.1	23.81	12.5
Northern Flicker		Moderate	MD/MF	0.07%	2.72	4.27	11.9	9.38
Ovenbird		Moderate	MD/MF	0.37%	52.75	64.96	89.29	6.25
Pine Warbler	Moderate		MD/MF	0.15%	15.71	38.03	5.95	0.00
Prairie Warbler	Highest		SPP	0.01%	0.00	0.73	0.00	0.00
Purple Finch		High	MD/MF	0.09%	8.84	8.42	4.76	17.65
Scarlet Tanager	High		MD/MF	0.05%	21.09	11.36	21.43	12.50
Veery		High	MD/MF	0.09%	13.68	29.92	30.95	34.38
Willow Flycatcher	High		SPP	0.03%	0.0	3.85	0.0	6.25
Wood Thrush	Highest	Highest	MD/MF	0.10%	2.04	0.73	16.67	5.88

MM=maritime marshes B/D=beach/dune MD/MF=mature deciduous and mixed forest
 SPP=early successional shrub/pitch pine barren G/A=grassland/agricultural U/S=urban/suburban
 FW=freshwater wetland/river and lake

Appendix K



© Jim Fenton

Common tern

Intra-Service Section 7 Biological Evaluation Form

MEFO #07-052
October 20, 2006

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Mark McCollough
Telephone Number: (207) 827-5938 x 12
Date: October 20, 2006

- I. **Region:** R5
- II. **Service Activity (Program):** Ecological Services
- III. **Pertinent Species and Habitat:**

A. Listed species and/or their critical habitat within the action area:

Federally designated endangered or threatened species at the refuge include the bald eagle (threatened), piping plover (threatened), and roseate tern (threatened). State-listed endangered species at the refuge, not included above, include the black tern, least tern, American pipit, peregrine falcon, black racer, Blanding's turtle, and ringed boghaunter, arctic tern, harlequin duck, upland sandpiper, and northern bog lemming. The New England cottontail became a candidate for listing in September, 2006. The federally-listed short-nosed sturgeon are found in large rivers and associated with estuaries, but their presence in refuge waters is unlikely.

The Rachel Carson National Wildlife Refuge is in the process of preparing a Comprehensive Conservation Plan (CCP) that is vital for the management of each refuge unit. The final CCP will provide strategic management direction over the next 15 years by:

- Providing clear statements of desired future conditions for habitat, wildlife, visitor services, and facilities;
- Providing refuge neighbors, visitors, and partners with a clear understanding of the reasons for management actions;
- Ensuring refuge management reflects the policies and goals of the System and legal mandates;
- Ensuring the compatibility of current and future public use;
- Providing long-term continuity and direction for refuge management; and providing direction for staffing, operations, maintenance, and developing budget requests.

The need to develop a CCP for the Complex is two-fold. First the Refuge Improvement Act requires that all national wildlife refuges have a CCP in place by 2012 to help fulfill the mission of the System. Second, the refuge lacks a

master plan to accomplish the actions noted above in an environment that has changed dramatically since the refuge was first established. For example, significant development pressure and population growth in coastal Maine are impacting the integrity of refuge habitats, and staffing and visitation has increased. Third, the refuge has developed strong partnerships, vital to its continued successes, with land trusts, watershed associations, and other conservation groups through the 11-town refuge region. The refuge's responsibility is to clearly develop priorities through this plan. Finally, the refuge needs a CCP to guide us in future habitat management and land protection that promotes the conservation of significant coastal ecosystems and Federal trust species.

- B. Proposed species and/or proposed critical habitat within the action area:**
The Service has been petitioned to list the American eel, which occurs in some of the rivers within the refuge system. A 12-month review for the American eel is currently being undertaken pursuant to the Endangered Species Act. The American eels may be found in a variety of aquatic habitats ranging from coastal to freshwater riverine, bays, and stream estuaries.
- C. Candidate species within the action area:**
The New England cottontail was listed as an official candidate for federal listing in September, 2006. It is found on 5 of 29 sites surveyed on the refuge, including some of the largest habitats for this species in the state. As such, the refuge will be important in recovery of this species.

IV. Geographic area or station name and action:
Rachel Carson NWR stretches along 50 miles of coastline in York and Cumberland Counties in southern Maine. The 5,293-acre refuge has 10 divisions between Kittery and Cape Elizabeth.

V. Location (attach map):
Maps are found in chapters 1 through 3 of the CCP.

- A. Ecoregion Number and Name:**
North Atlantic Coastal Ecoregion
- B. County and State:**
York and Cumberland Counties, Maine
- C. Section, township, and range (or latitude and longitude):** Refer to the CCP/EA Introduction and Chapters 2-4.
- D. Distance (miles) and direction to nearest town:** Varies
- E. Species/habitat occurrence:**

- **Piping plovers** nest at Crescent Surf Beach, Goosefare Brook, and Marshall Point at Goose Rocks. About 50% of the state's piping plover population of 50-70 nesting pairs, nests at sites on or near the refuge. Since 2000, the refuge has assumed responsibility for managing plovers at sites on and near the refuge.
- **Bald eagles** primarily use the refuge while migrating or wintering, and are associated with aquatic or wetland habitats and their adjacent terrestrial borders. No eagle nests are known on or near the refuge.
- **Roseate terns** are associated with intertidal or strand habitats. They nest on two islands adjacent to Rachel Carson NWR.

VI. Description of proposed action (attach additional pages as needed):

The proposed actions and alternative selected by the Service are described in Chapter 2 of the CCP.

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):

Refer to page 4-10, of the draft CCP for more information and details.

The proposed actions selected by the Service provide more potential habitat for fish and wildlife species native to the waters, wetlands, and forest associated with southern Maine. The Rachel Carson NWR plans to preserve, manage, and restore, some of the most important natural areas for wildlife on the coast of southern Maine. The refuge will incorporate methods such as restoration, habitat management, and/or monitoring of important wildlife habitats, ranging from coastal systems to native grasslands to shrublands to mature forests. The proposed management actions will provide support for threatened and endangered species in addition to hundreds of species of migratory birds, rare invertebrates, reptiles, amphibians, plants, and natural communities. Future actions will be coordinated with other federal and state natural resource agencies.

The CCP (p. 2-9, 2-21, 2-74) states we will perpetuate the biological integrity and diversity of coastal habitats to sustain native wildlife and plant communities, including species of special conservation concern. On p.2-10 and 2-38, the CCP provides specific objectives for protecting beach and berm and associated dune edges, washover, and intertidal areas for nesting, staging, and feeding piping plovers and least terns. The strategies also provide for active management of beaches, landowner outreach programs, vegetation management, predator management, and providing enforcement. The strategies outlined in the CCP will have a beneficial effect on the Federally-listed piping plover, roseate tern, and bald eagle.

Similarly, the CCP (p. 2-12, 2-42, 2-51, 2-75) states the Service will perpetuate

the biological integrity and diversity of upland habitats to sustain native wildlife and plant communities, including species of conservation concern. On pages 2-12, 2-51-53 the CCP provides specific objectives for managing shrubland and early successional habitats that will have a beneficial effect on the Federal-candidate New England cottontail.

- B. Explanation of actions to be implemented to reduce adverse effects:**
As explained above, we believe that implementation of the proposed alternatives in the CCP will result in either completely beneficial effects to the listed and candidate species described above; or that any direct, indirect, or cumulative adverse effects that may result will be no more than insignificant or discountable. In order to ensure that habitat restoration activities and other management actions in listed species habitat will have no adverse effects, these actions will be performed outside the listed species breeding seasonal windows.

VIII. Effect determination and response requested: [* optional]

A. Listed species/critical habitat:

Determination

Response requested

Is not likely to adversely affect

Concurrence

Species:

- Piping plover
- Bald eagle
- Roseate tern

B. Proposed species/proposed critical habitat:

Is not likely to adversely affect

Concurrence

Species:

- American eel

C. Candidate species:

No effect

Concurrence

Species:

- New England cottontail



Ward Feury
Refuge Manager
Rachel Carson NWR

11/10/06
Date

IX. Reviewing ESO Evaluation:

- A. Concurrence X Noncurrence _____
- B. Formal consultation required No
- C. Conference required No
- D. Remarks (attach additional pages as needed):



Mark McCollough
Endangered Species Biologist
Maine Field Office

10/20/06
Date

Appendix L



USFWS

Refuge staff installing a temporary scarecrow

Consultation and Coordination with Others

- Public Involvement Summary
- Land Conservation Partners
- Rachel Carson NWR CCP Planning Team

Public Involvement Summary

Effective conservation usually begins with effective community involvement. To ensure that our future management of the refuge considers the issues, concerns, and opportunities expressed by the public, we used a variety of public involvement techniques in our planning process.

- We kept updated mailing lists of refuge neighbors, friends, professional contacts and others to share information and updates about this CCP.
- In May and June 1998, we invited visitors to discuss current refuge operations and the planning process at a series of morning coffees. We sent four press releases about the CCP to 15 newspapers in Maine and New Hampshire, and ran notices on local public access cable stations. The York County Coast Star, southern Maine's primary local newspaper, raised public awareness by publishing a long article about our refuge planning. We designed and distributed leaflets about the morning coffees and our upcoming Issues Workbook.
- In summer 1999, we distributed nearly 500 12-page Issues Workbooks, the backbone of this plan's important public participation component. Those workbooks provided background information about the planning project and a means for the public to share its concerns and thoughts about important refuge issues. A refuge volunteer tallied the responses in the more than 100 workbooks returned. In July 1999, we sent a summary of those responses to our CCP mailing list, and also distributed it from the refuge office.
- Several information-gathering workshops in 1999 included a gathering of the extended planning team in March, a meeting on public use and community goals in June, and a meeting on biological resources, also in June. Our facilitated, all-day Alternatives Workshop gathered 15 stakeholder representatives in August. Refuge staff and 10 observers, including congressional representatives and Service administrators, assisted those participants with setting goals in the topical areas of wildlife, community, public use, and water quality. We mailed a complete summary of the comments and the materials the workshop generated to participants and observers soon after.
- Refuge planning team members met several times each month to synthesize information and prepare the CCP, and briefed our Regional Office in September 1999.
- As part of the CCP process we have been working with our Maine Field Office to evaluate potential impacts of our proposed management to threatened or endangered species. An intra-service Section 7 biological evaluation form was completed in October 2006 and is included as appendix K of this final CCP.
- On August 17, 2006 we released the draft CCP/EA for 30 days of public review and comment. This provided another opportunity for our stakeholders to discuss issues and offer solutions. The comment period ended September 18, 2006. A summary of the public comments we received can be found in appendix M of this final CCP. We notified the public of the availability of the draft CCP/EA via a newsletter, our website, and several press releases. We also advertised for and held two public meetings: on August 29, 2006, from 5-8pm at the University of New England in Biddeford, ME and on September 7, 2006, from 5-8pm, at the Wells National Estuarine Research Reserve in Wells, ME.

- We analyzed all of the comments on the draft CCP/EA we received during its 30 day public review and applied them when we revised it into this final CCP. Appendix M summarizes those public comments and our responses to them.

The refuge manager and staff will use this plan to guide their decisions on managing the refuge during the next 15 years. Each year, we will evaluate our accomplishments on the refuge in accordance with the preferred action described in this final CCP. We may intensify refuge monitoring without additional NEPA compliance. However, any results of our future monitoring that predict a new, significant impact would require our analysis and public involvement in an additional environmental assessment.

This plan also conveys our refuge management direction to other agencies, groups, and individuals. We must formally revise it every 15 years, or sooner, if the Secretary of the Interior determines that conditions affecting the refuge have changed significantly. We will monitor the results of our actions under this plan to ensure that our decisions accomplish the strategies and directions it conveys, and will use the data we collect in routine inspections or program evaluations to continually update and adjust our management activities.

Land Conservation Partners

Conserving wildlife habitat in southern coastal Maine requires partnerships. Some of our land conservation partners and refuge conservation stakeholders appear below.

■ Biddeford Pool Improvement Association

Mission.—Hold property and easements for conservation and preservation for the benefit of the general public.

■ Cape Elizabeth Land Trust (CELT)

CELT is a nonprofit organization dedicated to the preservation of open spaces for the benefit of its citizens.

■ The Conservation Fund

The fund forges partnerships to preserve our nation's outdoor heritage: America's legacy of wildlife habitat, working landscapes and community open space. It pioneers a unique brand of conservation driven by effectiveness, efficiency, and environmental and economic balance.

■ Friends of Rachel Carson NWR

Mission.—Support refuge acquisition funding; assist in the pursuit of acquisitions; increase public awareness of the needs and benefits of the refuge; provide monitoring of refuge divisions; comment on refuge activities; identify other, similar areas that warrant the same type of protection; assist in refuge projects as they arise; identify means and locations for education and the visitor center.

■ Great Works Regional Land Trust

Mission.—Protect wildlife habitat, open space, and agricultural, forestry, recreational, and historic properties.

■ Kennebunk Land Trust

Mission.—Acquire, receive, and administer property, easements, and funds to establish protected or unmanaged natural preserves and other appropriate areas for the promotion and advancement of conservation and education.

■ Kennebunkport Conservation Trust

Mission.—Acquire undeveloped lands in our community so they might remain in their natural state forever and provide retreats in an increasingly urbanized society.

■ Kittery Land Trust

Mission.—Preserve land through voluntary cooperation with landowners, educate the public on land preservation and conservation, and facilitate family estate planning through the use of land trust practices and options.

■ Laudholm Trust

Mission.—Provide resources and enable the Wells National Estuarine Research Reserve to serve as a research and education site and a passive recreational preserve by raising and allocating funds; aid in protecting the preserve's estuaries and other estuarine areas to the extent resources permit.

■ Maine Audubon Society

Mission.—Dedicated to the protection, conservation, and enhancement of Maine's ecosystems through the promotion of individual understanding and actions.

■ Maine Coast Heritage Trust

Mission.—Protect the shoreline and islands that define the character of Maine and enhance the well-being of its communities.

■ Mt. Agamenticus to the Sea Conservation Initiative (MtA2C)

MtA2C brings together 10 national, regional and local conservation partners to conserve a mosaic of critical, threatened lands, waterways and working landscapes encompassing a six-town area stretching from the Tattic Hills in Wells to Gerrish Island in Kittery Point.

■ National Park Service Rivers and Trails

The Rivers, Trails, and Conservation Assistance Program, also known as the Rivers & Trails Program or RTCA, is a community resource of the National Park Service. Rivers & Trails staff work with community groups and local and state governments to conserve rivers, preserve open space, and develop trails and greenways.

■ The Nature Conservancy

Mission.—Preserve plants, animals, and natural communities that represent the diversity of life in Maine and on Earth by protecting the lands and water they need to survive.

■ Saco Bay Partners

A regional coalition of organizations dedicated to the conservation of land, water and other natural resources in the Saco Bay watershed.

■ Saco Land Trust

Mission.—Preserve scenic, historic, recreational and environmental resources in the Upper Sandy River watershed by acquiring interests in land; protect open space, scenic area water quality, wildlife, and plant habitat for the public good.

■ Saco Valley Land Trust

Preserve scenic, historic, recreational and environmental resources in the Biddeford, Saco, and Old Orchard Beach area by acquiring interests in land; protecting open space, scenic areas and water quality, wildlife, and plant habitat for the public good.

■ Scarborough Land Conservation Trust

Its mission continues to be the acquisition, preservation, and management of unique land in Scarborough for the benefit and enjoyment of the public.

■ State of Maine Department of Inland Fisheries and Wildlife

Mission.—Protect and enhance the state’s inland fisheries and wildlife; provide for the wise use of those resources.

■ The Trust for Public Land

Mission.—Conserve land for people to improve the quality of life in our communities and protect our natural and historic resources for future generations.

■ Wells National Estuarine Research Reserve

Mission.—Improve the ecological health of coastal habitats and resources through a unique, integrated program of research, education, and resource management.

■ York Land Trust, Inc.

Mission.—Promote the protection of natural resources for the benefit of the general public—and for future generations.

■ York Rivers Association

The York Rivers Association is a group of local citizens committed to raising awareness of the character of the York River region among area residents and landowners. Their mission is to protect and enhance the natural, scenic, and historic qualities of the York River; and instill a sense of stewardship and ownership among all.

Rachel Carson NWR CCP Planning Team

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Appendix M



Lelaina Marin/USFWS

Public meeting for the draft Comprehensive Conservation Plan/Environmental Assessment release held at the University of New England, Biddeford, ME

Summary and Response to Public Comments

- Introduction
- Land Protection
- Management of Refuge Lands
- Public Use
- Support For a Specific Alternative

Introduction

We reviewed and considered all letters received during the public comment period for the Rachel Carson National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment (CCP/EA). We originally released the draft CCP/EA for 30 days of public review from August 17 to September 18, 2006. Based on the analysis in the draft CCP/EA and our review of public comments, the Service has selected a preferred alternative. It basically includes all of alternative B, the Service-Proposed action in the draft CCP/EA, with a few modifications described in the discussion below. We will also issue a Finding of No Significant Impact (FONSI). The FONSI establishes that our decision will not significantly affect the quality of the human environment and does not require preparation of an environmental impact statement.

We received numerous responses as oral testimony at public hearings or in written or electronic documents from local towns, conservation and recreational organizations, and local residents.

Seventeen people attended our public meeting on August 29, 2006 at the University of New England, Biddeford, Maine. Seventeen people attended the public meeting on September 7, 2006 at the Wells National Estuarine Research Reserve in Wells, Maine.

The following discussion summarizes the substantive issues raised and our responses to them. Many of our responses refer to the full text copy of our draft CCP/EA, and indicate how the final CCP reflects our proposed changes. If you would like to view or download copies of the draft CCP/EA or final CCP, they are available online at <http://library.fws.gov/ccps.htm> or <http://rachelcarsonrefuge.fws.gov>. You may also request them on CD-ROM or in print by contacting the refuge headquarters.

Rachel Carson National Wildlife Refuge
321 Port Road
Wells, Maine 04090
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Refuge Email: rachelcarsonrefuge@fws.gov

Land Protection

Comment: Several people wanted to know more about conservation easements: how they are structured, how they work, and what the Service buys.

Response: Conservation easements are among several essential tools for protecting the integrity of natural resources. Easements by nature must be flexible, and must be designed to fit the needs of both the landowner and the Service. We purchase conservation easements when that limited interest in the land will accomplish our management goals. Because our interest is the protection of wildlife habitat, the Service always purchases development rights as part of any conservation easement. There are no set ‘rules’ to conservation easements. Other rights are subject to landowner needs, and are usually negotiated.

Comment: If a landowner does not want trapping to occur, would that be a deal-breaker?

Response: No. We do plan to implement a furbearer management program to continue that use where it traditionally has been occurring. Although the proposed action is to continue furbearer trapping as we acquire lands in the expansion area, if the landowner was not allowing trapping before the sale, it would not be a traditional use, and the land would not be open to trapping when the Service acquired it, although we may permit fur management on those areas later, if we found it a compatible use.

Comment: Why grant a conservation easement to the Service versus a local land trust?

Response: That decision by landowners is personal, and is subject to their needs and desires. Conservation easements differ because of the circumstances of the landowners, e.g. their tax status. Our overarching interest in conservation easements is wildlife habitat protection. We will also have some land management requirements: the most common one is when fields are mowed. Because of our responsibilities for grassland nesting birds, we do not mow fields until about August 1. A land trust may have the same or different priorities on which they focus. The Service would not enter into a conservation easement without acquiring the development rights on that property.

Comment: Describe the research you have done to identify certain parcels for acquisition.

Response: Appendix B describes the process that we used in identifying priority resources of concern and developing habitat goals, objectives, and strategies to benefit those resources. We consider the 5,558 acres in our proposed land acquisition boundary nationally significant, under a set of biologically based criteria for identifying and mapping habitat for Service trust resources. Those biologically based criteria were developed by using the Gulf of Maine Habitat Suitability Model described on page A-6 of the draft CCP/EA.

Comment: What if a portion of my land is in the acquisition boundary?

Response: The Service listens to landowners. Let us say that a landowner has 75 percent of his land within the acquisition boundary and 25 percent outside, and wishes to sell all or nothing; the Service has the flexibility to purchase all the land even though some of it is outside the acquisition boundary. By regulation, the Service can add 10 percent of the approved acquisition boundary to the refuge, so this 5,558 acre expansion allows the flexibility of adding up to 556 acres.

Generally speaking, larger tracts are better for wildlife than smaller ones, just as intact systems are more beneficial than fragmented ones. Connectivity to conserved land and our partners' conservation efforts are strong motivating factors in our habitat protection plans.

Comment: How do you engage the local communities in the land acquisition process?

Response: The Service is developing its land acquisition plans in open view of the public and refuge neighbors. We sent copies of the proposed land protection plan to every landowner in the proposed expansion area, and sent copies of our comprehensive conservation plan to each of the eleven municipalities in the approved refuge boundary. We sent out hundreds of fact sheets and summaries of the plan, and sent notices to all the local media outlets. We met with the municipalities and discussed our proposed acquisitions. Our partners have been continuously involved in our habitat protection efforts for years. In the draft CCP/EA, chapter 3, goal 6, objective 6.1 commits the Service to working with landscape- or watershed-scale projects to benefit this area.

Comment: Are the areas of the new boundary expansion more populated than the areas you now take care of?

Response: No. The populations are the same, because the proposed boundary expansion area and our current existing refuge lands are all within the same towns. The only exception to that is the new proposed York Division, which is in the towns of York and Eliot, and those two towns have populations similar to the other towns in the refuge. This proposal will expand the number of municipalities with refuge ownership to 12.

Comment: On page 2–29 (Mousam River Division Map), is the proposed expansion (red highlighted area) a higher priority than the approved acquisition (larger black boundary)?

Response: No, they are both high priority. In fact, when the proposed expansion areas are approved, they will be part of the black areas.

Comment: Is the refuge also expanding its land acquisition priorities into the vernal pool area in Biddeford?

Response: Yes. That area is included in the proposed expansion areas in the Biddeford Pool Division.

Comment: I commend the refuge and Service staff who have created this comprehensive detailed management document and strongly urge wholehearted support of alternatives B and C. Among the most important is objective 6.1, "Landscape-Scale Conservation."

Response: Because natural resources do not organize themselves according to political boundaries, we agree that a larger landscape perspective is important. Therefore, the Service will continue to participate with conservation organizations such as the Mount A to the Sea Initiative, Saco Bay Partners, and the Wells National Estuarine Research Reserve to achieve conservation goals. In addition, we will partner with other conservation organizations, such as land trusts and NGOs, in conserving land.

■ Management of Refuge Lands

Comment: Downsizing – how will this effect the land acquisition and management of the refuge?

Response: First, the land acquisition program is funded separately. We secure Migratory Bird Conservation Fund, Land and Water Conservation Fund and North American Wetland Conservation Act funds for purchasing land and conservation easements.

Currently, the budget is flat, and there is a great deal of competition for operational budgets in the federal government. Although we have planned for that, we will not accomplish the same things with fewer people. We have a work planning process that highlights specific priorities that the refuge will accomplish. This is a 15-year plan; just as conditions have changed during the 10 years we have been developing this plan, they will also change again before the year 2021. This plan represents the way we think the wildlife resources and public opportunities on the Rachel Carson refuge should be managed.

Comment: Do you have a volunteer program?

Response: Yes. Volunteers help with monitoring, surveys, and managing invasive species, and will help out again this year in planting cover for the New England cottontail.

Comment: What is the refuge doing about erosion on the Mousam River? The paths that fishermen use have tripled within this last year, and jet skis are running up and down the river. How is the refuge planning to study wetland dieback?

Response: Those are separate issues. The refuge is concerned about the condition of the marsh. The proposed alternative states the refuge will restore all refuge saltmarsh. The Mousam River is a state waterway. The regulations of the Maine Department of Conservation state that boaters (watercraft) are responsible for their wake. If a boater's wake is causing erosion along the river banks, he is in violation. The refuge works with the Maine Marine Patrol, and we will pass along your observations to the Marine Patrol.

Wetland dieback is a new phenomenon, and a mystery. The refuge salt marsh ecologist, Dr. Susan Adamowicz, has convened two workshops for salt marsh experts and the public to investigate that phenomenon. The fact is that no one knows what causes areas of salt marsh plants to die quickly—within one or two growing seasons. Currently, the refuge is surveying marshes between Newburyport, Massachusetts, and the Canadian border to determine the extent of the dieback, and will continue to participate in research to better understand its nature.

Comment: We do not feel that the Rachel Carson refuge should take on the responsibility of more property, as it is already unable to maintain its existing properties. The refuge owns Starbird Road in Scarborough, and it is in appalling condition.

Response: We do not own Starbird Road; it is a private road. We have a right-of-way on Starbird Road to access refuge lands. In addition to the refuge lands, there are many private homes on Starbird Road. Along with the other neighbors on the road, we will assist in its maintenance; however, we are under no obligation to maintain it by ourselves.

Comment: Is the decline of the New England Cottontail being caused by habitat loss or predation?

Response: The biggest problem is a decline in their preferred early successional habitat, including thickets, brush, and brambles. Those habitats have been fragmented by development in York and Cumberland counties. Another problem is predators that include fox, coyotes, fishers and raptors. To overcome those problems on the refuge, the CCP will facilitate the management of 1,715 acres of early successional habitat to help sustain Maine's population of New England cottontails.

Public Use

Comment: What is the cost to maintain trails?

Response: Volunteers and the Youth Conservation Corps built the 1-mile Carson Trail in 1989. It is a universally accessible, 4-foot-wide, compacted stone dust trail, resurfaced by the Maine Conservation Corps about 5 years ago at a cost of about \$12,000, with an additional cost of \$4,000 for re-landscaping and additional plantings. By agreement, the Saco Bay Trails association maintains the Ted Wells trail on the refuge in Old Orchard Beach. We work with the Town of Kennebunk on the Bridle Path. Other refuge trails are maintained by staff or the Youth Conservation Corps.

Comment: What plans do you have for ATVs?

Response: ATVs are not allowed on the Rachel Carson National Wildlife Refuge.

Comment: Why are you starting a fee program?

Response: Recreational uses also require the maintenance, replacement, or repair of trails, observation platforms, parking areas, directional and interpretive or other signs, and the printing of brochures, trail guides, and maps. Visitation is expected to grow beyond its present level of 300,000 and, concurrently, the requests it brings for recreational services. Fee revenue supports public use activities. The specifics of the fee program are discussed in the draft CCP/EA, chapter 2, goal 5, page 2–61.

Comment: I do not like the fee plan. The Rachel Carson refuge depends heavily on community partnerships. It is vitally important to continue to develop the refuge as a place that belongs to the people.

Response: We are proposing to institute a pilot program to charge a user fee for refuge trails. At least 80 percent of the funds raised from user fees on a particular refuge in this region stay on that refuge. That money is reinvested back into the refuge to enhance visitor services and reduce the backlog of maintenance needs for recreation facilities such as trail maintenance, toilet facilities, boat ramps, hunting blinds, and interpretive signs and programs. The other 20 percent is sent to the region to be distributed to other refuges. In previous years, the refuge has received money from those regional funds for public use facilities.

We realize that the new fee program will require an adjustment period. Our plan for instituting the fee includes an educational period, a warning period and, finally, a transition to full enforcement. We will post a notice at the collection site informing the public of the use or anticipated use of recreation fees collected during the previous year. We may adjust fees periodically to reflect changes in administrative costs or management goals.

Comment: I am wondering if the Rachel Carson refuge would consider having as a goal the establishment of one interpretative trail in each of the towns in which it has lands.

Response: The refuge now has some form of access on almost every division/town: for example, Kittery—trail; Ogunquit—interpretive sign; Wells—trail; Kennebunk—overlook off town trail; Biddeford—interpretive sign; Saco—trails and overlook; Old Orchard Beach—trail and overlook; Scarborough—observation platform. Our comprehensive conservation plan proposes additional public uses as well: Kittery—trail; York—trail; Kennebunkport—overlook; Biddeford—trail; Scarborough—trail and observation platform. That will provide the public an opportunity to get out onto every unit in almost every town within the refuge for wildlife observation or photography. Additional public uses are also provided on many other units for hunting and fishing.

Comment: In appendix D, (e) “Availability of Resources,” why do you list “preparation of hunting maps/info for cost of \$630,” two times in the same cost analysis?

Response: That was a typo, the change has been made.

Support For a Specific Alternative

Most people who commented indicated their support for or concern about a particular activity or specific aspects of our preferred alternative B. However, we found it noteworthy that some people either prefaced their comments or summarized them by stating their preference for a particular alternative. Their totals follow.

- Support Alternative A: 0
- Support Alternative B: 18
- Support Alternative C: 5

Appendix N

John & Karen Hollingsworth/USFWS



Refuge landscape

Finding of No Significant Impact (FONSI)

Finding of No Significant Impact Rachel Carson National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment

In August 2006, we published the draft Comprehensive Conservation Plan and Environmental Assessment (CCP/EA) for the Rachel Carson National Wildlife Refuge (NWR). The refuge spans over 5,293 acres and comprises ten divisions between the towns of Kittery and Cape Elizabeth in York and Cumberland Counties, Maine. That draft evaluates three alternatives for managing the refuge over the next 15 years, and carefully considers their impacts on the environment and their potential contribution to the mission of the National Wildlife Refuge System (NWRS) and refuge purposes and goals. Its appendixes provide additional information supporting the assessment. A brief overview of each alternative follows.

Alternative A: The Council of Environmental Quality regulations on implementing the National Environmental Policy Act (NEPA) require this “No Action” alternative. It would not change our resource management programs on refuge lands. Partnerships with federal, state, county, town, and non-governmental organizations and volunteers will continue to form the core of management activities. The priorities of the biological program will continue focusing on piping plover and least tern management, salt marsh monitoring and restoration, waterfowl management, limited fall shorebird surveys, sharp-tailed sparrow ecology, invasive plant evaluation and eradication, shrubland, thicket, and grassland management for migratory birds and New England Cottontail, and rare plant and animal conservation. Hunting and fishing opportunities will remain as they are. Other priority public use programs will continue – primarily wildlife observation, nature photography, and interpretation. Those will focus on the divisions in the refuge that offer such visitor facilities as parking, nature trails, and information kiosks. Continue to pursue acquisition from willing sellers of the 3,833 acres of land that remains privately owned in the approved acquisition boundary. Selecting this alternative would maintain the status quo in refuge management over the next 15 years. Thus, it provides a baseline for comparing or contrasting the two “action” alternatives.

Alternative B: The draft CCP/EA identifies this alternative as the U.S. Fish and Wildlife Service (Service)-proposed action. Selecting this alternative will protect the remaining 3,833 acres within the approved acquisition boundary and expand the refuge by 5,558 acres beyond its current approved boundary, help increase our protection and management of endangered, threatened or other species of concern, including migratory wildlife, build a new administrative complex including office space, maintenance facilities, and visitor contact station, combine the Moody, Lower Wells, Upper Wells, and Mousam River divisions into one Wells Bay Division, incorporate a pilot recreation fee program to support public use activities, enhance outreach and partnerships with local communities, expand the role and numbers of our Friends Group, and strengthen our relationships with neighbors and elected officials, and develop the Rachel Carson NWR as an outstanding center for research and demonstration emphasizing land management techniques for restoring and sustaining healthy estuarine ecosystems in concert with the National Land Management Research and Demonstration program. It is designed to expand and improve opportunities for wildlife-dependent recreation, including additional hunting and fishing, improve the availability and quality of interpretive signs and kiosks, nature trails, and parking areas, and to allow the refuge to benefit from its proximity to Portland and urban communities.

Alternative C: This alternative expands on alternative B, under the premise that more funding and staffing would allow us to implement more extensive biological programs, more than double the land in the approved acquisition boundary, and appreciably increase the number and quality of our priority public use programs. This alternative protects and manages more acres of most habitat types, and the strategies involve a greater commitment of resources. The protection of coastal habitats will remain a top priority. This alternative greatly expands the protection of contiguous upland habitat. Finally, our biological inventory and monitoring program would expand even beyond what is proposed in alternative B.

Finding of No Significant Impact (FONSI)

We distributed the draft CCP/EA for a 31-day period of public review and comment from August 17 through September 18, 2006. We received 23 written responses, plus 18 additional oral comments at public meetings. Appendix J in the final CCP includes a summary of those comments and our responses to them.

After reviewing the proposed management actions, considering all public comments and our responses to them, I have determined that the analysis in the EA is sufficient to support my findings, described below.

I am selecting draft CCP/EA Alternative B (the Service-proposed action) as the final CCP for implementation, with these clarifications.

(1) The majority of the comments were enthusiastically supportive of the land expansion proposal. Several reviewers suggested that we consider the land expansion proposal in alternative C, which identifies 5,839 additional acres for a total of 11,397 acres. The land expansion proposal in the Service's preferred alternative represents what the Service can realistically accomplish in 15 years. We will work with our conservation partners to protect these additional lands.

(2) Several comments suggested that the refuge should not charge fees to access the refuge. The refuge will institute a pilot recreation fee program to charge and collect an entrance fee for the refuge. Our trial recreation fee program will help generate important revenue needed to support public use activities established under the Federal Lands Recreation Enhancement Act (REA). We realize that the new recreation fee program will require an adjustment period. The REA directs the Secretary of the Interior to publish advance notice in the Federal Register six months before new recreation fee areas are established. We will post a notice at the collections sites informing the public of the anticipated entrance fees. We may adjust fees periodically to reflect changes in administrative costs, management goals, or public comment, and will notify the public at least six months before any such adjustment.

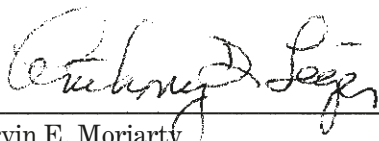
(3) One reviewer would like us to consider having as a goal the establishment of one interpretive trail in each of the towns that the refuge has lands within. This alternative will provide the public an opportunity to get out onto every unit in almost of every town within the refuge for wildlife observation/photography. Additional public uses are also provided on many other units for hunting and fishing. Extending and adding trails at Rachel Carson NWR will be carefully considered. We must first detail, inventory and map the archaeological and cultural features, sensitive habitats and species currently present before we can determine the appropriateness and compatibility of new trails on the refuges. Safety will be another important consideration. The Service understands the public's desire to be able to view plants and wildlife in representative natural landscapes, and we will explore ways to be able to facilitate future compatible access.

(4) The Service will strive to increase public awareness of the refuge. We will work with our partners to explore ideas to enhance the refuge's presence and visibility, and promote a positive effect on protecting the resources.

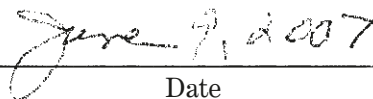
(5) Region 5 has recently identified "areas of emphasis" with regards to the six priority wildlife-dependent recreational uses for every refuge. The Rachel Carson NWR has been identified for environmental education and interpretation. Thus, we will further consider this recognition as we implement the strategies of the CCP over the next 15 years.

I have selected Alternative B as modified for several reasons. It helps fulfill the mission of the NWRs; best achieves the refuge purpose, vision, and goals; maintains and, where appropriate, restores the ecological integrity of the refuge; addresses the major issues identified during the planning process; and is consistent with the principles of sound fish and wildlife management.

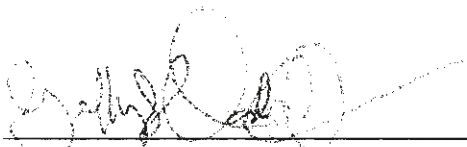
I find that implementing Alternative B adheres to all legal mandates and Service policies, and will not have a significant impact on the quality of the human environment, in accordance with Section 102(2)(c) of the NEPA. Therefore, I have concluded that an Environmental Impact Statement is not required, and this Finding of No Significant Impact is appropriate and warranted.



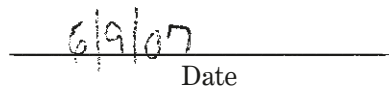
Marvin E. Moriarty
Regional Director
U.S. Fish and Wildlife Service
Hadley, Massachusetts



Date



Geoff Haskett
Assistant Director
National Wildlife Refuge System
U.S. Fish and Wildlife Service



Date

Acronyms

ACOE	Army Corps of Engineers	NAP	Natural Areas Program
ADA	Americans with Disabilities Act	NAS	National Audubon Society
ANP	Acadia National Park	NAWCP	North American Waterbird Conservation Plan
ARPA	Archaeological Resources Protection Act	NAWMP	North American Waterfowl Management Plan
ATV	all-terrain vehicle	NEPA	National Environmental Policy Act
BBS	Breeding Bird Survey	NHPA	National Historic Preservation Act
BCR	bird conservation region	NMFS	National Marine Fisheries Service
BMP	best management practices	NPS	National Park Service
CCP	Comprehensive Conservation Plan	NRCS	Natural Resources Conservation Service
CIREG	Coastal Island Registry number	NRPA	Natural Resource Protection Act
CWS	Canadian Wildlife Service	NWPS	National Wilderness Preservation System
DMR	Department of Marine Resources	NWR	National Wildlife Refuge
DEP	Department of Environmental Protection	NWRS	National Wildlife Refuge System
EA	Environmental Assessment	PID	Project Information Document
EIS	Environmental Impact Statement	PIF	Partners in Flight
EPA	Environmental Protection Agency	PRISM	Program for Regional and International Shorebird Monitoring
FAA	Federal Aeronautics Administration	RRONS	Refuge Operations Needs System
FONSI	Finding of No Significant Impact	RRP	Refuge Roads Program
FY	Fiscal Year	RRS	Refuge Revenue Sharing
GIS	Geographic Information System	SMART	(Objectives) Specific, Measurable, Achievable, Results-oriented, Time-fixed
GOMP	Gulf of Maine Program	TNC	The Nature Conservancy
GOMSWG	Gulf of Maine Seabird Working Group	UNB	University of New Brunswick
GPS	Geographic Positioning System	USCG	U.S. Coast Guard
HIOBS	Hurricane Island Outward Bound School	USDI	U.S. Department of the Interior
HMP	Habitat Management Plan	USFWS	U.S. Fish and Wildlife Service
IMP	Inventory and Monitoring Plan	USGS	U.S. Geological Survey
ISS	International Shorebird Survey	WNERR	Wells National Estuarine Research Reserve
LE	Law Enforcement	WSA	wilderness study area
LPP	Land Protection Plan	WUI	Wildland Urban Interface
LWCF	Land and Water Conservation Fund		
MAPS	Monitoring Avian Productivity and Survivorship		
MCHT	Maine Coast Heritage Trust		
MDIFW	Maine Department of Inland Fisheries & Wildlife		
MDOT	Maine Department of Transportation		
MITA	Maine Island Trail Association		
MMS	Management Maintenance System		
MNAP	Maine Natural Areas Program		
MOA	Memorandum of Agreement		
MOU	Memorandum of Understanding		

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June 2007

