Chapter 2. Alternatives, Goals, Objectives, and Strategies

Photos: White-tailed deer fawn, children planting native plants, and refuge habitat / USFWS

Chapter 2. Alternatives, Goals, Objectives, and Strategies

2.1 Considerations in Alternative Design

During development of the Draft CCP/EIS alternatives presented in this chapter, the Service reviewed and considered a variety of resource, social, economic, and organizational aspects important for managing the refuges. As is appropriate for a national wildlife refuge, resource considerations were fundamental in designing alternatives. House Report 105-106 accompanying the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57) states "…the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first."

The Service planning team reviewed and utilized available scientific information (reports and studies) to better understand ecosystem trends and the latest scientific recommendations for species and habitats. The team also met with staff from local, state, and Federal agencies, and elected officials to ascertain priorities and problems as perceived by others. Refuge staff also met with refuge users, nonprofit groups, and community organizations to ensure their comments and ideas were considered during Draft CCP/EIS development.

The details of public participation can be found in Appendix I. Scoping Report. During development of the alternatives, the planning team considered the actions detailed below. All of these actions were ultimately eliminated for the reasons provided.

2.2 Actions Considered but Not Developed for the Draft CCP/EIS

2.2.1 Commercial Waterfowl Guiding

The planning team considered commercial waterfowl guiding activities occurring within the refuges' boundaries. Guided waterfowl hunting is not an activity that is permitted on the refuges although it does occur off of refuge lands elsewhere in the lower Columbia River. There has been one request in the past 10 years by a waterfowl guide to conduct business on Lewis and Clark Refuge. No other communication has been received expressing interest in a waterfowl guide service. During the scoping process, the issue of commercially guided waterfowl hunting was identified as an issue to be discussed; however, no interest was expressed by commercial waterfowl guides and comments from the general public indicated that not opening the refuge to commercially guided waterfowl hunting is preferred.

Commercial waterfowl hunts differ from other forms of commercial guiding activities (e.g., fishing, kayaking) that occur within a refuge boundary. Generally, these guided activities travel through and around the refuge islands on State-owned navigable waters and do not use the refuges' land base as a destination. In addition, unlike commercially guided fishing or kayaking tours, commercially guided waterfowl hunts occupy a wide area for a period of time, at the exclusion of all others. By contrast, fishing and kayaking generally do not exclude others from being in the vicinity, nor does a commercially guided fishing or kayaking trip preclude the general public from being present in the area that kayaking and fishing are taking place. If

commercially guided waterfowl hunting were to occur on either refuge, competition for island shoreline hunting sites would likely occur between the waterfowl hunters with guide services and those without guide services.

Commercially guided waterfowl hunting was considered and dismissed from further consideration in this Draft CCP/EIS because minimal demand exists for the service and it would likely conflict with refuge visitors participating in compatible, noncommercial waterfowl hunting.

2.2.2 Camping

The planning team considered providing camping opportunities as some interest was expressed by a few members of the public during the scoping process. Refuge policy states that "camping on refuge lands is allowed only when required to implement or sustain an approved wildlife/wildlands oriented recreational activity or when no other alternative is practical" which means that if hunting, fishing, wildlife observation, interpretation, environmental education, and wildlife photography could not occur on Lewis and Clark or Julia Butler Hansen Refuges without camping, then we would need to consider allowing camping. While camping could make it easier to engage in wildlife-dependent recreation, or add to the refuge recreational experience, camping is not required for the public to partake in the refuges' approved public use opportunities. Therefore, establishing camping on refuge lands is not included in the Draft CCP/EIS alternatives.

Camping does occur within the overall refuge acquisition boundary on State-owned dredge-spoil islands and outside refuge boundaries on the Oregon and Washington mainland. Instead of providing camping on a refuge, a refuge goal for all alternatives considered is to identify existing and additional camping areas with State and local landowners that could be developed and would eliminate potential wildlife impacts. By helping to identify existing camp sites and working with partners to establish additional off-refuge camp sites, the demand by the camping public can be met without conflicting with refuge policy.

2.3 Alternative Descriptions

A summary table for each refuge is presented in Table 2.1 which summarizes the key differences between the alternatives.

2.4 Features Common to all Alternatives

All the alternatives contain some common features. To reduce the length and redundancy of the individual alternative descriptions, common features are presented below. Refuge names have been listed within the text as appropriate when the highlighted item is applicable only to that specific refuge.

2.4.1 Implementation Subject to Funding Availability

Under each alternative actions will be implemented over a period of 15 years as funding becomes available. It is the intent of the planning team that annual priorities will follow the final CCP guidelines; however, funding initiatives, unforeseeable management issues, and budgets, may vary from year to year. The CCP will be reviewed every five years and updated as necessary throughout its life.

2.4.2 Columbian White-tailed Deer Recovery Plan

The Columbian White-tailed Deer Recovery Plan (USFWS 1983) and the Additions to the Julia Butler Hansen Refuge for the Columbian White-tailed Deer (Oregon and Washington) Environmental Assessment (USFWS 1993) are the driving forces behind refuge purposes, management activities, land acquisition, and partnerships for the recovery of the CWT deer. These documents identify CWT deer life history needs, secure habitat requirements, population size, and distribution, necessary to meet the recovery goals for removing the CWT deer from the endangered species list. The minimum population goals and secure habitat objectives outlined in these documents were directly incorporated into the Draft CCP/EIS without changes.

2.4.3 Elk Hunt Plan

The Julia Butler Hansen Refuge for the Columbian White-tailed Deer Hunt Plan and associated Environmental Assessment for the Control of Elk on the Julia Butler Hansen Refuge for the Columbian White-tailed Deer (2004) are incorporated in all alternatives and are an important part of managing and maintaining a healthy CWT deer population. The elk hunt plan outlines population objectives for elk on the refuge's Mainland Unit, and describes how an elk hunting program is administered. The management of elk on the Mainland Unit will remain consistent with these documents and no changes are proposed in the Draft CCP/EIS.

2.4.4 Fire Management Plan

The 2004 Wildland Fire Management Plan for the Julia Butler Hansen Refuge for the Columbian White-tailed Deer and the Lewis and Clark National Wildlife Refuge details how the refuges respond to the threat of wildfire, and under what circumstances the refuges are to use fire as a tool on refuge lands. This plan will remain as is and no changes to fire management capabilities or opportunities are proposed in the Draft CCP/EIS.

2.4.5 Wallace Island Hunt Plan

The 2007 Wallace Island Waterfowl Hunt Plan and associated Environmental Assessment were completed to open the Wallace Island shoreline for waterfowl hunting. This hunting management plan was initiated due to a lawsuit from the Humane Society of the United States. No changes to this plan are proposed in the Draft CCP/EIS.

2.4.6 Wilderness Review

The Service's CCP policy requires that a wilderness review be completed for all CCPs. If it is determined that the potential for wilderness designation is found, the process moves on to the wilderness study phase. As part of the process for this Draft CCP/EIS the planning team completed preliminary wilderness inventories which can be found in Appendices E and F. These appendices describe potential wilderness qualities of the islands on both refuges.

After the public review and comment period on the Draft CCP/EIS is completed, the Service will identify in the final CCP which refuge islands, if any, will be the subject of a subsequent wilderness study. The wilderness study, which will be available for public review, will then identify, if warranted, wilderness study areas, and if warranted, make suitable wilderness recommendations to the Secretary of the Interior, the President, and Congress.

2.4.7 Integrated Pest Management (IPM)

In accordance with 517 DM 1 and 7 RM 14, an integrated pest management (IPM) approach would be utilized, where practicable, to eradicate, control, or contain pest and invasive species (herein collectively referred to as pests) on refuge lands. The IPM approach would involve using methods based upon effectiveness, cost, and minimal ecological disruption, which considers minimum potential effects to nontarget species and the refuge environment. Pesticides may be used where physical, cultural, and biological methods or combinations thereof, are impractical or incapable of providing adequate control, eradication, or containment. If a pesticide would be needed on refuge lands, the most specific (selective) chemical available for the target species would be used unless considerations of persistence or other environmental and/or biotic hazards would preclude it. In accordance with 517 DM 1, pesticide usage would be further restricted because only pesticides registered with the U.S. Environmental Protection Agency (EPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and as provided in regulations, orders, or permits issued by EPA may be applied on lands and waters under refuge jurisdiction.

Environmental harm by pest species causes a biologically substantial decrease in environmental quality as indicated by a variety of potential factors, including declines in native species populations or communities, degraded habitat quality or long-term habitat loss, and/or altered ecological processes. Environmental harm may be the result of direct effects of pests interacting with native species, including preying and feeding on them; causing or vectoring diseases; preventing reproduction or killing their young; out-competing them for food, nutrients, light, nest sites or other vital resources; or hybridizing with them so frequently that within a few generations few if any truly native individuals remain. Environmental harm can also be the result of an indirect effect of pest species. For example, decreased waterfowl use may result from invasive plant infestations reducing the availability and/or abundance of native wetland plants that provide forage during the winter.

Environmental harm may involve detrimental changes in ecological processes. For example, cheatgrass infestations in shrub steppe can alter fire return intervals displacing native species and

communities of bunch grasses, forbs, and shrubs. Environmental harm may also cause or be associated with economic losses and damage to human, plant, and animal health. For example, invasions by fire-promoting grasses that alter entire plant and animal communities eliminating or sharply reducing populations of many native plant and animal species can also greatly increase firefighting costs.

See Appendix D for the IPM program documentation to manage pests on the refuge. Along with a more detailed discussion of IPM techniques, this documentation describes the selective use of pesticides for pest management on refuge lands, where necessary. Throughout the life of the CCP, most proposed pesticide uses on refuge lands would be evaluated for potential effects to refuge biological resources and environmental quality. These potential effects would be documented in Appendix D, under Chemical Profiles. Pesticide uses with appropriate and practical best management practices (BMPs) for habitat management as well as cropland/facilities maintenance would be approved for use on refuge lands where there likely would be only minor, temporary, and localized effects to species and environmental quality based upon non-exceedance of threshold values in Chemical Profiles. However, pesticides may be used on refuge lands where substantial effects to species and the environment are possible (exceed threshold values) in order to protect human health and safety (e.g., mosquito-borne disease).

2.4.8 Monitor Effects of Public Use Programs on Wildlife

Monitoring to assess the effects of public use on wildlife will be conducted. Areas and/or timing of public use will be modified, if necessary, to provide secure and adequately sized sanctuary areas for CWT deer, dusky Canada geese, and other sensitive species.

2.4.9 Regulatory Compliance

All activities in all alternatives requiring review, permits and clearances (Section 106 of the National Historic Preservation Act, Section 7 endangered species consultation, 401 water quality permit, etc.) will undergo appropriate review and obtain necessary permits and/or clearances as needed.

2.4.10 Maintaining/Upgrading Existing Facilities

Periodic maintenance and upgrading of the refuges' buildings and facilities will be necessary regardless of the alternative selected. Periodic maintenance and upgrading of facilities is necessary for safety and accessibility and to support staff and management needs.

2.4.11 Tribal Coordination

Coordination with Native American Tribes that have an interest in the refuges is common to all alternatives. We will coordinate and consult with the Cowlitz Tribe and the Shoalwater Bay Tribe regarding issues of shared interest. The Service may expand and seek assistance from other Tribes for future issues related to cultural resources education and interpretation, special

programs, the National Historic Preservation Act (NHPA), and the Native American Graves Protection and Repatriation Act.

2.4.12 State Coordination

Under all alternatives, the Service will continue to maintain regular discussions and partnerships with the ODFW and WDFW. Key topics for discussion continue to be the CWT Deer Recovery Plan and its continued implementation on Julia Butler Hansen Refuge and the surrounding private and public lands; the Pacific Flyway Management Plan for the Dusky Canada Goose (Pacific Flyway Council 2007) (Julia Butler Hansen Refuge); wildlife monitoring, hunting and fishing seasons and regulations; and endangered species management.

2.4.13 Volunteer Opportunities

Volunteer opportunities occur in all alternatives. These are recognized as components of the successful management of public lands and may become vital to the implementation of refuge programs, plans, and projects, especially during periods of declining budgets. Currently, neither refuge has a formal volunteer program due to the refuges' small staff size, rural nature and remoteness, and large land base.

2.4.14 Participation in Planning and Review of Regional Development Activities

The Service will actively participate in planning and studies for ongoing and future industrial and urban development, water pollution, and other potential concerns that may adversely affect refuge wildlife resources, habitats, and/or environmental quality. The Service will cultivate working relationships with pertinent county, State, and Federal agencies to stay abreast of current and potential developments; and will utilize outreach and education as needed to raise awareness of each of the refuges resources and dependence on the local environment.

2.4.15 U.S. Army Corps of Engineers Section 536 Habitat Restoration

The Corps has funded a habitat restoration project to improve tidal flow and fisheries access to 87 acres of slough habitat and restore 210 acres of native riparian forest on the Mainland Unit. The project is intended to benefit a multitude of fish and wildlife species including federally endangered salmonids and CWT deer as well as bald eagles, waterfowl and neotropical migratory bird species. Restoration and reconnection of tidal sloughs and riparian forest habitat to the Columbia River would mimic the more natural riparian forest/tidal channel habitats that were historically abundant in the Columbia River estuary. This restoration will take place under all alternatives and it has been covered in the Section 536 Habitat Restoration Project Final Implementation Document and Environmental Assessment (April 2008).

2.5 Actions Considered but Dismissed

2.5.1 No Mammalian Predator Control

No mammalian predator (coyote, mountain lion, and bear) control would be conducted on Julia Butler Hansen Refuge. This action and its effects were evaluated in the Service's final Julia Butler Hansen Refuge Predator Management Plan and Environmental Assessment (PMP/EA) (USFWS 1997) and a supplemental document. The lack of mammalian predator control would not protect adult and juvenile CWT deer on the refuge that are vulnerable to predation. Based upon available scientific information (refuge studies, monitoring, and population modeling), not conducting predator control would not achieve Julia Butler Hansen Refuge goals and population objectives for CWT deer necessary to promote its recovery in the lower Columbia River region. In accordance with 43 CFR 46.135, the Service incorporates through reference, the action (no mammalian predator control) and evaluation of its environmental effects described in the PMP/EA.

2.5.2 Nonlethal Techniques to Remove Coyotes

In accordance with 7 RM 14 (Pest Control), nonlethal methods of vertebrate pest management would be considered before lethal control measures. In the final PMP/EA and its supplemental document we addressed the following nonlethal methods for controlling coyotes: trapping and permanent relocation, and trapping and temporary relocation. We also considered the use of birth control (sterilization) and aversive taste conditioning in the PMP/EA, but dismissed these methods from further consideration. In accordance with 43 CFR 46.135, the Service incorporates through reference the descriptions of these nonlethal techniques and the evaluation of environmental effects described in the PMP/EA. Birth control (sterilization) and aversive taste conditioning were dismissed from further consideration for this Draft CCP/EIS because the published scientific studies of these techniques have not shown them to be more effective than lethal methods for removing coyotes.

2.5.3 Public Trapping and Hunting to Remove Coyotes

After addressing nonlethal techniques, 7 RM 14 requires consideration of lethal control of vertebrate pests by public harvest before "means other than public harvest." In the PMP/EA and its supplemental document we addressed public trapping and hunting. In accordance with 43 CFR 46.135, the Service incorporates through reference the descriptions of public trapping and hunting as well as associated evaluation of environmental effects described in the PMP/EA. These actions are dismissed from consideration for this Draft CCP/EIS for the following reasons:

- Potential disturbance to CWT deer;
- Lower effectiveness of coyote removal;
- Safety of and potential conflicts with other refuge users; and
- Potential conflicts with refuge staffs implementing on-the-ground management actions.

2.6 Alternatives Descriptions Summary

2.6.1 Lewis and Clark Refuge

2.6.1.1 Alternative 1 Continue Current Management (No Action)

Alternative 1 assumes no change from past management programs and is considered the base from which to compare the other alternatives (Map 4). Under this alternative, refuge management practices already underway or funded would continue. No significant changes would be initiated by the Service. A detailed description of current refuge management programs is found in the Social and Economic Environment section of this Draft CCP/EIS (Chapter 5). Although the refuge currently has no integrated plan to guide the management of all of its resources and uses, current management efforts on the refuge focus on the protection of sensitive species, the enhancement of their habitats, and the management of public access to and use of refuge lands. Current management of the refuge is guided by the following existing "step-down" plans which include:

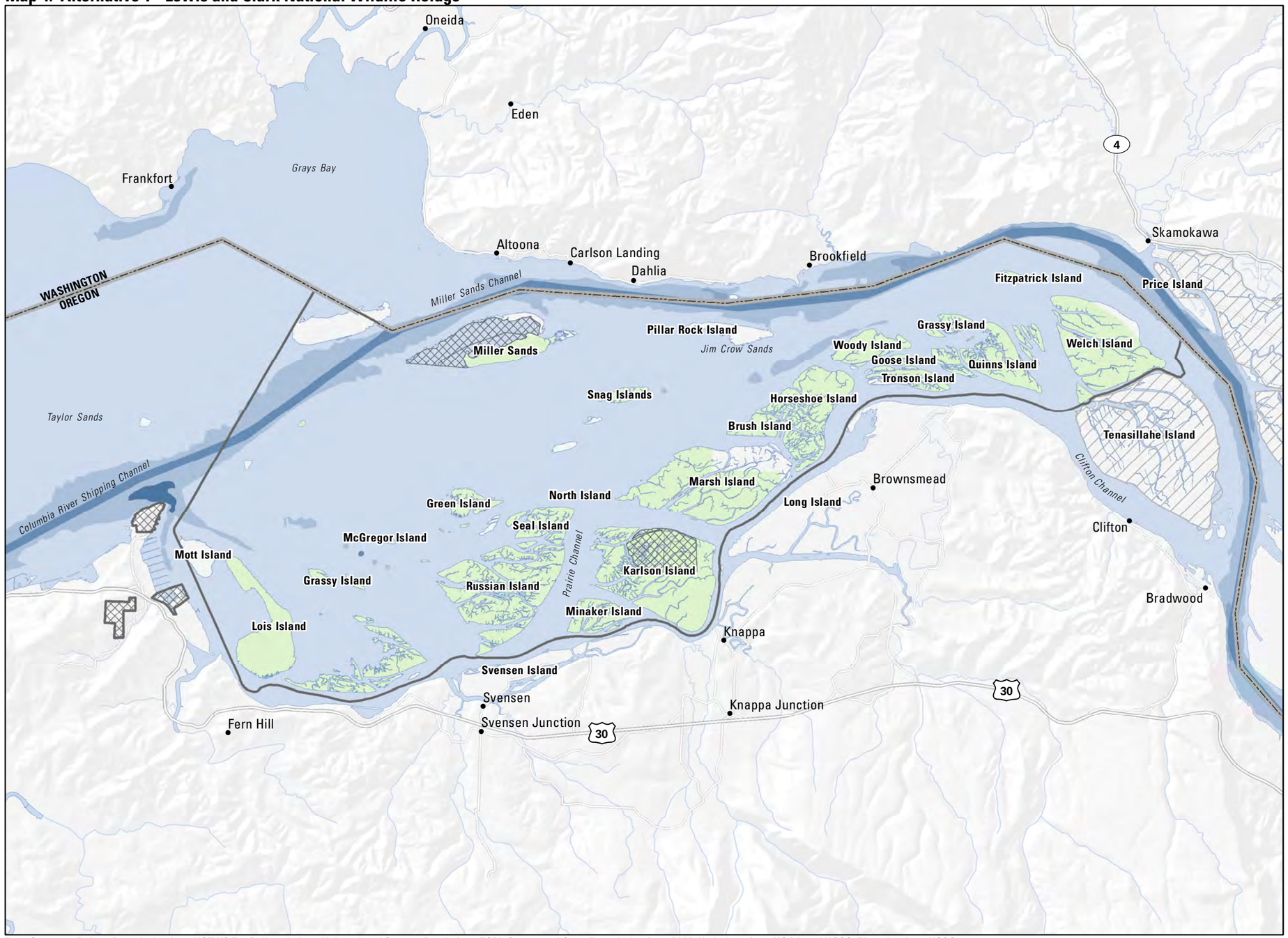
- Lewis and Clark Refuge Public Use Management/Development Plan (1984)
- Lewis and Clark Refuge Sport Hunting Plan and Environmental Assessment (1985)
- Lewis and Clark Refuge Management Plan (1986),
- Lewis and Clark Refuge Animal Control Plan (1989)
- Julia Butler Hansen/Lewis and Clark Refuge Fire Management Plan (2004)

Under Alternative 1 the Lewis and Clark Refuge islands would continue to be managed using natural processes with limited human intervention. These management actions include noxious weed control, wildlife/habitat surveys, and law enforcement patrol. There would be no new or expanded habitat management activities planned under this alternative. Public use opportunities would continue to focus on wildlife oriented recreation. Visitor information for the refuge would be available from the Julia Butler Hansen Refuge headquarters office near Cathlamet, Washington, and the Willapa National Wildlife Refuge Complex office near Ilwaco, Washington. This scenario would keep the public use opportunities at the current level with no new or expanded activities planned.

2.6.1.2 Alternative 2 (Preferred Alternative) Enhance Resource Protection/Provide Wildlife-dependent Public Use

Under Alternative 2 most of the existing management practices and public use programs would be retained (Map 5). Additional emphasis would be placed on working with the ODSL to allow the refuge to acquire or manage State-owned lands within the acquisition boundary of the refuge; increase invasive species control efforts on and off the refuge; facilitate research opportunities; develop/enhance habitat on dredge spoil islands; increase volunteer opportunities; work with area landowners to address camping needs; develop an interpretive water trail through the refuge; and improve signage for refuge visitors.

Map 4. Alternative 1 - Lewis and Clark National Wildlife Refuge



Legend

Public Use

Closed to Waterfowl Hunting

Refuge Land Status

Approved Refuge Boundary

Refuge Managed Lands

Julia Butler Hansen Refuge for the Columbian White-tailed Deer

All refuge lands closed to all hunting except for waterfowl hunting. It is a statutory mandate that 60% of all lands purchased with Duck Stamp Act funding be closed to hunting of migratory birds. On the Lewis and Clark NWR 2,930 acres were purchased with Duck Stamp funding in 1974 and of that 1,760 acres within Miller Sands Bay and Karlson Island were closed to hunting. This waterfowl sanctuary will remain the same throughout the CCP.

Waters around the refuge are open to fishing in accordance with state regulations. Bank fishing is permitted along open shorelines.

0 Miles 2

0 Kilometers 2

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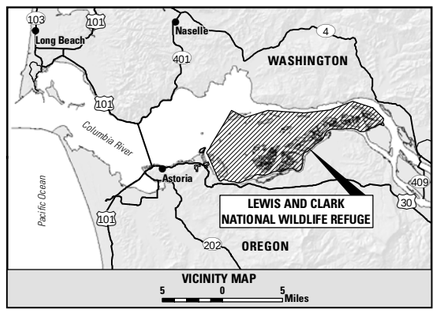
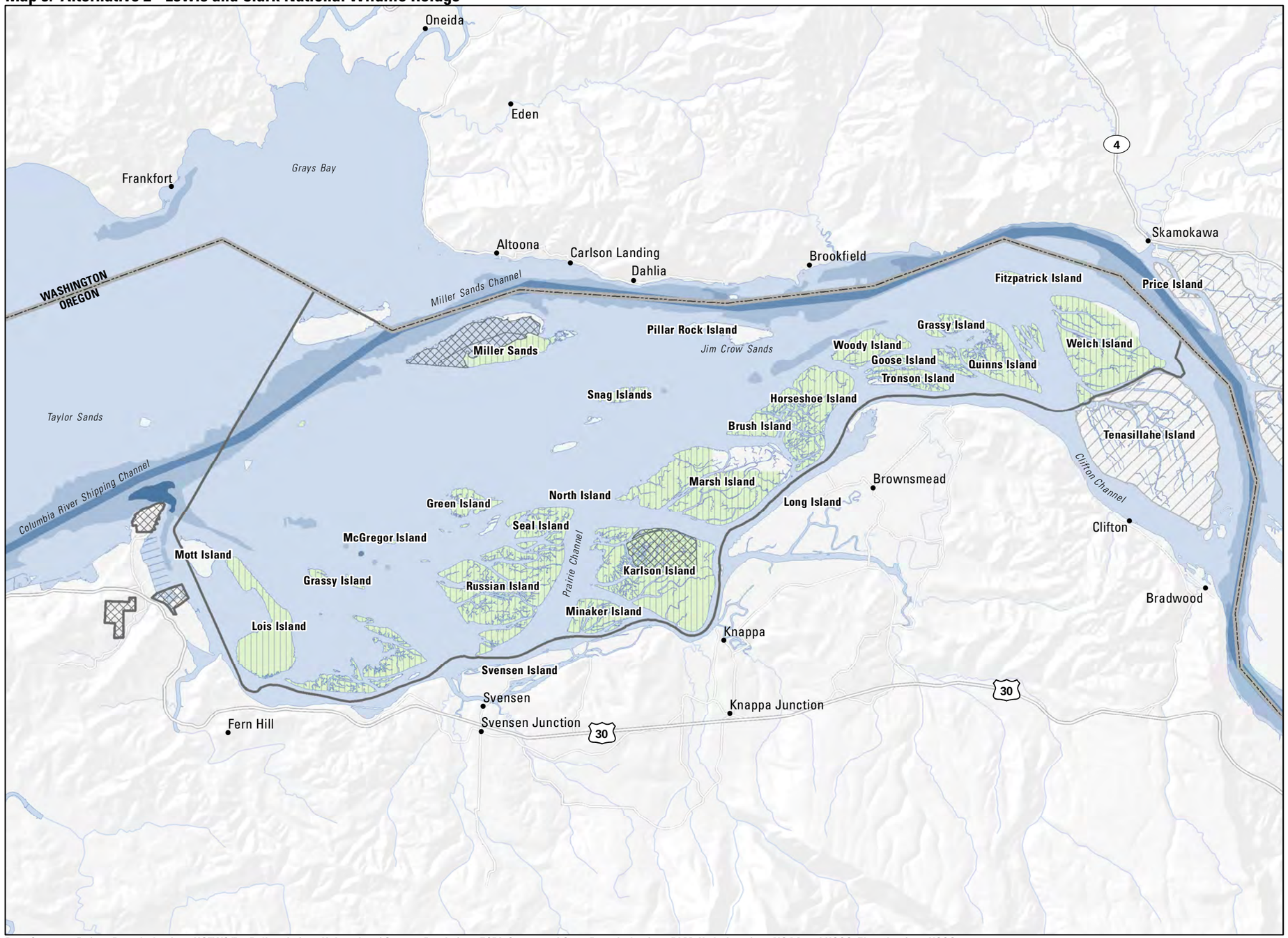
NAD 83



Data Sources: Refuge Boundaries from USFWS/R1; Railroads from University of Oregon; Roads from ESRI; County and State Boundaries from BLM; Hydrology from NOAA and USGS; Elevation from USGS

Map 5. Alternative 2 - Lewis and Clark National Wildlife Refuge



Legend

Public Use

- Closed to Waterfowl Hunting

Wilderness Inventory

- Wilderness Inventory Area

Refuge Land Status

- Approved Refuge Boundary
- Refuge Managed Lands
- Julia Butler Hansen Refuge for the Columbian White-tailed Deer

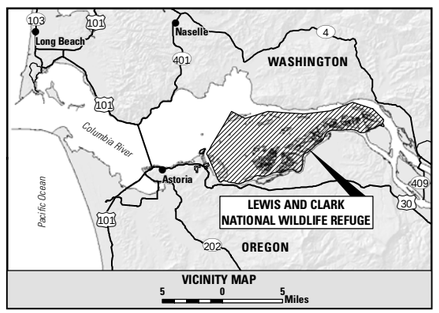
All refuge lands closed to all hunting except for waterfowl hunting. It is a statutory mandate that 60% of all lands purchased with Duck Stamp Act funding be closed to hunting of migratory birds. On the Lewis and Clark NWR 2,930 acres were purchased with Duck Stamp funding in 1974 and of that 1,760 acres within Miller Sands Bay and Karlson Island were closed to hunting. This waterfowl sanctuary will remain the same throughout the CCP.

Waters around the refuge are open to fishing in accordance with state regulations. Bank fishing is permitted along open shorelines.

0 Miles 2

0 Kilometers 2

UTM ZONE 10N
NAD 83



Data Sources: Refuge Boundaries from USFWS/R1; Railroads from University of Oregon; Roads from ESRI; County and State Boundaries from BLM; Hydrology from NOAA and USGS; Elevation from USGS

2.6.2 Julia Butler Hansen Refuge for the Columbian White-tailed Deer

2.6.2.1 Alternative 1, Current Management (No Action)

No change to current management programs would occur under Alternative 1, it is considered the base from which to compare the other alternatives (Map 6). Under Alternative 1 refuge management consistent with available funding and staffing would continue. No significant changes would be initiated by the Service. A detailed description of current refuge management programs is available in Chapter 5 of this Draft CCP/EIS (Chapter 5). Management efforts on the refuge would continue to focus on the protection of threatened and endangered species and migratory birds, and the maintenance/enhancement of their habitats; and the management of wildlife-dependent recreational uses of refuge lands. Current management of the refuge is guided by the following existing step-down plans:

- Columbian White-tailed Deer Refuge Public Use/Development Plan (1983)
- Columbian White-tailed Deer Refuge Sport Fishing Plan and Environmental Assessment (1984)
- Columbian White-tailed Deer Refuge Sport Hunting Plan and Environmental Assessment (1984)
- Columbian White-tailed Deer Refuge Habitat Management Plan (1987)
- Julia Butler Hansen Refuge Animal Control Plan (1989)
- Julia Butler Hansen Refuge Predator Management Plan and Environmental Assessment (1997)
- Julia Butler Hansen Refuge Elk Management Plan and Environmental Assessment (2004)
- Julia Butler Hansen/Lewis and Clark Refuge Fire Management Plan and Environmental Assessment (2004)
- Wallace Island Waterfowl Hunt Plan and Environmental Assessment (2007)

In addition to the step-down plans, several other existing documents have provided management direction for the refuge in recent years, including the Columbian White-tailed Deer Recovery Plan (1983); the Habitat Site Plan (2003); and the interim Habitat Management Plan (2005).

Under this alternative, the Mainland and Tenasillahe Island units would continue to be actively managed for a mosaic of short grass pasture (680 existing acres), early successional riparian forest (120 existing acres), and managed wetlands (130 existing acres). The habitat management emphasis in both units would continue to be CWT deer forage and cover; whereas, pasture for wintering goose use and wetlands for wintering waterfowl would continue to be secondary. Managed wetlands would also provide amphibian breeding habitat focusing on native species such as long-toed salamanders, northwestern salamanders, and red-legged frogs. Management of riparian sites would continue to be focused on the needs of CWT deer primarily, and providing habitat for migratory land birds, bald eagles, and other raptors secondarily.

Existing riparian sites, short-grass fields, and wetlands would be maintained and new sites would be established or enhanced. Habitat improvements (short-grass fields, riparian sites and managed wetlands) would be completed on a limited basis, as funding and staff time permits. Although current management of refuge habitats (e.g., mowing, disking, reseeding) would

continue, refuge wide habitat goals and objectives would generally not be met due to limited habitat enhancement efforts.

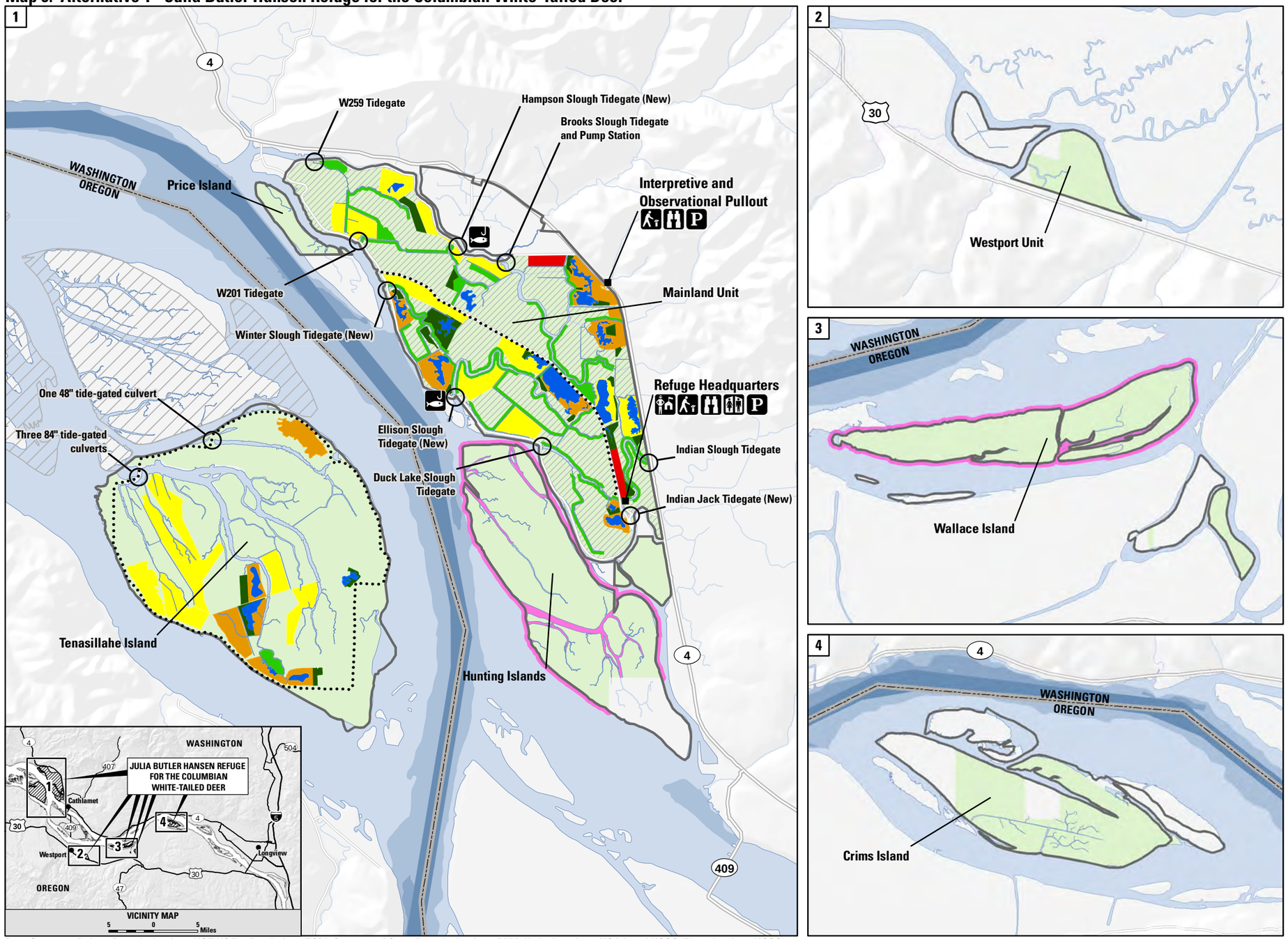
Existing water control structures (including culverts and risers) would be repaired or replaced and new structures would be installed based upon available funding and opportunity. Expulsion pump operations at the head of Brooks Slough would continue during periods of high water levels in the Mainland Unit's interior, and the tidegates would be managed as currently designed. The tidegates on the Mainland and Tenasillahe Island units would continue to be managed to prevent/minimize flooding of CWT deer habitat. Opportunities to improve water exchange between sloughs and the Columbia River as well as to allow two way fish passage (consistent with CWT deer habitat management) would continue to be developed and implemented, where appropriate (e.g., through modifying existing tidegates and installing new tidegates designed to be conducive to water exchange and fish passage).

A variety of other management activities would occur on both diked units in existing managed habitat, including invasive plant control, wildlife/habitat monitoring, fence construction, ditch and slough maintenance, law enforcement patrols, habitat restoration actions, and wildfire suppression. Active management activities on undiked units would include invasive plant control, wildlife/habitat monitoring, law enforcement patrols, and wildfire suppression.

Based upon a supplement to the final PMP/EA (USFWS 1997), the current integrated (nonlethal and lethal) control of coyotes would continue to occur on refuge lands. Although nonlethal (temporary or permanent relocation of coyotes) would be considered first for the integrated approach, state agencies in Oregon and Washington currently have not or would not grant permits to relocate coyotes trapped on the refuge. As a result, lethal control (trapping and euthanizing as well as shooting) would be used to remove coyotes from refuge lands. The specific details for implementing lethal control on the refuge for Alternative 1 are described in Section 2.2.2 of the final PMP/EA (USFWS 1997). Moreover, this method of coyote control would be "temporary in nature" where removals would only occur during years meeting criteria described in Section 2.2.1.

The current wildlife-dependent public use opportunities would continue with no new or expanded activities. On the Mainland Unit, the small interpretive center and viewing deck would continue to be available to the public at the refuge's headquarters. Refuge staff members would provide information and assistance when the office is open and staff are available. Steamboat Slough and Brooks Slough dike roads, which surround the Mainland Unit, and the viewing site on State Highway 4 would be open for wildlife viewing opportunities. Center Road, which bisects much of the Mainland Unit, would continue to be open from June through September as a walking trail, which would not conflict with refuge management activities. With construction of the new refuge maintenance shop, only the northwestern end of the road is open for public access. The remainder of the Mainland Unit's interior would continue to be closed to general public use to limit disturbance to the CWT deer. Fishing opportunities would continue along the outside perimeter of the county-owned dike roads and at the Brooks Slough Pump Station. Except for a regulated elk hunt identified in the Julia Butler Hansen Refuge Elk Management Plan and EA (2004), there would continue to be no hunting allowed inside the Mainland Unit.

Map 6. Alternative 1 - Julia Butler Hansen Refuge for the Columbian White-Tailed Deer



Data Sources: Refuge Boundaries from USFWS/R1; Roads from ESRI; County and State Boundaries from BLM; Hydrology from NOAA and USGS; Elevation from USGS

Legend

Wildlife Habitat Management

- Existing Riparian Forest
- Planned Riparian Forest
- Existing Mow Field
- Existing Mow Field and Graze Livestock
- Existing Hay Field
- Existing Non-tidal Wetland

Public Use

- Existing Elk Hunting by Special Permit
- Existing Waterfowl Hunting
- Existing Walking Trail (Seasonally Closed)
- Existing Fishing Access

Refuge Land Status

- Approved Boundary
- Refuge Managed Lands
- Lewis and Clark National Wildlife Refuge

Seasonal Columbian White-Tailed Deer Protection (Predator Management) is performed from January to April 15th.

All Mow, Mow and Grazing, and Hay Fields are plowed, disked, reseeded, and fertilized as necessary.

Waterfowl hunting is permitted along the open shorelines of the Hunting Islands and Wallace Island Units. Waters around the refuge are open to fishing in accordance with state regulations. Bank fishing is permitted along open shorelines. Interior sloughs in all refuge units are closed to fishing.

0 Miles 1

0 Kilometers 1

UTM ZONE 10N
NAD 83

At the Tenasillahe Unit, walking, wildlife viewing, and fishing would continue to be permitted around the 6.6-mile perimeter dike of the refuge. The remainder of the interior of this unit would be closed to public use, including hunting. At the other undiked refuge units (Wallace Island, Hunting Island, Price Island, Crims Island and the area around Westport, Oregon), wildlife-dependent public use activities would continue to be allowed along the shorelines. Although not closed to visitor use, access to the interior of these islands is not feasible due to the dense vegetation and uneven terrain. Moreover, there is limited wildlife viewing potential. Waterfowl hunting along the shoreline of Hunting and Wallace islands would continue during the State waterfowl season, but Crims Island would remain closed to waterfowl hunting.

Hunting in areas considered outside the jurisdiction of the refuge such as navigable sloughs, rivers, and other waterways, is subject to Oregon and Washington hunting regulations. It should be noted that the interior waterways of the Mainland and Tenasillahe Island units are considered nonnavigable. Therefore, they would remain closed to any visitor access.

2.6.2.2 Alternative 2, Enhanced Habitat and Columbian White-tailed Deer Management with Increased Wildlife-dependent Public Use Opportunities (Preferred Alternative)

Under this alternative, the Mainland, Crims, and Tenasillahe Island units would be actively managed for a mosaic of short-grass fields, riparian forests, and wetlands to benefit CWT deer and a diverse assemblage of other native wildlife (Map 7). The acreage of short-grass fields would increase from 680 to 790 acres.

The refuge currently maintains 120 acres of early successional riparian forest on the Mainland and Tenasillahe Island units, as well as the recently established 115 acres on Crims Island. Under this alternative, early successional riparian forest would be increased by 190 acres.

This alternative also would increase the acreage of nontidal wetlands by 40 acres (total of 170 acres). In addition, the Service would work with watershed partners to restore aquatic habitats and work with landowners adjacent to the Mainland Unit to conduct habitat restoration that would benefit CWT deer.

This alternative would promote establishing new subpopulations of CWT deer in one or more suitable locations in the lower Columbia River region. Identifying locations considered “secure habitat” as defined in the recovery plan, would be important. Specifically, there may be opportunities to reintroduce CWT deer to public lands that are within their historical range.

The lethal control methods for removing coyotes described under the integrated approach (Alternative 1) also would be used for Alternative 2. However, the time period for coyote control under Alternative 2 would be January 1 to December 31 whereas the time period under Alternative 1 would be January 1 to April 15. In addition, removal of mountain lions and black bears by nonlethal or lethal means would occur anytime one or more of these predators are present on the refuge. As it would be for coyote control, these removal activities would be conducted by the State or U.S. Department of Agriculture’s Animal and Plant Health Inspection Service (APHIS) that would act as a Service authorized agent. Because these large mammalian predators could prey upon juvenile and adult CWT deer, they would be removed from the refuge

as quickly as possible to prevent substantial reductions in deer population levels. Although bears and mountain lions have not been observed on the refuge, there has been one documented cache of a CWT deer likely attributable to a mountain lion (Refuge files).

For Alternative 2, the criteria used to implement coyote removal on the refuge during any year follow.

- Fawn:doe ratios in December greater than 37:100 and CWT deer numbers below the population objective for one or more management units (see Objective 2.9.5.1).
- Fawn:doe ratios in December less than 20:100 and CWT deer numbers within 25 percent of the population objective for one or more management units (see Objective 2.9.5.1)
- Fawn:doe ratios in December less than 45:100 and CWT deer numbers greater than 25 percent below the population objective for one or more management units (see Objective 2.9.5.1)

In comparison with Alternative 1, research and monitoring activities would be increased to include amphibian monitoring, intensive habitat monitoring, and facilitating graduate level research through cooperative efforts with interested universities.

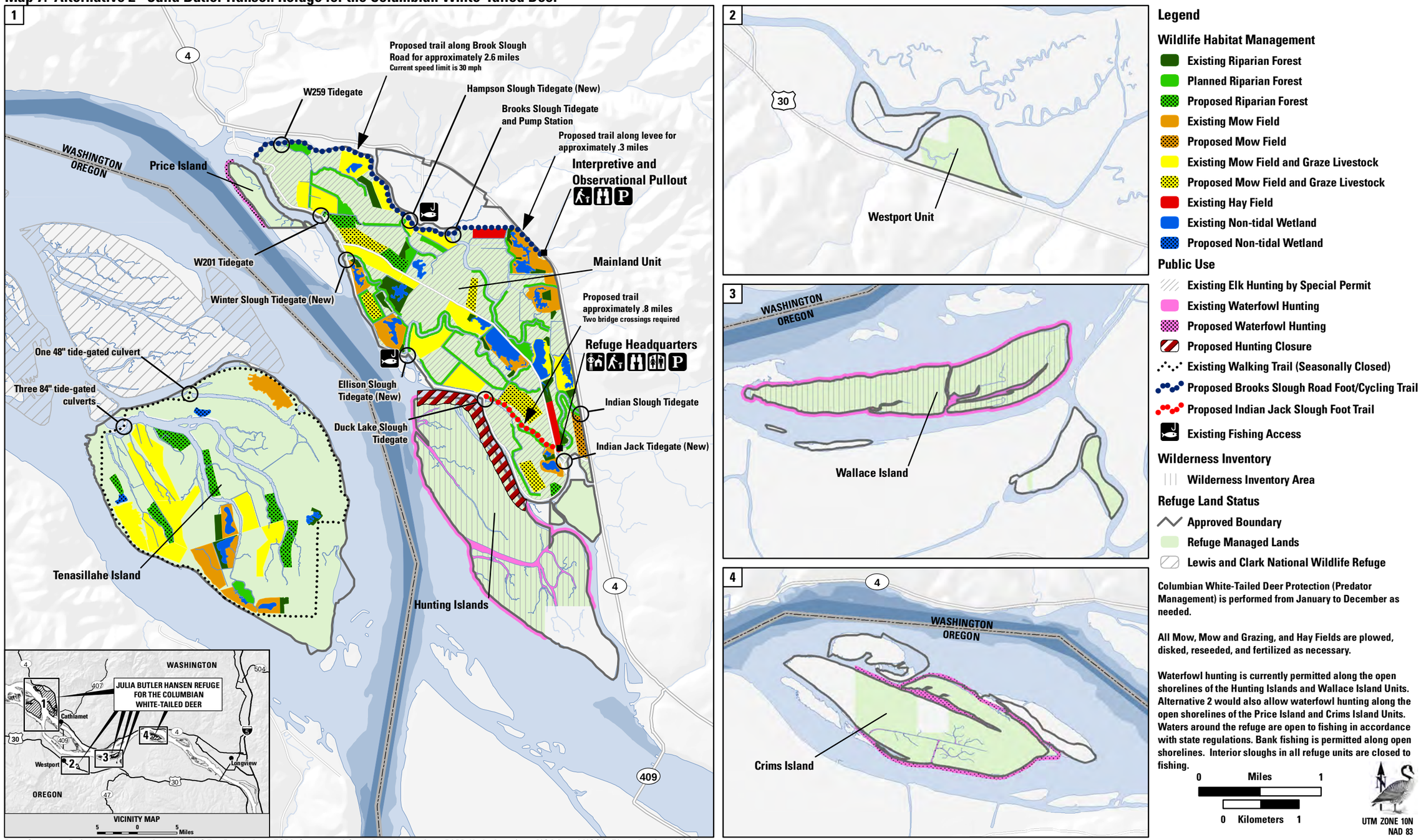
Public use opportunities would be similar to Alternative 1, except wildlife observation and photography would be expanded under Alternative 2. There would be an additional interpretive panel at the Columbia River overlook, and modifying the visitor overlook on State Highway 4 from a wildlife viewing site to an interpretive site. This alternative would also create a new trail replacing the Centerline Trail. The new 0.8-mile trail called the Indian Jack Slough Trail would offer an easy loop through a riparian forested area with the return located along the county road. The 2.6-mile county-maintained Brooks Slough Road and a 0.3-mile section along a refuge levee would be promoted as a foot/cycling trail. Waterfowl hunting would be permitted on Crims and Price Islands, but waterfowl hunting along the portion of Hunting Island's shoreline that runs parallel to the Elochoman Slough would be closed for public safety. Available fishing areas would be similar to Alternative 1.

The environmental education program would continue to provide brochures and other information while developing partnerships with other agencies. This program would be expanded primarily through establishment of a refuge Youth Conservation Corps program. Interpretive panels and information would be updated.

2.6.2.3 Alternative 3, Maintain Current Habitat Management; Enhance Columbian White-tailed Deer Population Management and Wildlife-dependent Public Use

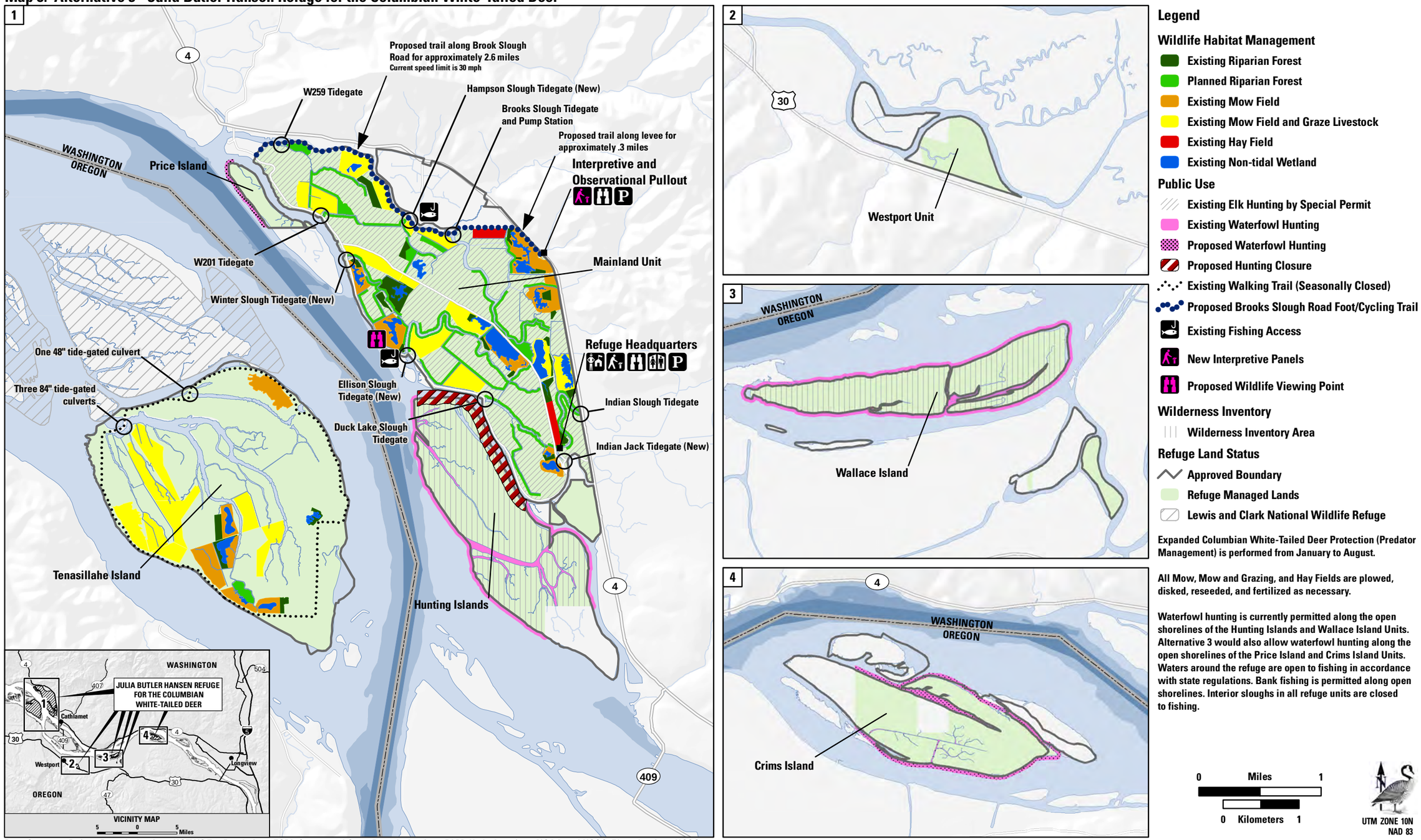
Habitat management would be similar to Alternative 1, but research and monitoring efforts overall would be reduced for Alternative 3 (Map 8). Within the diked portion of the refuge, riparian forest establishment would be restricted to the 210 acres that is being planted under the Army Corps of Engineers Section 536 habitat enhancement program. There would be no habitat improvements for amphibians. Except for the Section 536 tidegate installations which are

Map 7. Alternative 2 - Julia Butler Hansen Refuge for the Columbian White-Tailed Deer



Data Sources: Refuge Boundaries from USFWS/R1; Roads from ESRI; County and State Boundaries from BLM; Hydrology from NOAA and USGS; Elevation from USGS

Map 8. Alternative 3 - Julia Butler Hansen Refuge for the Columbian White-Tailed Deer



Data Sources: Refuge Boundaries from USFWS/R1; Roads from ESRI; County and State Boundaries from BLM; Hydrology from NOAA and USGS; Elevation from USGS

already underway, efforts to improve habitat conditions for native fish would be limited. For areas outside any dikes and subject to Columbia River tidal action, management actions would not differ from those described for Alternative 1.

Under this alternative, CWT deer protection would be the same as Alternative 1, with an extension of the coyote control date. Coyote control measures would occur from January 1 to August 30. As in Alternative 1, the refuge would continue to coordinate with the states when CWT deer predators are present on the refuge and/or are impacting the CWT deer population.

Lethal control methods for removing coyotes described for Alternatives 1 and 2 would also be used for Alternative 3. However, the time period for coyote control under Alternative 3 would be January 1 to August 31 (the coyote control time period for Alternative 1 would be January 1 to April 15; and for Alternative 2 it would be January 1 to December 31). For Alternative 3, criteria to implement coyote removal on the refuge during any year would be the same as Alternative 2. In similarity with Alternative 2, removal of mountain lions and black bears by nonlethal or lethal means would occur anytime one or more of these predators are present on the refuge, under Alternative 3. These removal activities would be conducted by the State or U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USDA-APHIS), acting as a Service-authorized agent.

Under this alternative, wildlife observation and photography opportunities would be enhanced through the following facility improvements:

- Adding two auto pull-outs with interpretive panels;
- Installing two spotting scopes;
- Establishing a new foot/cycling trail along Brooks Slough Road; and
- Upgrading and adding interpretive panels at the Highway 4 Interpretive Site.

Where appropriate, develop a water trail as part of the Columbia River Trail System adjacent to the refuge, in partnership with the Washington Water Trails Association. The hunting program would be the same as Alternative 2 and there would be no change in the current fishing program.

2.7 Goals, Objectives, and Strategies Introduction

Goals and objectives are the unifying elements of successful refuge management. They identify and focus management priorities, resolve issues, and link to refuge purposes, Service policy, and the Refuge System mission. A vision broadly reflects the refuge purposes, the Refuge System mission and goals, other statutory requirements, and larger scale plans as appropriate. A CCP describes management actions that help bring a refuge closer to its vision. Public use and wildlife/habitat management goals define general targets in support of the vision, followed by objectives that direct effort into incremental and measurable steps toward achieving those goals. Strategies identify specific tools and actions to accomplish objectives (USDI 2002).

In the development of this Draft CCP/EIS, the Service evaluated a reasonable range of alternatives associated with achieving refuge management goals and objectives. Although alternatives can differ with respect to objectives (e.g., acres to be restored), they mainly vary in terms of the management actions to be implemented over the lifetime of the CCP.

2.7.1 Reviewing the Goals, Objectives and Strategies

The goals and objectives for the Julia Butler Hansen and Lewis and Clark Refuges are presented within this section. Each goal is followed by one or more objectives that pertain to it. Similarly, management strategies are presented for each objective where there are actions needed to achieve the objective. Below each objective statement are management strategies that would be implemented to achieve it, presented in a tabular format. For these tables, note the following:

- Each management strategy is presented on a row in a table.
- A checkmark in an alternative column denotes that a specific management strategy would apply to that alternative.

2.8 Lewis and Clark National Wildlife Refuge Goals, Objectives, and Strategies

Before human influence, the Columbia River estuary was a high energy environment dominated by physical forces, with extensive sand beds and highly variable river flows. Several authors have suggested that the biological processes in this environment may have been unique on the Pacific Coast. The estuary of today, however, has been extensively modified in terms of physical and biological processes. The development and operation of the Columbia River's hydroelectric system has contributed significantly to these changes. Direct effects have occurred through changes in seasonal flow rates and reduced sediment discharges, resulting in changes in the estuary's energy balance. Despite these changes, much of the refuge islands remain in a relatively natural state, with tidal inundation occurring twice daily in the lower marshy areas of the refuge.

Pintail ducks / USFWS

2.8.1 Goal 1. Protect and Maintain Natural Forested Wetland (Swamp) Habitats Characteristic of the Historic Lower Columbia River for the Benefit of Migratory Birds, Columbian White-tailed Deer, and Other Native Wildlife.

2.8.1.1 Objective for Scrub-Shrub Swamp

Throughout the life of the CCP, protect all existing acreages of scrub-shrub wetlands (an estimated 2,165 acres) for the willow flycatcher, CWT deer, yellow warbler, and other wildlife. This habitat includes the following characteristics.

- Shrubs are the dominant vegetation, with native species such as Sitka willow, Pacific willow, red osier dogwood, salmonberry, Pacific ninebark, and hardhack.
- Interspersed scattered trees taller than 13 feet are present, comprised of native species including Sitka spruce, black cottonwood, tree willows

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Allow natural processes to drive vegetative changes.	✓	✓
B. Monitor vegetation and wildlife composition changes over time and threats to biological integrity such as contamination and invasive species.	✓	✓
C. Work with partners to control invasive species with Integrated Pest Management techniques using mechanical, physical, biological and/or chemical means.	✓	✓

Rationale: The hydrology of the lower Columbia River and its estuary are related to the daily rising and falling of the tides. As it nears the ocean, the slowing current deposits the river's silt load to form low, marshy islands and sandbars. Islands farther downstream tend to have more of a willow shrub component, and because of their relatively low topography, are more susceptible to tidal fluctuations. Because these islands are outside of any flood protection dikes and subject to natural processes, little if any physical management actions are appropriate for these areas.

Scrub-shrub swamp is a climax vegetative community in parts of the lower estuary (Maps 9a and 9b). It provides essential habitat for shrub-dependent birds such as the little willow flycatcher and the yellow warbler. Waterfowl forage in the scrub-shrub at higher tide levels. Red-legged frogs also utilize this habitat. Of the principle habitats of the Columbia River estuary, tidal swamps have been the most heavily impacted by human activities such as diking and drainage. The extent of the swamps has been reduced by approximately 77 percent since 1870 (USFWS 1983). The LCREP (1999) calls for the preservation of existing wetlands in the lower Columbia River.

2.8.1.2 Objective for Sitka Spruce Swamp

Throughout the life of the CCP, protect all existing acreages (estimated 285 acres) of Sitka spruce swamp (Palustrine evergreen forested wetland) for the bald eagle, red crossbill, CWT deer, and other wildlife. Habitat characteristics include:

- Late succession mature trees predominantly composed of Sitka spruce; black cottonwood, and red alder, western red cedar may also be present;
- More than seven mature spruce trees per acre; and
- Typically located within 5,000 feet of water.

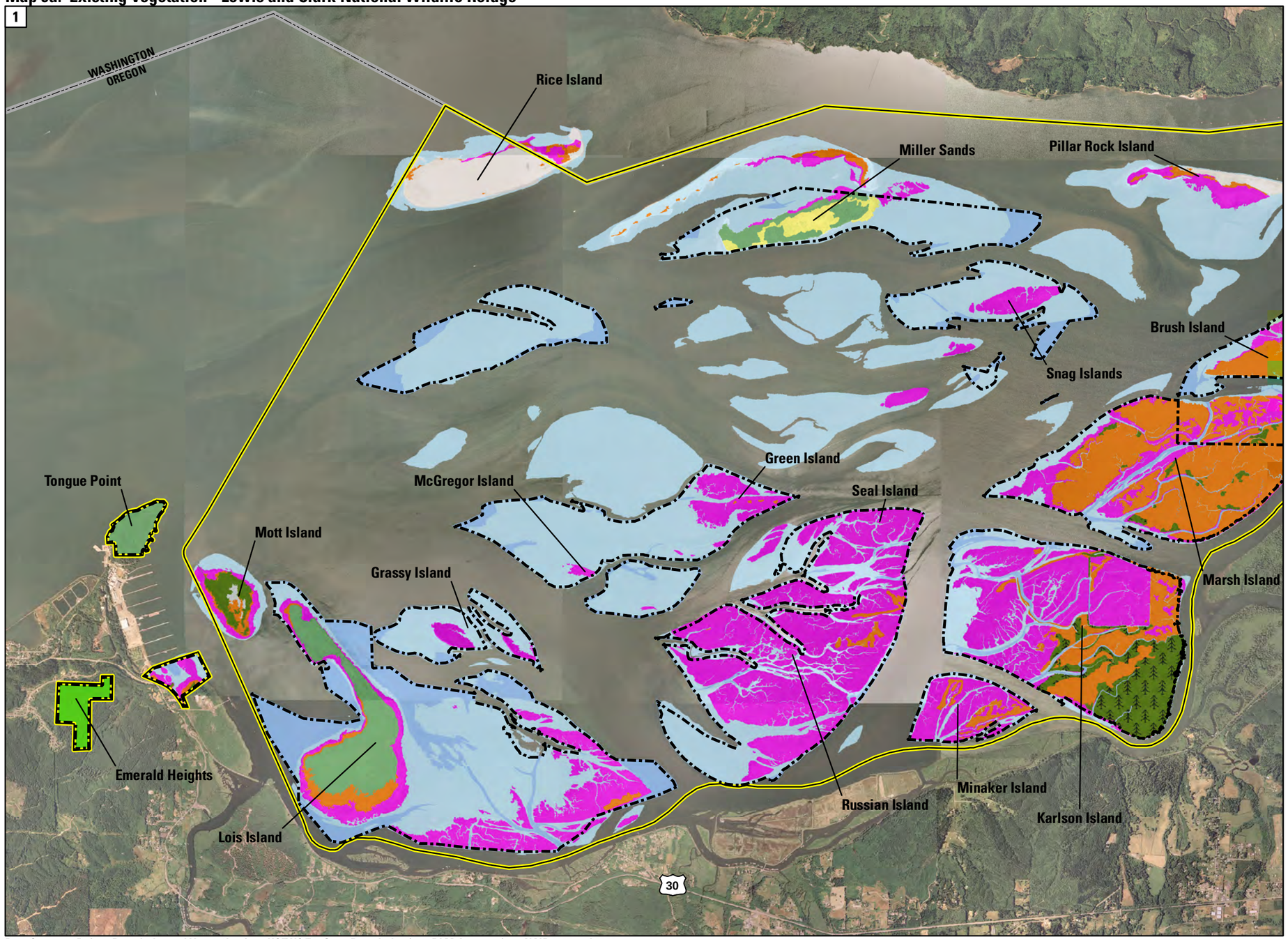
Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Allow natural processes to dictate vegetative changes	✓	✓
B. Monitor vegetation and wildlife composition changes over time and threats to biological integrity such as contamination and invasive species.	✓	✓
C. Work with partners to control invasive species with Integrated Pest Management techniques using mechanical, physical, biological and/or chemical means.	✓	✓

Rationale: The hydrology of the lower Columbia River and its estuary are related to the daily tidal rise and fall. As the river nears the ocean, the slowing current deposits the river's silt load to form low, marshy islands and sandbars. Sitka spruce swamp habitat is a diverse and rich wildlife habitat. The large spruce trees are often spaced far enough apart to permit the growth of a dense understory of shrubs, particularly Sitka willow and red-osier dogwood.

Fingers of tidal emergent marsh and areas of pure scrub-shrub are intermixed with the spruce swamp (Maps 9a and 9b). The trunks and root masses of long-fallen trees form hummocks, where terrestrial mammals such as CWT deer can escape tidal flooding. The spruce cones provide a source of seeds for red crossbills, and the branches provide a nesting platform for great blue herons, bald eagles, and other birds. Sitka spruce swamps have been heavily impacted by land diking and clearing. Of the original 14,000 acres found in the estuary, only 2,200 acres remain (Christy and Putara, 1992).

Preservation of this habitat is a high priority for the refuge. Because these islands are outside of any flood protection dikes and subject to natural processes, little if any physical management actions are appropriate for these areas. The LCREP calls for the preservation of existing wetlands in the lower Columbia River.

Map 9a. Existing Vegetation - Lewis and Clark National Wildlife Refuge



Legend

Vegetation Class

- Estuarine and Palustrine Emergent Wetland – Tidal Marsh
- Palustrine Scrub-shrub Tidal Wetland
- Palustrine Deciduous Forested Tidal Wetland – Cottonwood/Willow Swamp
- Palustrine Evergreen Forested Tidal Wetland – Sitka Spruce Swamp
- Palustrine Emergent Wetland – Non-tidal Marsh
- Grassland
- Riparian Forest and Shrub
- Upland Conifer and Mixed Forest
- Riverine and Estuarine Unconsolidated Shore – Tidal Flats and Sandbars
- Riverine and Estuarine Unconsolidated Bottom
- Barren Land - Upland Dredge Spoil with Sparse Vegetation
- Low Intensity Developed

Refuge Land Status

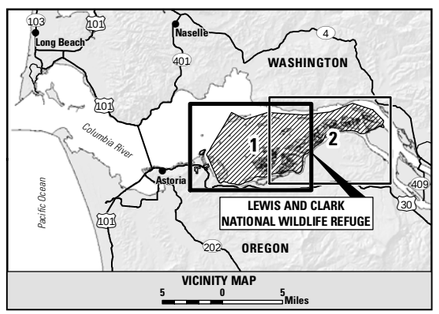
- Approved Refuge Boundary
- Refuge Managed Lands

Vegetation was interpreted and digitized from 2003 color infrared and 2005 true color aerial photography.

0 Miles 1

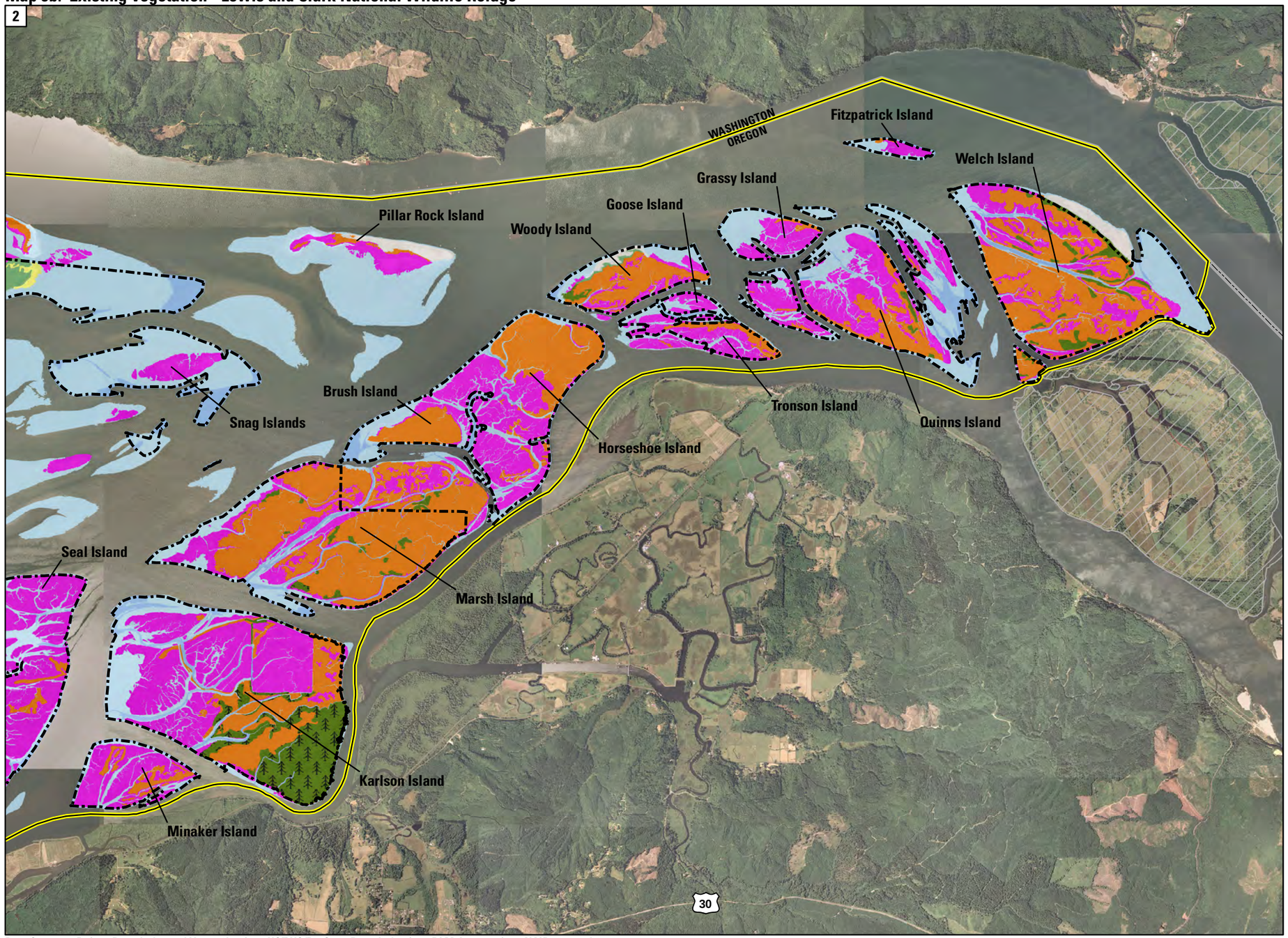
0 Kilometers 1

UTM ZONE 10N
NAD 83



Data Sources: Refuge Boundaries and Vegetation from USFWS/R1; State Boundaries from BLM; Imagery from NAIP 2005 and 2006

Map 9b. Existing Vegetation - Lewis and Clark National Wildlife Refuge



Legend

Vegetation Class

- Estuarine and Palustrine Emergent Wetland – Tidal Marsh
- Palustrine Scrub-shrub Tidal Wetland
- Palustrine Deciduous Forested Tidal Wetland – Cottonwood/Willow Swamp
- Palustrine Evergreen Forested Tidal Wetland – Sitka Spruce Swamp
- Riparian Forest and Shrub
- Grassland
- Riverine and Estuarine Unconsolidated Shore – Tidal Flats and Sandbars
- Riverine and Estuarine Unconsolidated Bottom
- Barren Land – Upland Dredge Spoil with Sparse Vegetation

Refuge Land Status

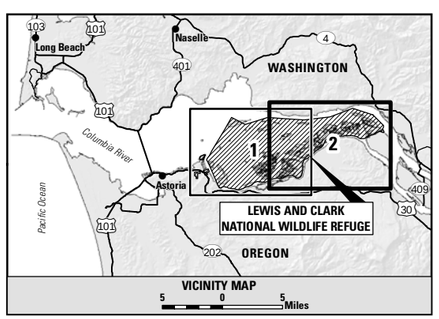
- Approved Refuge Boundary
- Refuge Managed Lands
- Julia Butler Hansen Refuge for the Columbian White-Tailed Deer

Vegetation was interpreted and digitized from 2003 color infrared and 2005 true color aerial photography.

0 Miles 1

0 Kilometers 1

UTM ZONE 10N
NAD 83



Data Sources: Refuge Boundaries and Vegetation from USFWS/R1; State Boundaries from BLM; Imagery from NAIP 2005 and 2006

2.8.1.3 Objective for Cottonwood/Willow Swamp

Throughout the life of the CCP, maintain and protect 120 acres of mid to late succession tidal cottonwood/willow swamp (Palustrine deciduous forested wetland) for the benefit of bald eagles, Swainson's thrush, and other native wildlife. Mid to late succession tidal cottonwood/willow swamp is characterized by the following: (1) A canopy cover with greater than 50 percent mature, native trees, including black cottonwood, tree willows, and Oregon ash; and (2) A shrub layer composed of native species including red osier dogwood, salmonberry, trailing blackberry, and shrub willows.

Strategies for Achieving the Objective	Alt.1	Alt. 2
A. Allow natural processes to drive vegetative changes.	✓	✓
B. Monitor vegetation changes over time and threats to the biological integrity such as contamination and invasive species.	✓	✓
C. Work with partners to control invasive species with IPM techniques using mechanical, physical, biological, and/or chemical means.	✓	✓

Rationale: The hydrology of the lower Columbia River and its estuary are related to daily tidal fluctuations. As it nears the ocean, the slowing current deposits the river's silt load to form low, marshy islands and sandbars with cottonwood/willow forested swamps. This habitat type is similar to the Sitka spruce swamp habitat, but it tends to be located further upriver. Although this habitat has a more significant cottonwood tree component, it is still affected by tidal fluctuations.

Because these islands are outside of any flood protection dikes and subject to natural processes, little if any active management is appropriate for these areas. These cottonwood/ willow forested swamps are a minor habitat type on the Lewis and Clark Refuge occurring mostly along the periphery of and along the banks (high ground) of interior sloughs of Lois, Miller Sands, and Karlson Islands in the downriver portion of the refuge; and on Welch and Quinns Islands in the upriver portion (Maps 9a and 9b). Even though the acreage is relatively small, these narrow swaths of habitat are important for a wide variety of forest wildlife including the focal species Swainson's thrush, red-legged frog, and bald eagle (nesting). Of the principle habitats of the Columbia River estuary, tidal swamps have been the most heavily impacted by human activities such as diking and drainage. The extent of the swamps has been reduced by approximately 77 percent since 1870 (Thomas 1983). The LCREP calls for preservation of existing wetlands in the lower Columbia River.

2.8.2 Goal 2. Protect Unique Palustrine and Estuarine Emergent Tidal Marsh, Characteristic of the Historic Lower Columbia River

2.8.2.1 Objective for Emergent Tidal Marsh

Throughout the life of the CCP, all existing acres of emergent tidal marsh (approximately 3,720 acres) will be preserved and protected for the needs of migratory waterfowl, salmonids, bald eagles, and a variety of other benefiting species. Habitat characteristics include:

- Marsh elevations between mean low low water (MLLW) and slightly above mean high high water (MHHW), dominated by herbaceous emergent vegetation and low shrubs, and often including tidal channels;
- Water depth from zero to three feet depending on river and tide levels; and
- Native emergent and submergent seed bearing vegetation including soft-stem bulrush, Lyngbye's sedge, smartweed, wapato, sedges, and rushes.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Allow natural processes to dictate vegetative changes and water depths.	✓	✓
B. Monitor vegetation and wildlife composition changes over time, and threats to biological integrity such as contamination and invasive species.	✓	✓
C. Work with partners to control invasive species with Integrated Pest Management (IPM) techniques using mechanical, physical, biological and/or chemical means.	✓	✓

Rationale: The tidal marshes on the refuge (Maps 9a and 9b) provide an extremely diverse habitat for a wide variety of species from waterfowl to fish to seals to birds of prey. These marshes are a major source of nutrients for aquatic life, including juvenile salmonids, in the estuary. They also provide forage for waterfowl and hunting grounds for bald eagles, northern harriers, peregrine falcons, and other raptors.

The management strategies used in this unique ecosystem are focused on protection of this special habitat. Because this habitat is outside of any flood protection dikes and subject to natural processes, little if any physical management actions are appropriate for these areas. Control of invasive species would likely provide the best opportunity to improve habitat in the emergent tidal marsh. Tidal marshes in the Columbia River estuary declined by 43 percent from historic levels (Thomas 1983). The LCREP calls for the preservation of existing wetlands in the lower Columbia River.

2.8.3 Goal 3. Protect Tidal Mudflats and Sandbar Habitats Characteristic of the Historic Lower Columbia River

2.8.3.1 Objective for Mud Flats and Sand Bars

Throughout the life of the CCP, protect all existing acres of sand bars and largely unvegetated mud flats (estimated 4,825 acres) for the needs of shorebirds, marine mammals, salmonids, and a variety of other benefiting species. Habitat characteristics include:

- Soft substrates for benthic invertebrates;
- Sand bars for haul-outs of marine mammals; and
- No vegetation present.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Allow natural processes to dictate availability of open habitat.	✓	✓
B. Monitor vegetation and wildlife composition changes over time, and threats to biological integrity such as contamination and invasive species	✓	✓
C. Work with partners to control invasive species with IPM techniques using mechanical, physical, biological and/or chemical means.	✓	✓

Rationale: The largely unvegetated mud flats and sandbars are generally exposed twice daily at low tide (Maps 9a and 9b). Large numbers of invertebrates thrive in this habitat. The amphipod *Corophium salmonis* is particularly abundant and is an important food of juvenile salmon (NOAA 1995). Shorebirds forage almost exclusively on the mud and sand flats. Upwards of 100,000 shorebirds may be present in the estuary during spring migration. Seals and sea lions haul out on the sandbars to rest. Because this habitat is outside of any flood protection dikes and subject to natural processes, only limited management actions are appropriate.

Sanderlings and other shorebirds forage for invertebrates on refuge sand bars and mudflats.

Photo: USFWS

2.8.4 Goal 4. Protect Upland Forest Characteristic of the Historic Lower Columbia River for Marbled Murrelets, Bald Eagles, Forest Birds, and a Diverse Assemblage of Other Native Species

2.8.4.1 Objective for Upland Forest

Throughout the life of the CCP, protect all existing acres of upland coniferous forest (approximately 89 acres) for migratory landbirds and bald eagles. The forest is characterized by:

- Large, dominant or co-dominant trees (live and dead) in a heterogeneous stand of mature or old-growth coniferous forest dominated by western hemlock, and located near large bodies of water for bald eagle nesting habitat; and
- Relatively open canopies with some habitat discontinuity or edge, or much foliage height diversity, providing access to trees for potential marbled murrelet nesting.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Allow natural processes to dictate vegetative changes.	✓	✓
B. Monitor vegetation and wildlife composition changes over time and threats to biological integrity such as contamination and invasive species.	✓	✓
C. Work with partners to control invasive species with Integrated Pest Management techniques using mechanical, physical, biological and/or chemical means.	✓	✓

Rationale: There are few habitat types on the refuge protected from the daily tidal cycles of the lower Columbia River. This forest habitat is different than all other refuge habitats in that it resides outside the estuary boundaries. The forested hillsides provide cover for a variety of forest dwelling birds such as the varied thrush, brown creeper, and pileated woodpecker. This habitat has historically been utilized by bald eagles for nesting, foraging, and perching.

The Emerald Heights Unit is an 89-acre parcel located just south of Tongue Point and Oregon Highway 30. The unit's elevations range from 50 feet to 266 feet. The unit is completely forested, with 120-year-old western hemlock being the dominant species. Sitka spruce are scattered throughout the stand. The southwest part of the unit contains a small amount of 65-year-old western hemlock, Sitka spruce, Douglas fir, and western red alder (Maps 9a and 9b).

2.8.4.2 Objective for Riparian Forest

Throughout the life of the CCP, protect all existing acres of riparian forest (approximately 470 acres) for migratory landbirds and bald eagles. This habitat is characterized by:

- Late succession forest, with a heterogeneous stand of mature or old-growth tree species, adjacent to water, consisting of mature western hemlock/Sitka spruce/western red alder forest with some Douglas-fir and bigleaf maple.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Allow natural processes to dictate vegetative changes.	✓	✓
B. Monitor vegetation and wildlife composition changes over time and threats to biological integrity such as contamination and invasive species.	✓	✓
C. Work with partners to control invasive species with IPM techniques using mechanical, physical, biological and/or chemical means.	✓	✓

Rationale: There are few habitat types on the refuge that are protected from the daily tidal cycles of the lower Columbia River. The riparian forests provide cover for a variety of forest dwelling birds such as the varied thrush, brown creeper, and pileated woodpecker. This habitat has historically been utilized by bald eagles for nesting, foraging, and perching.

The Tongue Point Unit comprises 79 acres at the northern tip of the point. The vegetation is mature western hemlock/Sitka spruce/western red alder forest with some Douglas-fir and big-leaf maple. The topography is essentially a hill, with steep to moderate slopes rising from the water to a crest. The west slope has a steep (95 percent) slope and there are tall cliffs in the northwest corner, where an old rock pit and shooting range were once located. The unit is bordered on the south by the Tongue Point Job Corps Center and a USCG Navigation Station. Other riparian forest habitats, primarily dominated by black cottonwood, are located at Lois and Miller Sands Islands (292 and 94 acres respectively), and smaller fragments elsewhere (Maps 9a and 9b).

Riparian forest habitat. Photo: Rebecca Young / USFWS

2.8.5 Goal 5. Protect Riverine and Estuarine Open Water and Slough Habitats Characteristic of the Historic Lower Columbia River Estuary

2.8.5.1 Objective for Open Water

Throughout the life of the CCP, the refuge will protect 1,360 acres of open water and slough habitat in the lower Columbia River—for migrating and rearing salmonids, wintering and foraging waterfowl, and resting and foraging marine mammals—characterized by:

- Medium to deep water depths (elevations from 3 feet to more than 18 feet below MLLW); and
- Shallows and flats (elevations between MLLW and 6 feet below MLLW) absent of vegetation.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Allow natural processes to dictate vegetative changes and water depths.	✓	✓
B. Work with other agencies and partners to reduce contaminants.	✓	✓
C. Work with other agencies and partners to preserve and protect open water habitat for wildlife.	✓	✓
D. Monitor vegetation and wildlife composition changes over time (indentify threats to the biological integrity).	✓	✓

Rationale: The open water channels and sloughs of the river are home to fish and a variety of invertebrate animals and aquatic plants. They serve as pathways for adult salmon, shad, eulachon, lamprey, and steelhead migrating upriver to spawn, and for juveniles moving downstream to the ocean. White sturgeon forage in the deeper channels and holes. Clams, mussels, aquatic worms, amphipods, and other small organisms are found on the bottom. Rooted aquatic plants are scarce in the main channels because of the strong, erosive currents, but are found in backwaters.

Through an active role in local, state and Federal partnerships, the refuge would work to maintain the water quality and ecological integrity of the lower Columbia River estuary to provide resting and foraging habitat for waterfowl, shorebirds, and marsh and wading birds; and maintain or enhance migratory fish populations, including endangered salmonids. Although much of the estuary's open water habitat is within the designated boundaries of the refuge, the refuge has limited authority over the activities that occur in these waters. The USCG has authority over navigable waters in the river, and ODSL controls much, but not all of the river bottom and tidelands. Also, the Columbia River ship channel which runs though much of the refuge is an integral part of the transportation system in the Pacific Northwest.

The refuge must work with these and other partners such as the Corps (river maintenance authority), in order to provide the necessary protection to wildlife in these open water locations and the adjacent river islands and tidal sloughs. As with other estuary habitats, these areas are outside of any flood protection dikes and subject to natural processes, therefore, little if any physical management actions are appropriate for these areas.

2.8.6 Goal 6. Foster and Strengthen Partnerships to Enhance Estuary Protection, Wildlife and Habitat Conservation, and Public Understanding and Appreciation of the Natural Resources in the Lower Columbia River Estuary

2.8.6.1 Objective for Oregon Department of State Lands

Within 5 years of completing the CCP, the refuge will work with ODSL to develop an agreement covering issues such as land exchanges, acquisitions, public uses, and development of other specific management agreements on lands and waters within refuge boundaries.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Meet with ODSL representatives to discuss management options on ODSL lands.		✓
B. Work with ODSL to acquire islands and tidelands within the acquisition boundary as the opportunity exists.		✓
C. Draft an interim State Lands management agreement for review.		✓

Rationale: Not all the islands within the boundaries of the refuge are owned by the Service. A portion of the islands in the lower river estuary within the Lewis and Clark Refuge's boundary are owned and managed by the ODSL. In order to provide the highest level of protection to wildlife and habitat both on and adjacent to refuge uplands and tidelands, the Service would work with the ODSL to develop a management agreement to increase habitat protection for all lands within the boundaries of the refuge. Of particular importance are the public use activities which occur inside the refuge acquisition boundary. A balanced approach which puts the needs of wildlife first, but still recognizes the need for wildlife-dependent recreation along with State mandated laws, will be the focus of this management agreement.

2.8.6.2 Objective for Lower Columbia River Estuary

Throughout the life of the CCP, the refuge will initiate, develop, and continue to strengthen partnerships with interested groups to protect, maintain, and enhance the natural resources of the lower Columbia River estuary.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Maintain a working relationship with the USCG to alert in case of law enforcement incidents in the estuary.	✓	✓
B. Work with partners to identify, monitor, and control invasive species.	✓	✓
C. Cooperate with National Park Service and others to explore Natural Heritage Area designation for the lower Columbia River.		✓
D. Work with other organizations to develop outreach and education programs on the lower Columbia River estuary.		✓

Rationale: Refuge jurisdiction is generally limited to areas down to mean high tide within the boundaries of the Lewis and Clark Refuge. Therefore, partnerships with other Federal and state agencies, local communities, anglers, watershed associations, conservation groups, and researchers are essential to improving habitat on the refuge and in adjacent areas of the lower Columbia River estuary. Resources in the estuary waters include anadromous fish; wintering, migratory, and breeding waterfowl and waterbirds; seabirds; and marine mammals. There are many jurisdictions and sometimes competing national interests in the estuary. States have authority over submerged lands and overlying water in the estuary, while the USCG oversees law enforcement of navigable waters.

In the report America's Living Oceans Charting a Course for a Sea of Change (Pew Oceans Commission 2003), threats to the overall ocean ecosystem is linked to activities on land. Millions of people live and work on tributaries adjacent to the Columbia River. Threats to the river and estuary ecosystem include nonpoint source pollution (i.e., oil runoff from streets and driveways and nitrogen release), point source pollution (i.e., waste from feedlots and industry), invasive species, aquaculture (i.e., accidental escape of fish, nitrogen, phosphorus and fecal matter discharge), coastal development, over fishing, bycatch, and climate.

The Pew Commission's documentation shows that coastal development and associated sprawl destroys and endangers 20,000 acres of coastal wetlands and estuaries each year that serve as nurseries for fish, and "paved surfaces have created expressways for oil, grease, and toxic pollutants into coastal waters." In addition to raising alarms nationally about the state of our marine and estuarine waters, the Pew Commission provided a detailed set of recommendations toward a more sustainable future for coastal ecosystems. Many of the recommendations are beyond the scope of the Lewis and Clark Refuge; however, the refuge can contribute in several areas including confronting urban sprawl and controlling invasive species.

2.8.6.3 Objective for Dredge Spoil Islands

Throughout the life of the CCP, coordinate with estuary partners to manage dredge spoil islands within the refuge acquisition boundary for the benefit of streaked horned larks, other migratory birds, and benefiting wildlife species.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Work with the Corps to develop a plan for sequencing dredge material placement, to maintain sparsely vegetated habitat for streaked horned larks on refuge managed dredge spoils.		✓
B. Where appropriate, work with other agencies to establish vegetation on selected sites for the benefit of wildlife species.	✓	✓
C. Work with partners to control invasive species such as Scotch broom using IPM techniques.	✓	✓

Rationale: The sandy dredge spoil islands constitute a unique habitat. The vegetation ranges from none on recent spoil sites to dense growths of shrubs and trees on old sites. Most of these islands are active disposal sites and the defining vegetative characteristic is a sparse growth of grasses, forbs, and shrubs. The lack of vegetation and absence of mammalian predators make the islands an attractive nesting location for colonial waterbirds such as glaucous-winged and western gulls, Caspian terns, and double-crested cormorants. Canada geese also nest on the spoil islands. The rare streaked horned lark is fairly common here.

Not all the islands within the boundaries of the refuge are owned by the Service. Many of the islands in the lower river estuary are owned and managed by the ODSL. Many of the ODSL lands primarily consist of sand and are used as dredge spoil sites, which are continually being replenished with sand from dredging on the lower Columbia River. Wildlife values on the dredge spoil islands are generally very different than in other areas of the estuary. Both short and long term habitat\wildlife objectives are needed for these areas and the refuge will be working with other involved agencies to begin a dialogue on the wildlife values for these areas.

2.8.6.4 Objective for Pest Management

Develop partnerships to support the achievement of refuge habitat objectives regarding (Objectives 2.8.1.1, 2.8.1.2, 2.8.1.3, 2.8.2.1, 2.8.3.1, 2.8.4.1, and 2.8.4.2) control, and where possible eradication, of invasive plant and animal species using IPM strategies. The tolerable threshold for treatment of established invasive plants is 10 percent cover; however, the threshold for treatment of new invasive species is presence.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Work with the states to monitor and control invasive species through mechanical, biological, and/or chemical means.	✓	✓
B. Share training opportunities and information with members of the public, other groups, and other agencies.		✓
C. Share equipment and resources for collaborative projects with other agencies, groups, and landowners.		✓
D. Identify high priority areas for intensive control and monitoring.	✓	✓
E. Control invasive animal species such as nutria and the New Zealand mud snail using all appropriate methods.	✓	✓
F. Focus on prevention by communicating with landowners, recreational users of the estuary, and members of the general public.		✓

Rationale: Expansion of invasive plants (including noxious weeds) in the estuary continues to be one of the more serious issues affecting the refuge. Being at the lower end of the entire Columbia River system presents challenges as seeds and other plant debris are funneled down through the lower river islands, where they tend to become established. Because of the immense area included within the refuge boundary—more than 30,000 acres—much of the initial work would likely involve monitoring of invasives to determine extent of infestation

and control needs. Coordination with a variety of other groups and agencies will be required to make an impact, and funding will need to be secured before any wide scale control efforts can begin in such a dynamic ecosystem. Targeted efforts with minimal funding and staffing may be successful in smaller areas where the weeds are just beginning to take hold.

Aerial photo of some of the Julia Butler Hansen Refuge (foreground) and Lewis and Clark Refuge (islands across the river). Photo: Rebecca Young / USFWS

2.8.7 Goal 7. Gather Scientific Information (Inventories, Monitoring, Research, and Studies) in Support of Adaptive Management Decisions on the Refuge under Goals 1 Through 6.

2.8.7.1 Objective for Research, Monitoring and Inventory of Habitats and Wildlife

Throughout the life of the CCP, conduct research, monitoring, and inventory of wildlife and habitats, to provide information for management decision making.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Monitor species composition and distribution, and the timing of refuge use by migratory birds, including a mid-winter waterfowl survey, a bald eagle survey, and a dusky Canada goose survey.	✓	✓
B. Work with graduate school programs and others (e.g., appropriate agencies and groups) to conduct research and monitoring studies.		✓
C. Monitor the species composition, distribution, and life history attributes of fishery resources.		✓
D. Maintain a full time refuge biologist to ensure biological information is obtained for management actions and regional/national data needs.	✓	✓
E. Conduct wilderness study.		✓

Rationale: Monitoring and research are essential to assessing the progress we have made toward achieving habitat and population management goals and objectives. Wildlife population and habitat management practices must be monitored to evaluate their effectiveness. Refuges must collect site specific information and conduct defensible research to design and implement management practices. The refuge spans nearly the entire width of the Columbia River estuary. For threatened/endangered salmonids, eight Evolutionarily Significant Units (ESUs) of Pacific salmon and five Distinct Population Segments (DPSs) of steelhead occur within refuge waters; however, very little is known about the interactions between these fish and refuge habitat. Additional research is needed on salmonid use of refuge habitats, and potential impacts of invasive plant and animal species at the refuge.

Conduct a wilderness study to identify which islands, if any, contain the necessary wilderness elements such as primeval character, solitude, and special features of value (e.g., ecological, geological, or other features of scientific, educational, scenic, or historical value). The study findings will determine whether or not the study areas merit recommendation for inclusion in the Wilderness System. The wilderness inventory is part of the Draft CCP/EIS (Appendix E).

A biologist using radio telemetry to track and monitor Columbian white-tailed deer.
Photo: USFWS

2.8.8 Goal 8. Provide a Variety of Quality, Wildlife-dependent Recreational Opportunities Focusing on Lewis and Clark Refuge's Unique Solitude and Abundant Wildlife Resources While Minimizing Negative Impacts on Wildlife

2.8.8.1 Objective for Hunting

Throughout the life of the CCP, maintain opportunities for quality waterfowl and snipe hunting and maintain current waterfowl sanctuary area.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Improve signage.	✓	✓
B. Update maps and hunting brochures for the public.	✓	✓
C. Increase law enforcement to ensure quality hunting experiences for hunters.	✓	✓
D. Work with the State on law enforcement issues and regulation publications.	✓	✓

Rationale: Waterfowl hunting is a traditional use of the refuge and surrounding area in both Washington and Oregon (Map 10). This compatible, wildlife-dependent public use provides waterfowl hunters and others an opportunity to find solitude on the waters and shorelines of refuge islands. Access is by boat only in a remote area of the lower Columbia River, which generally limits the number of hunters on the refuge. Hunters on refuge islands are generally contained to shorelines, the interiors are largely inaccessible due to the islands' dense vegetation. A waterfowl sanctuary encompassing 1,760 acres is closed to hunting, in accordance with the Duck Stamp Act.

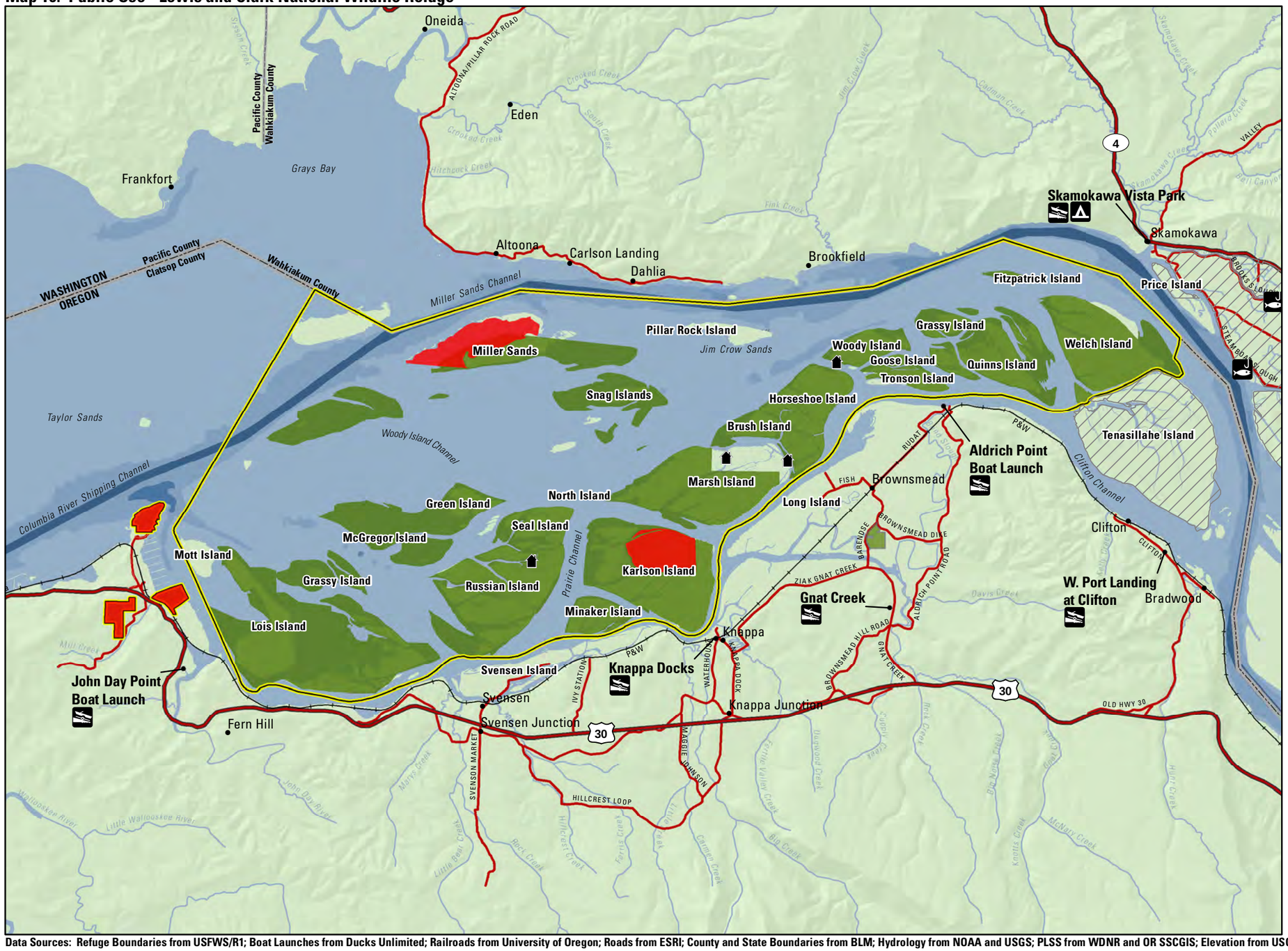
2.8.8.2 Objective for Fishing

Throughout the life of the CCP, anglers will be provided with the opportunity to enjoy fishing experiences unique to the lower Columbia River estuary and associated waterways.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Improve signage.	✓	✓
B. Update maps and fishing brochures for the public.	✓	✓
C. Increase law enforcement to ensure quality, public fishing experiences.	✓	✓
D. Work with state agencies on law enforcement issues including publishing regulations.	✓	✓

Rationale: Anglers enjoy fishing in refuge waters, including channels, sloughs and open waters. This activity would remain along the perimeter of the islands of Lewis and Clark Refuge. Most of the fishing occurs from boats in the State's navigable waterways and is a traditional outdoor activity. Boat access is provided by off-refuge boat ramps identified on Map 10. Fish resources include salmon, steelhead and sturgeon.

Map 10. Public Use - Lewis and Clark National Wildlife Refuge



Legend

Public Use

- Boat Launch
- Camping
- Fishing
- Closed to Waterfowl Hunting

Refuge Land Status

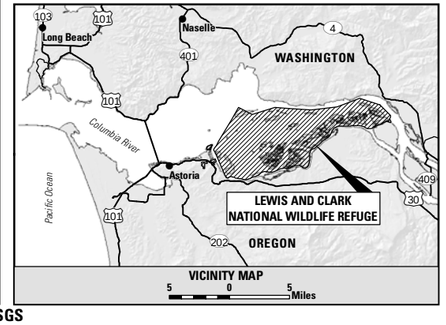
- Approved Refuge Boundary
- Refuge Managed Lands
- Easement (Tongue Point Road)
- Private Floathouses

All refuge lands closed to all hunting except for waterfowl hunting. Waters around the refuge are open to fishing in accordance with state regulations. Bank fishing is permitted along open shorelines.

0 Miles 2

0 Kilometers 2

UTM ZONE 10N
NAD 83



Data Sources: Refuge Boundaries from USFWS/R1; Boat Launches from Ducks Unlimited; Railroads from University of Oregon; Roads from ESRI; County and State Boundaries from BLM; Hydrology from NOAA and USGS; PLSS from WDNR and OR SSCGIS; Elevation from USGS

2.8.8.3 Objective for Education and Interpretation

Throughout the life of the CCP, refuge staff and volunteers will work with other agencies and organizations to develop, conduct, or host environmental education and interpretation programs which focus on the unique qualities of the lower Columbia River estuary.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Refuge staff members and volunteers will provide refuge information at one or more community festivals or events each year.		✓
B. Work with area schools and volunteers to develop refuge awareness.	✓	✓
C. Maintain and develop partnerships with other organizations such as school districts, the lower Columbia River Estuary Partnership, volunteers, and others to conduct and develop education programs.	✓	✓
D. Work with nearby landowners to develop campsites for use by refuge visitors and others.		✓

Rationale: Because the Lewis and Clark Refuge largely consists of islands located in the Columbia River, hosting environmental and interpretive programs on the refuge is impractical. Large groups would displace wildlife from the refuge's relatively small land area and shallow water feeding grounds. By partnering with other organizations, the refuge can still educate the public about topics of concern such as endangered species, water quality, and refuge goals.

2.8.8.4 Objective for Wildlife Observation and Photography

Throughout the life of the CCP, the public will continue to have a unique opportunity to photograph and observe wildlife in the pristine, natural setting of the refuge.

Strategies for Achieving the Objective	Alt. 1	Alt. 2
A. Work with other groups to develop safe, educational water trails that minimize disturbance to wildlife.		✓
B. Work with partners to produce a map of water trails for refuge visitors.		✓
C. Eliminate illegal camping on refuge lands to protect wildlife.	✓	✓
D. Work with nearby landowners to develop campsites for use by refuge visitors and others.		✓

Rationale: Most wildlife observation and photography occurs in combination with various forms of boating activities on the Columbia River and within the estuary, including kayaking and canoeing. The Washington Water Trails Association has developed a Columbia River Trails System for boaters, primarily kayakers and canoeists. Partnering with the boating community and providing important refuge information; identifying points of interest and locating trails away from sensitive habitats and wildlife needing protection (closed zones, nesting areas), is needed to help protect refuge resources. Developing partnerships is needed to identify and locate camping areas off refuge property for boating visitors.

2.9 Julia Butler Hansen Refuge for the Columbian White-tailed Deer Goals, Objectives, and Strategies

Prior to European settlement of the area in the late 19th century and the construction of dikes to prevent tidal flooding in the early 20th century, all refuge lands were subject to routine and natural tidal inundation. Refuge habitats were historically a mix of tidal forested swamp, tidal emergent marsh, and tidal channels. The construction of dikes around much of the areas that now compose the refuge's Mainland and Tenasillahe Island units drastically changed the habitat types where tidal swamps and marsh were displaced by riparian woodlots and agricultural lands. Other refuge units, however, including Price, Hunting, and Wallace Island, remain in a relatively natural state, except that Columbia Basin dams have altered the water flow regime in the river. Crims Island is unique because tidal flow has been reestablished to a large portion of the island.

2.9.1 Goal 1. Provide Short-Grass Fields for the Benefit of Columbian White-tailed Deer, Dusky Canada Geese, and Other Grassland Dependent Wildlife.

(*Note: Goals 1, 2, and 3, pertain to Julia Butler Hansen Refuge's Lands Enclosed Within Dikes with little or no tidal inundation.)*

2.9.1.1 Objective for Short-grass Fields

Throughout the life of the CCP, maintain between 680 acres and 790 acres split between the Mainland and Tenasillahe Island units as short-grass fields protected from riverine fluctuations. Because actively growing grasses will provide quality foraging habitat for CWT deer, dusky Canada geese, and other grassland wildlife, these short-grass fields will be characterized by:

- An average height of 4-6 inches during the winter (Dec-Feb);
- A field size large than 50 acres within approximately 820-feet of riparian forest habitat (Goal 2) to allow maximum use by CWT deer;
- A composition of 20-40 percent clover, birdsfoot trefoil, and native forbs;
- A composition of 20 percent orchard grass;
- A composition of 20 percent timothy and ryegrass;
- A maximum composition of 30-40 percent unpalatable/invasive plant species including reed canary grass, thistle, tussock, and tall fescue.

Alternatives	**Alt. 1**	**Alt. 2**	**Alt. 3**
Acres managed to achieve objectives by alternative	**140-680**	**680-790**	**140-680**
Strategies for Achieving the Objective			
A. Mow fields (when not grazing livestock) to a height of 4-6 inches at least twice per year, once in July and once in mid-September to mid-October. An early mowing in May is desirable if fields are dry enough.	✓	✓	✓

B. Graze livestock in fenced pastures from mid-April to early October. Use rotational grazing so that livestock are moved periodically from one pasture to another to maintain a vegetation height of 4-6 inches.	✓	✓	✓
C. Manage short-grass fields by haying during the summer months.	✓	✓	✓
D. Plow, disk, reseed, and fertilize fields that have a cover of unpalatable/invasive plant species greater than 50 percent.	✓	✓	✓
E. Control invasive or undesirable plant species with IPM techniques using mechanical, physical, biological, and/or chemical means.	✓	✓	✓
F. Maintain the integrity of the refuge's managed habitats by maintaining the dikes on the Tenasillahe Island and Mainland units.	✓	✓	✓

Rationale: Immature (palatable), nutritious grasses are an important food source for CWT deer on the refuge's Mainland and Tenasillahe Island units. A food habits study conducted by the refuge found that grasses comprised more than 50 percent of the CWT deer's diet during the winter months. Suring (1979) and Gavin (1984) also noted high use of grasses by CWT deer. Creeping buttercup and white clover (forbs heavily utilized by foraging deer) thrive in short-grass fields. Canada geese (including Dusky and cackling geese) utilize the refuge and forage exclusively in short-grass fields and marshes. Raptors such as red-tailed hawks, northern harriers, American kestrels, and various species of owls utilize the short-grass fields as foraging grounds.

It is important to maintain the grass in a short, immature growth form by repeated mowing or livestock grazing during the growing season prior to arrival of migrating waterfowl. Once grass matures, it becomes coarse, much less digestible, and has less protein (Blair et al. 1977). Deer on the refuges prefer grazed fields over mowed fields for winter forage (Gavin 1984). Managed short-grass fields and other habitats for the CWT deer on the Tenasillahe Island and Mainland units (Map 11) require protection from inundation by the daily tidal cycles of the Columbia River; therefore, maintaining the integrity of the dikes is necessary for protecting CWT deer.

2.9.2. Goal 2. Restore and Maintain Riparian Forests with Diverse Age and Structural Features Characteristic of the Historic Lower Columbia River

(*Note: Goals 1, 2, and 3, pertain to Julia Butler Hansen Refuge's Lands Enclosed Within Dikes with little or no tidal inundation.)*

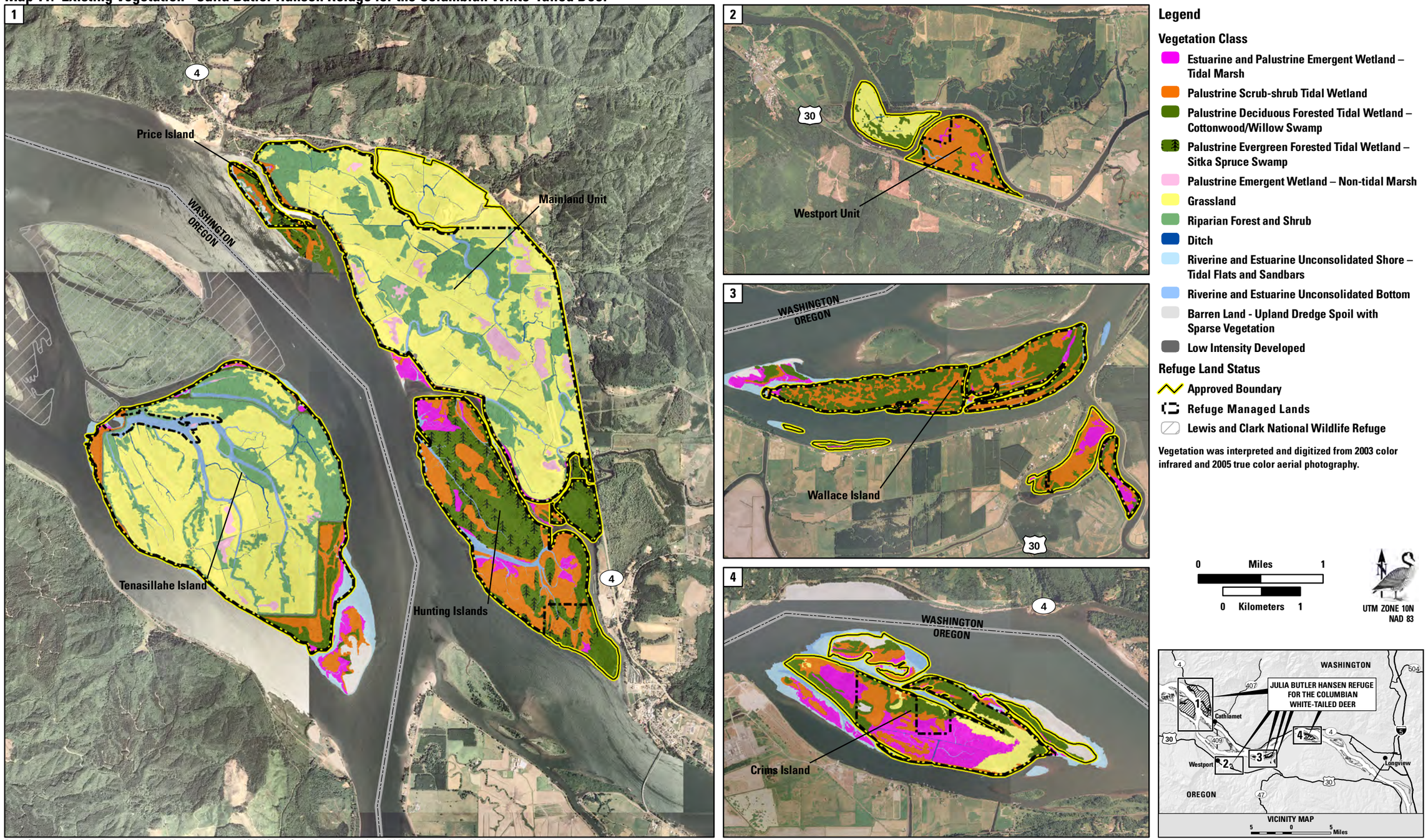
2.9.2.1 Objective for Early-successional Riparian Forest

Throughout the life of the CCP, establish a minimum of 210 acres or more of early-successional riparian forest on the Mainland Unit and 70 acres on the Tenasillahe Island Unit; maintain 120 acres of the Crims Island Unit for the benefit of CWT deer, migratory landbirds and resident birds, native reptiles and amphibians, and other riparian dependent wildlife. Establish an additional 100 acres under Alternative 2 on the Mainland Unit. Early-successional riparian forest is characterized as follows:

- Predominantly composed of native shrubs and small trees less than 30 feet tall, including red osier dogwood, salmonberry, Pacific nine-bark, willow sp., Sitka spruce, red cedar, red alder, and black cottonwood;
- Relatively few trees taller than 30 feet; and
- Trees are shallowly rooted in the refuge's wet soils so wind damage and natural tree diseases will continually create openings that stimulate understory vegetation for CWT deer, migratory landbirds, and small mammals.

Alternatives	**Alt. 1**	**Alt. 2**	**Alt. 3**
Acres managed to achieve objectives by alternative	**400**	**500**	**400**
Strategies for Achieving the Objective			
A. Plant tree and shrub seedlings in selected areas. Fence the planted seedlings to exclude deer and elk when seedlings are small and fencing is reasonably cost efficient. Remove fencing when most seedlings are taller than 10 feet (usually after the third growing season).	✓	✓	✓
B. Maintain newly established riparian forest on Crims Island.	✓	✓	✓
C. Evaluate disking grassy areas as a tool to encourage natural seeding of trees and shrubs.	✓	✓	✓
D. Use tree protectors on seedlings to prevent damage from meadow voles.	✓	✓	✓
E. Control invasive or undesirable plant species with IPM techniques using mechanical, physical, biological and/or chemical means.	✓	✓	✓
F. Control beaver and other wildlife damage when necessary using fencing, trapping, and where appropriate, lethal control.	✓	✓	✓
G. Establish riparian forest along slough banks to lower water temperatures (by shading and lower soil temps) and reduce erosion.	✓	✓	✓

Map 11. Existing Vegetation - Julia Butler Hansen Refuge for the Columbian White-Tailed Deer



Data Sources: Refuge Boundaries and Vegetation from USFWS/R1; State Boundaries from BLM; Imagery from NAIP 2005 and 2006

Rationale: Riparian forest provides both cover and browse (leaves and stems of woody plants) for CWT deer. The deer seldom stray far from cover, and trees and shrubs are preferred for cover over tall grasses and forbs (Suring 1979). Forest understory shrubs are a major source of browse, which constitutes 20-30 percent of the deer's diet during winter and spring (food habits study). Palatable browse plants such as red osier dogwood and Pacific nine-bark are among the deer's most preferred food items during winter (Dublin 1980). Early-successional riparian forest is characterized by an abundance of shrubs that provide browse. The forest floor also provides palatable grasses and forbs for CWT deer. The shrubby, early successional forest is habitat for migratory landbirds, including yellow warblers and rufous hummingbirds. Red-legged frogs frequent all stages of forest succession.

Early-successional forest is a transitional stage. These stands will grow over time into mid-successional and finally late-successional (mature) stages. This is a desirable progression, and the refuge does not intend to hold back succession by cutting larger trees. Rather, new stands will be created in existing fields largely dominated by reed canary grass until the goal of 50 percent forest cover is attained. Trees are shallowly rooted in the refuge's wet soils, so wind damage and natural tree diseases will continually create openings that stimulate understory vegetation and achieve a desirable forest structure for priority wildlife species. Note: the 50 percent figure when achieved will involve a total of approximately 920 acres of planted early successional riparian forests plus 92 acres of mid-successional forests and 875 acres of late successional forests for both the Mainland and Tenasillahe Island units (Map11).

2.9.2.2 Objective for Mid-successional Riparian Forest

Throughout the life of the CCP, enhance and maintain 70 acres on the Mainland Unit and 22 acres on the Tenasillahe Island Unit of existing mid-successional riparian forest for the benefit of the CWT deer and other riparian dependent wildlife. Mid-successional riparian forest is characterized by:

- A canopy cover of less than 70 percent;
- A canopy and subcanopy composed of native species, including Sitka spruce, black cottonwood, red alder, and red cedar; and
- A shrub layer of native species, including red osier dogwood, salmonberry, nine-bark, trailing blackberry, and willows.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. As specified in the refuge's elk management plan, maintain an elk herd of 20 elk or less, to prevent over browsing of understory shrubs.	✓	✓	✓
B. Control invasive or undesirable plant species with IPM techniques using mechanical, physical, biological, and/or chemical means.	✓	✓	✓
C. Consider selective thinning of planted stands if canopy cover is greater than 70 percent, to allow light penetration to stimulate growth of understory shrubs and herbaceous species.		✓	
D. Use fencing to protect forested areas from livestock grazing in short-grass fields.	✓	✓	✓

Rationale: During the life of the CCP, the existing 92 acres of planted early-successional riparian forest (Map 11) will naturally transition into mid-successional forest. This forest habitat will benefit CWT deer during the winter by providing thermal and hiding cover. The early-successional stands are usually planted thickly to compensate for expected losses to deer, elk, meadow voles, and grass competition. It may be necessary to selectively thin stands with high tree survival to achieve a multi-layered, varied mid-successional forest, to benefit native wildlife species such as Cooper's hawk, red-eyed vireo, band-tailed pigeon, Swainson's thrush, yellow warbler, and red-legged frog.

2.9.2.3 Objective for Late-successional Riparian Forest

Throughout the life of the CCP, enhance and maintain 445 acres on the Mainland Unit and 430 acres on Tenasillahe Island Unit as late-successional riparian forest characterized by:

- A canopy cover of more than 50 percent mature trees, including native species such as Sitka spruce, black cottonwood, red alder, and red cedar.
- A cover of more than 50 percent shrubs, including native species such as salmonberry, red-osier dogwood, willows, and Pacific nine-bark (along slough edges).

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. As specified in the refuge's elk management plan, maintain elk herd at 20 elk or less to prevent over browsing.	✓	✓	✓
B. Control invasive or undesirable plant species with IPM techniques using mechanical, physical, biological and/or chemical means.	✓	✓	✓
C. Use fencing to exclude livestock grazing in short-grass fields from forested areas.	✓	✓	✓
D. If a stand is dominated by one or two tree species (e.g., red alder and black cottonwood), under-plant Sitka spruce and red cedar in openings to enhance forest diversity.		✓	

Rationale: The existing 875 acres of remnant forest on the diked portions of the Mainland and Tenasillahe Island units (Map 11) will be managed as late-successional riparian forest. For much of this acreage, management will be limited to habitat protection and invasive species control. Wind throw and natural disease losses will periodically topple some larger trees and create openings where shrubs and tree seedlings can thrive, and naturally create a multi-layered, structurally diverse forest. The old-growth forest will be dominated by Sitka spruce with some red cedar and scattered red alder and black cottonwood. The late-successional forest provides most of the wildlife benefits of early- and mid-successional forest because of the abundant understory in the openings and around the edges. In addition, the late-successional forest contains large snags that benefit species such as Vaux's swift and purple martin. The older trees contain cavities for cavity nesting birds such as the wood duck. Because this late-successional forest type is under represented in the lower Columbia River, it is important for biological integrity, diversity, and environmental health. Natural processes will drive the structure, composition, and function of this habitat type. Active management will sustain or mimic natural processes in late-successional riparian forest.

2.9.3 Goal 3. Restore and maintain nontidal wetlands and sloughs as a mosaic with other refuge habitat types, especially riparian forest and short grass fields.

(*Note: Goals 1, 2, and 3, pertain to Julia Butler Hansen Refuge's Lands Enclosed Within Dikes with little or no tidal inundation.)*

2.9.3.1 Objective for Nontidal Wetlands

Throughout the life of the CCP, restore and maintain 125 acres (105 acres existing; 20 acres to be restored) on the Mainland Unit and 45 acres (25 acres existing; 20 acres to be restored) on Tenasillahe Island Unit as nontidal marshes (palustrine emergent wetlands) for the benefit of CWT deer, waterfowl, other waterbirds, and amphibians. These nontidal wetlands will have the following attributes:

- Less than 30 acres.
- Cover of more than 40 percent desirable native wetland plants (such as smartweeds) and emergent vegetation (e.g., bulrushes, wapato, cattail) in the fall.
- Invasive plant species such as purple loosestrife will be maintained at less than 5 percent cover in the wetlands. Invasive plant species such as reed canary grass and common rush will be maintained at less than 40 percent plant species composition.
- Seasonally (approximately October through June) flooded to a depth of 4-18 inches.

Alternatives	**Alt. 1**	**Alt. 2**	**Alt.3**
Acres managed to achieve objectives by alternative	**130**	**130-170**	**130**
Strategies for Achieving the Objective			
A. Manage water levels at desired depths by installing water control structures.	✓	✓	✓
B. Excavate and contour wetland basins to ensure water depth and habitat heterogeneity as well as manage invasive species.		✓	
C. Disk wetlands to promote germination of native aquatic and desirable forage species for waterfowl.	✓	✓	
D. Control invasive or undesirable plant species with IPM techniques using mechanical, physical, biological and/or chemical means.	✓	✓	✓
E. Place large woody debris in wetlands to provide habitat for amphibians.	✓	✓	
F. Control nonnative nutria population to enhance the growth of desirable wetland plants, when necessary.	✓	✓	

Rationale: Seasonal nontidal wetlands occur naturally in low areas of the Mainland and Tenasillahe Island units (Map 11). Without active management, these areas are dominated by invasive plants such as reed canarygrass and common rush (tussock). Recontouring wetlands to increase depth and installing water control structures will greatly enhance the wildlife values of these wetlands. Desirable wetland plant species such as spike rush, bulrush, smartweed, and bur-reed become established and provide forage for waterfowl. The managed

wetlands hold water longer into the summer, providing breeding habitat for native amphibians such as red-legged frogs, Pacific chorus (tree) frogs, and long-toed salamanders. Periodic draining in summer (after the amphibian larvae have metamorphosized) promotes a flush of new vegetative growth that provides forage for CWT deer when most other forages are at their lowest nutritive value. Disking mimics the natural disturbance process of scouring associated with flood events. Draining wetlands also permits mechanical control of invasive plants.

2.9.3.2 Objective for Sloughs

Throughout the life of the CCP, maintain and protect the existing 143 acres of sloughs (riverine unconsolidated bed habitats) for the benefit of juvenile salmonids and other native fish, waterfowl, bald eagles, other native wildlife, and native aquatic species. Sloughs also will minimize potential flooding impacts to CWT deer. The sloughs will be characterized by:

- Tidal exchange (with respect to magnitude, frequency, duration, and hydraulics conducive to juvenile fish passage) without flooding CWT deer habitat;
- Maximum mean daily water temperature lower than 65 degrees Fahrenheit during primary period of juvenile salmon migration;
- Native aquatic vegetation (e.g., sago pondweed) and invertebrates (e.g., chironomids and gammarid amphipods);
- Relatively low abundance of nutria;
- Relatively low abundance of carp;
- Cover of less than 30 percent invasive plants including purple loosestrife and milfoils; and
- Native riparian vegetation (woody and nonwoody) on banks.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Install new and maintain currently existing tidegates designed to improve tidal exchange and fish passage on sloughs that are enclosed by dikes on the Mainland and Tenasillahe Island units.	✓	✓	✓
B. Monitor for the presence of invasive species such as purple loosestrife, carp, nutria, and milfoils.	✓	✓	✓
C. Work with partners to monitor and control invasive species such purple loosestrife, nutria, and milfoils.	✓	✓	✓
D. Plant native woody and nonwoody riparian vegetation adjacent to sloughs as a source for woody debris in sloughs.		✓	✓
E. Recontour Risk Creek to provide more natural meanders and channel form between State Highway 4 and Brooks Slough.		✓	✓
F. Study the potential for rerouting Nelson Creek back to its historical channel through the southeast portion of the Mainland Unit to restore salmon habitat.		✓	✓

Rationale: Sloughs on the diked areas of the refuge (Map 11) are largely cut off from the Columbia River. Some, but not all of the sloughs have tidegates that permit a one-way passage of water from inside the refuge to the Columbia River. The existing tidegates impede fish passage and are an impediment to quickly removing water from the interior of the refuge. Compared to the river channel, current velocities in the sloughs are low and aquatic vegetation and invertebrate organisms are abundant. There is potential, therefore, to provide off-channel rearing habitat for juvenile salmonids, by replacing the existing tidegates with tidegates that allow water movement to/from the Columbia River, that open wider, and stay open longer. Increasing the exchange of water with the Columbia River would also be expected to improve water quality and reduce water temperatures in the sloughs. Increasing the number of tidegates will help expel water from the refuge during high water events for better CWT deer habitat. The invasive parrotfeather milfoil is the dominant vegetation in the sloughs and warm water species of fish such as largemouth bass and yellow perch are abundant. Control of these invasive species may further improve habitat for juvenile salmonids. Installing additional tidegates and modifying existing tides would be expected to not only improve aquatic habitats for juvenile salmonids, but also minimize potential flooding of CWT deer habitat.

Sloughs benefit salmon and other fish and minimize flooding impacts / USFWS

2.9.4 Goal 4. Maintain and protect tidally influenced freshwater wetlands and swamp habitats characteristic of the historic Lower Columbia River.

Goals 4 and 5 pertain to lands Not Enclosed within Dikes subject to Frequent Tidal Inundation, and All Refuge Lands and Waters.

2.9.4.1 Objective for Scrub-Shrub Swamp

Throughout the life of the CCP, protect 847 acres of tidally influenced palustrine scrub-shrub swamp for the benefit of CWT deer, willow flycatchers, red-legged frogs, fish, and other native, wetland-dependent wildlife. Tidally influenced palustrine scrub-shrub swamp is characterized by the following.

- Native shrubs are dominant vegetation, including Sitka willow, Pacific willow, red osier dogwood, salmonberry, Pacific ninebark, and hardhack.
- Scattered large native trees taller than 13 feet are present, including Sitka spruce, black cottonwood, and willows.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Protect and promote natural processes to maintain the scrub-shrub habitat.	✓	✓	✓
B. Control invasive or undesirable plant species with IPM techniques using mechanical, physical, biological and/or chemical means.	✓	✓	✓
C. Monitor for protection of natural resources.	✓	✓	✓

Rationale: The hydrology of the lower Columbia River and its estuary are related to daily tidal fluctuations. As it nears the ocean, the slowing current deposits the river's silt load to form low, marshy islands, and sandbars. Islands near the lower end of the refuge tend to have more of a willow shrub component, and because of their relatively low topography are more susceptible to tidal fluctuations than some up the upriver islands. Because these areas are outside of any flood protection dikes and subject to natural processes, little if any physical management actions are appropriate for these areas.

Scrub-shrub swamp is a climax vegetative community in parts of the lower estuary (Map 11). The refuge will protect the existing acreage and control invasive species such as Japanese knotweed. Scrub-shrub constitutes a valuable browse resource for CWT deer. It also provides habitat for shrub-dependent migratory landbirds such as the little willow flycatcher and the yellow warbler. Waterfowl forage in the scrub-shrub at higher tide levels. Native amphibians such as red-legged frogs also utilize this habitat. Of the principle habitats of the Columbia River estuary, tidal swamps have been the most heavily impacted by human activities such as diking and drainage. The overall acreage of the swamp habitats in the lower Columbia River has been reduced by approximately 77 percent since 1870 (Thomas 1983).

2.9.4.2 Objective for Sitka Spruce Swamp

Throughout the life of the CCP, protect existing acreages of tidal Sitka Spruce Swamp habitat (approximately 353 acres) (Palustrine evergreen forested wetland) for the benefit of CWT deer, bald eagles, red crossbills, fish, and other native wildlife. This late-succession forest habitat type is characterized by:

- Mature, native trees that are predominantly Sitka spruce, black cottonwood, red alder, willow and western red cedar; and
- More than 7 mature spruce trees (larger than 32 inches diameter breast height [DBH]) per acre.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Protect and promote natural processes to drive vegetative changes.	✓	✓	✓
B. Control invasive or undesirable plant species with IPM using mechanical, physical, biological, and/or chemical means.	✓	✓	✓

Rationale: The hydrology of the lower Columbia River and its estuary are related to the daily rising and falling of the tides. As it nears the ocean, the slowing current deposits the river's silt load to form low, marshy islands and sandbars.

Sitka spruce swamp is a diverse and rich wildlife habitat. The large spruce trees are often spaced far enough apart to permit the growth of a dense understory of shrubs, particularly Sitka willow and red-osier dogwood. Fingers of tidal emergent marsh and areas of pure scrub-shrub are intermixed with the spruce swamp (Map 11). The trunks and root masses of long-fallen trees form hummocks, where terrestrial mammals such as CWT deer can escape tidal flooding. The spruce cones provide a source of seeds for red crossbills; the branches provide a nesting platform for great blue herons, bald eagles, and other birds.

Sitka spruce swamps have been heavily impacted by land diking and clearing. Of the original 14,000 acres found in the estuary, only 2,200 acres remain (Christy and Putara, 1992). Preservation of this habitat is a high priority for the refuge. Natural processes are expected to maintain the spruce swamps. Active management will be limited to invasive species control and habitat and wildlife monitoring.

2.9.4.3 Objective for Cottonwood/Willow Swamp

Throughout the life of the CCP, maintain and protect 611 acres of mid to late successional tidal cottonwood/willow swamp (Palustrine deciduous forested wetland) for the benefit of CWT deer, red-legged frogs, bald eagles, Swainson's thrush, fish, and other swamp-dependent wildlife. Mid to late succession tidal cottonwood/willow swamp is characterized by:

- A canopy cover of more than 50 percent mature trees, including black cottonwood, tree willows, and Oregon ash; and
- A cover of more than 30 percent native shrubs, including red osier dogwood, salmonberry, trailing blackberry, and shrub willows.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Protect and promote natural processes to drive vegetative changes.	✓	✓	✓

B. Control invasive or undesirable plant species with IPM techniques using mechanical, physical, biological, and/or chemical means.	✓	✓	✓

Rationale: The hydrology of the lower Columbia River and its estuary are related to the daily rising and falling of the tides. As it nears the ocean, the slowing current deposits the river's silt load to form low, marshy islands and sandbars. Islands with this vegetative type are similar in topography to Sitka Spruce swamp habitat, but tend to be located further upriver. Although this habitat has a more significant Cottonwood tree component than the Sitka Spruce swamp, it is still affected by tidal fluctuations.

The cottonwood/willow forested swamps are the principal habitat type on Crims Island, Wallace Island, and south Hunting Island (Map 11). They provide forage and cover for CWT deer. This habitat occupied much of the deer's original range along the lower Columbia River until the advent of dikes and agriculture in the late 19th and early 20th centuries. Of the principle habitats of the Columbia River estuary, tidal swamps have been the most heavily impacted by human activities such as diking and drainage. The extent of the swamps has been reduced by approximately 77 percent since 1870 (Thomas 1983).

Oregon ash is a major component of the swamps on Crims Island. In addition to the deer, these swamps are important habitat for a wide variety of forest wildlife including the focal species Swainson's thrush, red-legged frog, and bald eagle (nesting). Natural processes are expected to maintain the cottonwood/willow swamps. Active management will be limited to invasive species control and habitat/wildlife monitoring.

2.9.4.4 Objective for Emergent Tidal Marsh

Throughout the life of the CCP, all existing acres of emergent tidal marsh (approximately 300 acres) will be protected to benefit migratory waterfowl, salmonids, bald eagles, and a variety of other species. Characteristics of this habitat include:

- Elevations between mean low low water (MLLW) and slightly above mean high high water (MHHW), dominated by native herbaceous emergent vegetation, and often includes tidal channels;
- Water depth ranging from 0- to 3-feet deep depending on river and tide levels;
- Native emergent and submergent plants, including soft-stem bulrush, Lyngby's sedge, smartweeds, wapato, sedges, and rushes.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Protect and promote natural processes to drive vegetative changes and water depths	✓	✓	✓
B. Control invasive or undesirable plant species with IPM techniques using mechanical, physical, biological, and/or chemical means.	✓	✓	✓

Rationale: The tidal marshes on the refuge (Map 11) provide an extremely diverse habitat for a wide variety of species from waterfowl to fish to seals to terns. These marshes are a major source of nutrients for aquatic life, including juvenile salmonids, in the estuary. They also provide forage for waterfowl and hunting grounds for bald eagles, northern harriers, peregrine

falcons, and other raptors. Columbian white-tailed deer graze on marsh plants. Tidal marsh occurs primarily on Hunting, Wallace, and Crims Islands, although there are some small areas of marsh fringing the outside of the dikes on the Tenasillahe Island and Mainland units. The management strategies used in this unique ecosystem are focused on protection of this special habitat. Because this habitat is outside of any flood protection dikes and subject to natural processes, little if any physical management actions are appropriate for these areas.

2.9.4.5 Objective for Open Water and Tidal Slough

Throughout the life of the CCP, the refuge will protect 105 acres of open water and tidal slough habitat in the lower Columbia River for migrating and rearing salmonids, wintering and foraging waterfowl, and resting and foraging marine mammals. Open water habitats are characterized by the following:

- Medium to deep water depths (at elevations from 3 feet to more than 18 feet below MLLW);
- Shallows and flats (elevations between MLLW and approximately 6 feet below MLLW) and largely absent of vegetation.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt.3
A. Protect and promote natural processes to dictate vegetative changes and water depths.	✓	✓	✓
B. Work with other agencies and partners to identify off refuge sources of contaminants and to reduce impacts when possible.	✓	✓	✓
C. Work with other agencies and partners to preserve open water habitat for wildlife.		✓	✓

Rationale: The open water channels of the river (Map 11) are home to fish and a variety of invertebrate animals and aquatic plants. They serve as pathways for adult salmon, American shad (an introduced species), eulachon, Pacific lamprey, and steelhead migrating upriver to spawn, and for juveniles migrating downstream to the ocean. White sturgeon forage in the deeper channels and holes. Clams, mussels, aquatic worms, amphipods, and other small organisms are found on the bottom. Rooted aquatic plants are scarce in the main channels because of the strong, erosive, currents, but are found in backwaters.

Through an active role in local, State and Federal partnerships, the refuge will work to maintain and improve the overall water quality and ecological integrity of the lower Columbia River estuary. Providing quality open water habitat for resting and foraging waterfowl, shorebirds, marsh birds, and wading birds, and maintaining or enhancing migratory fish populations, including endangered salmonids. The USCG has authority over the navigable waters in the river, and the ODSL controls much, but not all of the river bottom and tidelands. The refuge works with these and other partners such as the Corps, in order to protect wildlife in open water locations and in adjacent river islands and tidal sloughs. As with other estuary habitats, these areas are outside of any flood protection dikes and subject to natural processes, therefore, little if any physical management actions are appropriate for these areas.

2.9.5 Goal 5. Maintain a Healthy, Sustainable Population of Endangered Columbian White-tailed Deer to Promote the Recovery of this Species

Goals 4 and 5 pertain to lands Not Enclosed within Dikes subject to Frequent Tidal Inundation, and All Refuge Lands and Waters.

2.9.5.1 Objective for Columbian White-tailed Deer Recovery

Throughout the life of the CCP, contribute to the recovery of the CWT deer by maintaining a minimum total population greater than or equal to 330 CWT deer on the refuge, with approximately 125 CWT deer on the Mainland Unit, 125 CWT deer on the Tenasillahe Island Unit, and 80 CWT deer divided among the other refuge units.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Manage a mosaic of habitats (see objectives for Goals 1, 2, 3, and 4) to meet the life-history requirements of CWT deer.	✓	✓	✓
B. Utilize a permit hunt and exclusionary fencing to manage competing wildlife, particularly Roosevelt elk, as identified in the elk management plan.	✓	✓	✓
C. Remove coyotes when necessary. See description of control actions in Section 2.6.2.	✓ Jan 1-Apr 15	✓ Jan 1-Dec 31	✓ Jan 1-Aug 31
D. Remove (by lethal or nonlethal means) mountain lions and bears when present on the refuge, in coordination with states.		✓	✓
E. Monitor CWT deer population size and fawn mortality factors on refuge management units.	✓	✓	✓
F. Limit disturbance by humans and pets.	✓	✓	✓
G. Maintain integrity of refuge dikes at the Tenasillahe Island and Mainland units to eliminate/minimize the frequency and intensity of flooding CWT deer wintering habitat.	✓	✓	✓

Rationale: Currently, there is an estimated 600 to 800 CWT deer in the lower Columbia River region. The Columbian White-tailed Deer Recovery Plan (USFWS 1983) recommends that greater than 400 CWT deer be maintained in three viable subpopulations occupying secure habitat. Most secure habitat (free from adverse human activities and relatively safe from natural phenomena that would destroy its value to CWT deer) is on the refuge. At present, there is only about 1,600 acres of secure habitat off the refuge, which is owned by the states of Oregon and Washington or the Columbia Land Trust in a relatively contiguous block capable of supporting a viable subpopulation of about 100 deer. Given such small numbers in the lower Columbia River region, the population is vulnerable to extirpation by events such as prolonged severe weather, excessive predation, loss of habitat, and the spread of virulent diseases.

Intensive management actions to directly benefit CWT deer (including predator control) would be necessary to ensure herd health and genetic integrity necessary for a long-term sustainable

population on the refuge. Active management of the habitat (mowing, grazing, haying, pasture improvements) would be needed for both the Mainland and Tenasillahe Island units to support the life-history needs of greater than 125 CWT deer. Based upon results from previous studies and population modeling for the refuge, it would be necessary to periodically remove coyotes as well as mountain lions and black bears, when present, in order to maximize survival rates of adults and juveniles and promote healthy CWT deer herds on refuge management units at objective levels.

In establishing CWT deer population objectives for refuge management units, the following factors were considered: Recovery Plan goals, the health of the herd, the quality of refuge habitats, and opportunities for public viewing on refuge lands. The identified objective levels represent the best balance between a relatively large, healthy deer population (to help achieve recovery goals) and a thriving natural vegetative habitat (to sustain deer and other native wildlife).

The Mainland and Tenasillahe Island units are managed to maintain healthy and sustainable populations of CWT deer at relatively higher densities. Forty deer per square mile is a reasonable density for Tenasillahe Island that is less vulnerable to flooding. Because the Mainland Unit is more susceptible to flooding, a density of 35 deer per square mile is appropriate for this refuge unit. Unmanaged islands (Wallace, Hunting, Price, and Kinnunen Cut) are more likely to support densities of 20 deer per square mile while still maintaining biodiversity. Crims Island (presently a mix of riparian forest, old fields, and tidal swamp) is likely to support 30 deer per square mile until forest habitat replaces the old fields during the next 10-20 years. Given the sizes of these refuge units and the units' deer densities, the population objectives would be 125, 125, and 80 respectively for the Mainland Unit, Tenasillahe Island Unit, and other refuge units (see Table 4-12). The total population objective for the refuge (greater than 330 CWT deer) would provide the best balance between managing for a healthy, sustainable herd over the long-term based upon the CWT deer Recovery Plan while providing refuge visitors with an opportunity to view this endangered species. Other lands in public or conservation ownership (e.g., Fisher Island, Lord Island, Hump Island, White Island, and Willow Grove wetlands) would be expected to support enough CWT deer to satisfy the recovery goal of 400 deer on secure habitat in the lower Columbia River.

Deer populations are naturally cyclic in nature over time. Herd size can vary in response to climate, predation, and other factors. Population objectives provide a reference point for determining when population numbers are too low and other management actions (e.g., coyote removal) may be needed to protect the CWT deer herd. The CWT deer numbers may rise above population objectives, in fact, it is expected that population levels would be above unit objectives much of the time. Under this scenario, surplus deer could be trapped for reintroduction elsewhere, if appropriate reintroduction sites are available. The population objectives are conservative estimates to ensure refuge habitats support a healthy, sustainable deer herd.

2.9.5.2 Objective for Establishing Healthy Populations of Columbian White-tailed Deer off Refuge Lands

Throughout the life of the CCP, encourage the establishment and maintenance of healthy CWT deer subpopulations off refuge lands and establish where appropriate, experimental subpopulations of CWT deer.

- Establish new CWT deer subpopulation(s) upstream of Longview, Washington, and/or other sites deemed to be appropriate.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Maintain a full time biologist position at the refuge to ensure that biological information needed for management actions is obtained on CWT deer.	✓	✓	✓
B. Relocate CWT deer to establish new subpopulations or enhance existing ones where appropriate.	✓	✓	✓
C. Encourage travel corridors between subpopulations and habitats.	✓	✓	
D. Encourage the enhancement of CWT deer habitat off of refuge lands by providing technical advice and participating in interagency and private lands agreements.	✓	✓	✓
E. Work with other national wildlife refuges and State wildlife areas to reintroduce CWT deer into its former range to establish secure sites.	✓	✓	✓

Rationale: The lower Columbia River population of CWT deer presently occupies only a small fraction of its historical habitat. Although some of the original habitat is no longer suitable because of urban, industrial, and agricultural development, there are still thousands of acres that could support reintroduced CWT deer. Increasing the deer's range and numbers above the minimum recovery objectives would lessen the risk of catastrophic losses, help ensure there will never be a need to put the deer back on the endangered species list, and restore and maintain a portion of the lower Columbia's natural ecosystem.

Work with partners such as the ODFW and WDFW, the CWT Deer Recovery Team, Columbia Land Trust, The Nature Conservancy, private corporations, and private landowners to establish new and experimental subpopulations of CWT deer. Approximately half of the current population of CWT deer resides on private lands. Continued efforts to protect habitat on these lands are vital to maintaining the health of the population. Potential reintroduction and/or experimental population sites need to include sufficient acreage and habitat to support greater than 50 deer. An example of a suitable site is Ridgefield National Wildlife Refuge.

2.9.6 Goal 6. Provide and Encourage Establishment of Aquatic Habitat Conditions that Benefit Salmonids and Other Native Aquatic Species of the Lower Columbia River

2.9.6.1 Objective for Aquatic Habitat

Throughout the life of the CCP, assess, manage and monitor aquatic habitat conditions and distribution of fish species, including biological characteristics; develop management activities to protect and restore habitats; and assess effects of implementing aquatic habitat management activities at the Mainland and Tenasillahe Island units and other areas where applicable.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Conduct aquatic habitat and fish species surveys.	✓	✓	
B. Modify existing tidegates to improve connectivity between the Columbia River and regulated sloughs.	✓	✓	✓
C. Protect existing conditions of well connected sloughs with high quality aquatic habitats for salmonids and other native species.	✓	✓	✓
D. Eliminate barriers to fish passage within interconnected ditches and sloughs of the Mainland Unit.	✓	✓	
E. Within small watersheds that cross the Mainland Unit develop agreements with landowners and local governments to conduct appropriate habitat restoration actions and improvements to fish passage.		✓	
F. Analyze data concerning physical habitats, riparian areas, and fish assemblages, to assess efficacy of aquatic habitat management activities especially relative to appropriate reference sites, and generate information to improve management actions and develop additional actions.	✓	✓	

Rationale: In the 19th century, the Columbia River was known as one of the greatest salmon producing rivers in the world with annual runs of 10-16 million salmon (Northwest Power Planning Council 2000). Today, 13 stocks of Pacific salmon and steelhead that traverse the lower Columbia River are considered threatened or endangered. Interior sloughs and the Mainland and Tenasillahe Island units could play a critical role in the survival and recovery of these listed stocks. These refuge units could provide food, refuge, and habitat for juvenile salmon during their transition, called smoltification, from freshwater to saltwater. Improved quality and diversity of interior slough habitat in the estuary can directly influence the abundance and diversity of salmon populations that use the area. The lower Columbia River estuary has lost over 70 percent of its historical habitat (50 percent since 1950), due primarily to construction of agricultural levees in floodplain habitat and to floodplain development (Thomas 1983). The importance of estuary sloughs in the life cycle of the Pacific salmon—the region's iconic species—is well documented. Protection and restoration of sloughs is vital to the recovery of the region's salmon and steelhead. Because these interior sloughs are managed by the refuge, the refuge can have a greater role in the assessment, monitoring, and management actions affecting aquatic habitat in the refuge's sloughs.

2.9.7 Goal 7. Gather Scientific Information (Inventories, Monitoring, Research, and Studies) in Support of Adaptive Management Decisions on the Refuge Under Goals 1-6

2.9.7.1 Objective for Research and Monitoring Habitats and Wildlife

Throughout the life of the CCP, monitor habitat and wildlife to enhance endangered species protection, habitat management/restoration activities, and public use activities.

- Annually complete CWT deer status report (survival, movement, productivity)

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Maintain a full time biologist position at the refuge to ensure biological information is obtained for management actions and regional/national data needs.	✓	✓	✓
B. Monitor the health status of CWT deer.	✓	✓	✓
C. Monitor survival of CWT deer, with an emphasis on the causes of fawn mortality.	✓	✓	✓
D. Monitor growth and species composition of short-grass fields, riparian forest, and wetlands.	✓	✓	✓
E. Formulate habitat management recommendations based on analysis of the refuge's CWT deer nutrition study.	✓	✓	✓
F. Work with graduate school programs to conduct research and monitoring utilizing the bunkhouse for students and other researchers.		✓	
G. Monitor species composition and distribution of amphibians.		✓	
H. Monitor species composition, distribution, and timing of avian use of the refuge, including a mid-winter waterfowl survey, a bald eagle survey, and a dusky Canada goose survey.	✓	✓	
I. Conduct wilderness study.		✓	

Rationale: Monitoring and research are essential to habitat and population management. For example, Goal 5, Objective 5.1 calls for maintaining a minimum of 345 CWT deer on the refuge. Conducting CWT deer population surveys is essential to determining if the recovery goal is being met. Similarly, wildlife population and habitat management practices must be monitored to evaluate their effectiveness. Refuges must collect site specific information and conduct defensible research to provide information for devising and adapting management practices.

Conduct a wilderness study to identify which islands, if any, contain the necessary wilderness elements such as primeval character, solitude, and special features of value (e.g., ecological, geological, or other features of scientific, educational, scenic, or historical value). The findings of the study determine whether or not the study areas merit recommendation for inclusion in the Wilderness System. The wilderness inventory was conducted as part of this CCP process (Appendix F).

2.9.8 Goal 8. Refuge Visitors Have the Opportunity to Participate in Wildlife Observation, Hunting, Fishing, Photography, Interpretation, and Environmental Education.

2.9.8.1 Objective for Wildlife Observation and Photography

Throughout the life of the CCP, provide quality opportunities for wildlife observation and photography in a manner that minimizes impacts on wildlife and habitats.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Maintain and enhance the interpretive area and wildlife viewing site located along State Highway 4, by increasing interpretive messages about the refuge and refuge system with new displays.	✓	✓	✓
B. Develop, maintain, and improve auto pull-outs for wildlife observation on Steamboat Slough Road.		✓	✓
C. Install spotting scopes at the wildlife viewing site on State Highway 4 and the Steamboat Slough Road Tenasillahe Island Overlook.			✓
D. Add mile markers at ¼ mile intervals on the auto tour route and trails to assist birdwatchers with posting their observation data.			✓
E. Look for an alternative to the Center Road Trail, by working with the county to develop Brooks Slough Road as an access point and as an all season hiking and cycling route, or an alternate route accessed from the refuge.		✓	✓
F. Look for a second alternative to the Center Road Trail by developing a nature trail extending from refuge headquarters, southwest along Indian Jack Slough.		✓	
G. Install interpretive panel and map at the Steamboat Slough Road Tenasillahe Island Overlook.		✓	✓

Rationale: Currently, there are very few places in the surrounding area to view and interpret the region's once common, now rare habitat type, Sitka spruce swamp. Two developed wildlife viewing sites, available on the Mainland Unit, offer viewing opportunities of mostly managed short-grass field habitat (Map 12). The State Highway 4 refuge wildlife viewing site was originally established for safe observation/photography of a large elk herd which caused unsafe traffic congestion. In recent years, to reduce competition for CWT deer habitat by using fencing and an elk management hunt, the elk have been encouraged to shift their use of the refuge's CWT deer habitats and utilize habitats off the refuge. The State Highway 4 viewing site lacks adequate interpretive displays and needs updated refuge information. Updating this display to interpret the refuge's mission, natural resources, and programs would provide the public an opportunity to understand the refuge's purposes and resources.

The refuge currently has one walking trail bisecting the refuge's Mainland Unit, the Centerline Trail. This trail has several drawbacks, it doubles as a service road, it is closed much of the year to limit disturbance to CWT deer, it generally floods in winter months, and it is in a poor location to observe/photograph wildlife. The refuge will improve and expand wildlife

observation/photography opportunities for the public, while limiting potential disturbance to CWT deer by working with the county to identify and where appropriate, develop walking trails along Brooks Slough Road connecting through the refuge.

As a second alternative the refuge will look at developing a nature trail that starts at the refuge office and follows along the edge of Indian Jack Slough to the Steamboat Slough Road. This trail could be extended by following the roadside of Steamboat Slough Road back to the refuge office forming an approximate 2.5 mile nature trail loop.

By developing a new walking trail(s) and viewing area/auto tour pull-out for interpreting important habitat types—Sitka-spruce swamp and the riparian forests—visitor experiences and knowledge about the resource could be enhanced. Development of a new walking trail and/or viewing areas will be limited to areas which do not create a wildlife or resource disturbance.

The refuge's headquarters viewing platform provides a good opportunity to view/photograph wildlife and has an excellent interpretive display. No changes to this area are proposed.

2.9.8.2 Objective for Hunting

Throughout the life of the CCP, allow quality waterfowl, snipe, and elk hunting on the refuge.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Improve signage to better delineate the refuge's hunting boundaries.	✓	✓	✓
B. Update maps and hunting brochures for the public.	✓	✓	✓
C. Increase law enforcement to ensure a quality hunting experience for everyone.	✓	✓	✓
D. Work with state agencies on law enforcement issues and publication of regulations.	✓	✓	✓
E. Allow waterfowl and snipe hunting on Hunting Islands and Wallace Island only.	✓		
F. Allow waterfowl and snipe hunting on Wallace, Crims, Price and Hunting Islands.		✓	✓
G. Provide opportunities for elk hunting on the refuge's Mainland Unit when the elk population exceeds 20 individuals. Follow current Elk Hunt Plan and Environmental Assessment.	✓	✓	✓
H. For safety purposes work with the county and State on closing waterfowl hunting on lower Elochoman Slough between the Mainland Unit's dike and Hunting Islands.	✓	✓	✓

Rationale: An Elk Hunt Plan/Environmental Assessment (EA) was completed in 2004. The Elk Hunt Plan/EA is up-to-date and the refuge is currently implementing it. High numbers of elk on the refuge result in unacceptable levels of competition for food between elk and CWT deer. The current plan keeps competition for browse (food) at an acceptable level while maintaining a sufficient population of elk, to maintain the biological integrity of the habitat and provide for public viewing.

Waterfowl and snipe hunting have been traditional uses of the refuge in the lower Columbia River estuary for a long period of time. Currently, the waterfowl hunting program allows hunting on Hunting Islands and the Wallace Island shoreline and the open navigable waterways within the refuge boundary (Map 12). The refuge staff has identified a potential safety hazard in a small waterfowl hunting zone along Hunting Islands and the Mainland Unit, where hunters may possibly and/or unknowingly shoot toward the heavily traveled county road (refuge tour route). Refuge staff members will work with the WDFW to clearly delineate the area of concern. Waterfowl and snipe hunting are proposed for Price and Crims Islands.

2.9.8.3 Objective for Fishing

Throughout the life of the CCP, anglers will continue to enjoy current levels of quality fishing opportunities unique to the Columbia River estuary and associated waterways.

Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Improve location signage to more clearly delineate fishing opportunities for fisherman.		✓	✓
B. Update maps and fishing brochures for the public.		✓	✓
C. Work with ODFW and WDFW to ensure refuge regulations are accurately described in state publications.	✓	✓	✓
D. Increase law enforcement to ensure a quality fishing experience for everyone.	✓	✓	✓

Rationale: The majority of fishing opportunities on the Mainland Unit occur along Steamboat Slough and Brooks Slough roads, which are both county roads and overlay refuge lands (Map 12). Additional fishing occurs along the narrow strip on the outside of the Mainland Unit dike. All other areas of the interior Mainland Unit, (except the seasonal walking trail) are closed to all public access including fishing. In addition, the interior of Tenasillahe Island is closed to all public access including fishing.

A boat is required to access most other refuge units; therefore, although technically open to fishing, the shorelines of refuge islands receive little or no fishing use, because fishing from a boat can be more successful.

2.9.8.4 Objective for Interpretation and Environmental Education

Throughout the life of the CCP, provide opportunities for visitors and students to understand and appreciate the unique purposes, wildlife resources, and management activities of the refuges in the lower Columbia River ecosystem.

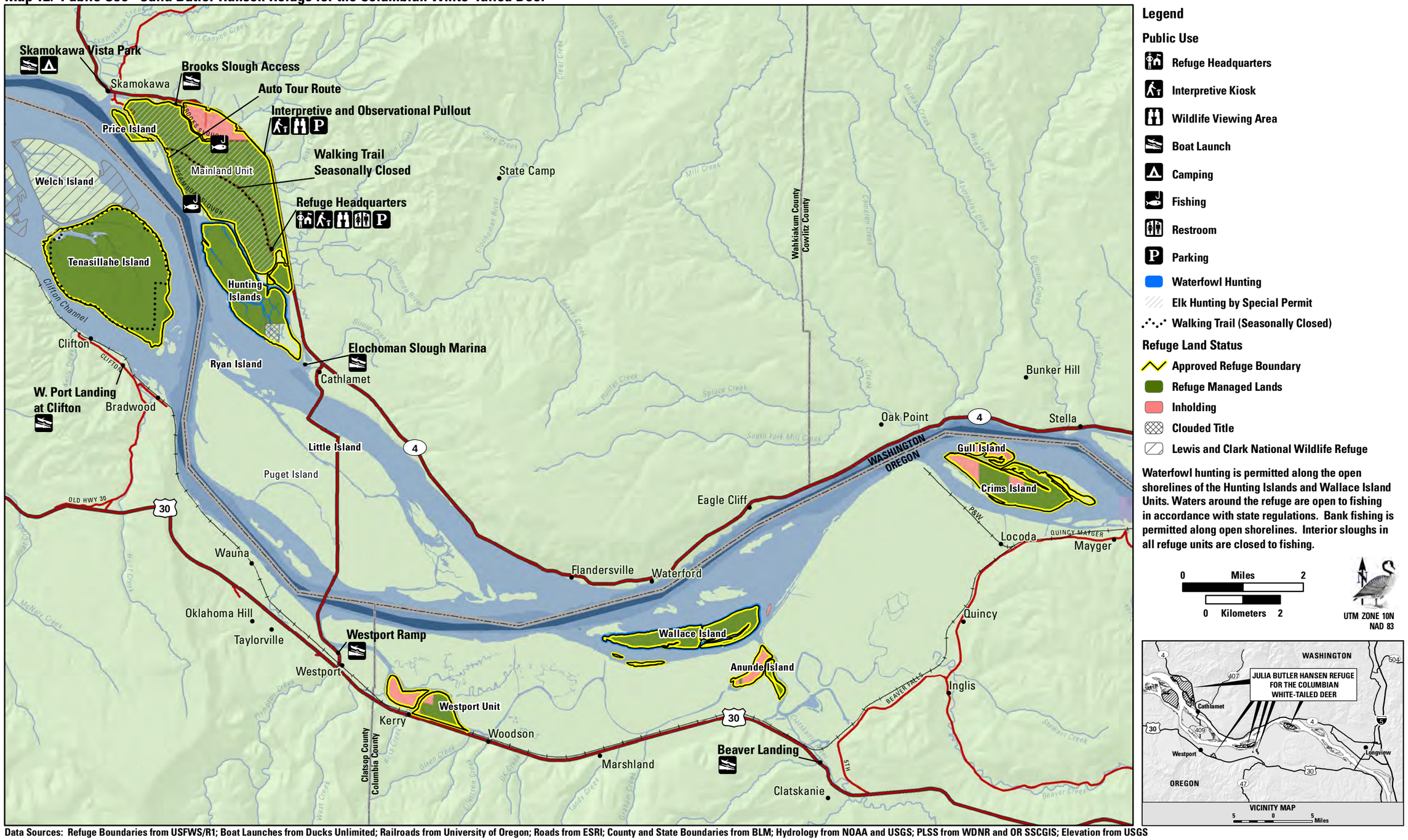
Strategies for Achieving the Objective	Alt. 1	Alt. 2	Alt. 3
A. Improve refuge boundary signage.	✓	✓	✓
B. Maintain and update maps, brochures, and interpretive messages.		✓	✓
C. Work with other organizations to provide refuge information.		✓	✓
D. Install a new interpretive panel at the Columbia River Tenasillahe Island Overlook on Brooks Slough Road.			✓
E. Improve refuge resource interpretation by installing new and improved exhibit panels along State Highway 4.		✓	✓
F. Maintain the State Highway 4 interpretive/viewing area.	✓	✓	✓
G. Maintain the interpretive/viewing area at Refuge Headquarters.	✓	✓	✓
H. Develop curriculum based learning opportunities for students of all ages.			✓
I. Work with area schools to develop refuge specific study sites that provide hands on science opportunities that could be incorporated into the school curriculum.			✓
J. Establish Youth Conservation Corps (YCC) program specific to the Julia Butler Hansen/Lewis and Clark Refuges.		✓	✓
K. Work with the states to install information/interpretive panels about the refuges along highway pullouts and boat ramps.			✓

Rationale: National wildlife refuges are often mistaken for other land management systems such as national or state parks. Providing information through programs, written materials, and interpretive panels presents opportunities for the public to understand and appreciate the unique purposes and activities of the Refuge System. Providing information regarding the mission of the Service, the purposes of the refuge, along with specific resource information may alleviate potential impacts to wildlife by educating our visitors.

Providing opportunities for interested local teachers to develop curriculum-driven learning opportunities and bring students to the refuge is one way to increase school visits. Creating and developing specific study sites for classes to utilize on the refuge would reduce potential disturbances to wildlife, yet allow students to get hands on experiences in science and nature.

A YCC program on the refuge would provide jobs for high school aged students with opportunities to learn more about refuge resources, and natural resource related careers. Students often receive high school credits for working in YCC positions. The YCC crew would assist refuge staff with resource management activities (fencing, tree planting, and invasive species removal).

Map 12. Public Use - Julia Butler Hansen Refuge for the Columbian White-Tailed Deer



Data Sources: Refuge Boundaries from USFWS/R1; Boat Launches from Ducks Unlimited; Railroads from University of Oregon; Roads from ESRI; County and State Boundaries from BLM; Hydrology from NOAA and USGS; PLSS from WDNR and OR SSCGIS; Elevation from USGS

Table 2.1 Alternatives Summary Table – Lewis and Clark Refuge

Key Themes/Issues	Alternative 1 Current Management (No Change)	Alternative 2 (preferred) Enhance Resource Protection Provide Wildlife-dependent Public Use
Habitat Management		
Scrub-Shrub Swamp	Protect 2,165 acres	Same as Alt. 1
Sitka Spruce Swamp	Protect 285 acres	Same as Alt. 1
Cottonwood Willow Swamp	Protect 120 acres	Same as Alt. 1
Emergent Tidal Marsh	Protect 3,720 acres	Same as Alt. 1
Mud Flats and Sandbars	Protect 4,825 acres	Same as Alt. 1
Upland Forest	Protect 89 acres	Same as Alt. 1
Riparian Forest	Protect 470 acres	Same as Alt. 1
Open Water	Protect 1,360 acres	Same as Alt. 1
Resource Management		
Oregon Dept. of State Lands Agreement	No change No agreement	Meet with ODSL to discuss management options for State lands within the refuge boundary and potential future opportunities to acquire islands and tidelands.
Lower Columbia River Estuary	No Change	Coordinate with National Park Service regarding Natural Heritage Area designation and develop educational programs with other groups.
Dredge Spoil Islands U.S. Army Corps of Engineers	Limit focus to Service owned habitats	Work with the Corps and other partners to ensure islands provide vegetative benefits for the unique species using these areas.
Pest Management	Maintain partnerships for monitoring and priority control of invasive species	Same as Alt. 1 plus work with others to share resources, education, training, inventory and control invasive species.
Research, Monitoring, and Inventory	Maintain current monitoring and research activities Maintain refuge biologist	Same as Alt. 1 plus improve monitoring and research utilizing graduate students.
Public Use		
Waterfowl Hunting	Maintain existing waterfowl hunting. Maintain sanctuary areas closed to hunting.	Same as Alt. 1
Fishing Opportunities	Maintain current fishing program.	Same as Alt. 1
Environmental Education and Interpretation (EEI)	Maintain current EEI by providing talks on a case by case basis. Maintain limited refuge signs, displays, and brochures.	Same as Alt. 1 plus increase refuge visibility by developing informational signs, attending festivals, posting additional boundary signs, and updating brochures.
Wildlife Observation and Photography	Refuge lands are open to wildlife observations but no facilities are provided	Work to increase wildlife viewing opportunities, install interpretive signs, and identify off refuge campsites.
Wilderness		
Wilderness	No Wilderness	Wilderness inventory and future study.

Table 2-2 Alternatives Summary Table–Julia Butler Hansen Refuge

Key Themes/Issues	Alternative 1 Current Management (No Change)	Alternative 2 (preferred) Enhanced Habitat and CWT Deer Management with Increased Wildlife-dependent Public Use Opportunities	Alternative 3 Maintain Current Habitat Management, Increase CWT Deer Management with Enhanced Wildlife-dependent Public Use Opportunities
Habitat Management			
Short grass fields	Maintain 680 acres on the Mainland and Tenasillahe Island units.	Same as Alt. 1 plus establish additional 110 acres on Mainland and Tenasillahe Island units.	Same as Alt. 1
Early-successional Riparian Forest	Establish 210 acres on the Mainland Unit and 70 acres on the Tenasillahe Island Unit, and maintain 120 acres on the Crims Island Unit.	Same as Alt. 1 plus establish additional 100 acres on Mainland and Tenasillahe Island units.	Same as Alt. 1
Mid-successional Riparian Forest	Maintain 70 acres on the Mainland Unit and 22 acres on the Tenasillahe Island Unit.	Same as Alt. 1	Same as Alt. 1
Late-successional Riparian Forest	Maintain 445 acres on the Mainland Unit and 430 acres on the Tenasillahe Island Unit.	Same as Alt. 1	Same as Alt. 1
Nontidal Wetlands	Maintain existing 130 acres.	Same as Alt. 1 plus establish additional 40 acres.	Same as Alt. 1
Sloughs	Maintain 143 acres.	Same as Alt. 1	Same as Alt. 1
Tidal Scrub-Shrub Swamp	Maintain 847 acres.	Same as Alt. 1	Same as Alt. 1
Tidal Sitka Spruce Swamp	Maintain 353 acres.	Same as Alt. 1	Same as Alt. 1
Tidal Cottonwood/ Willow Swamp	Maintain 611 acres.	Same as Alt. 1	Same as Alt. 1
Emergent Tidal Marsh	Maintain 300 acres.	Same as Alt. 1	Same as Alt. 1
Open Water	Maintain 105 acres.	Same as Alt. 1	Same as Alt. 1
Columbian White-tailed Deer			
CWT Deer Population Mgt. (ES Recovery)	Follow Recovery Plan guidelines	Same as Alt. 1 plus expand population by establishing experimental population up river.	Same as Alt. 1
CWT Deer Protection	Integrated coyote control from January to mid-April	Lethal coyote control year round to achieve fawn:doe ratios and population	Lethal coyote control January through August to achieve fawn:doe

Key Themes/Issues	Alternative 1 Current Management (No Change)	Alternative 2 (preferred) Enhanced Habitat and CWT Deer Management with Increased Wildlife-dependent Public Use Opportunities	Alternative 3 Maintain Current Habitat Management, Increase CWT Deer Management with Enhanced Wildlife-dependent Public Use Opportunities
		objectives. Removal of mountain lions and bears when present on refuge.	ratios and population objectives. Removal of mountain lions and bears when present on refuge.
Aquatic Habitats			
Aquatic Habitat	Assess, monitor, and restore aquatic habitat as appropriate and as funding becomes available.	Same as Alt. 1 plus modify existing tidegates. Work with partners to restore aquatic habitats. Protect sloughs.	Same as Alt. 1
Conduct Research And Monitoring			
Research and Monitor Habitats	Maintain a full time biologist position and monitor CWT deer.	Same as Alt. 1 plus monitor growth and various species composition using research assistance from colleges.	Same as Alt. 1
Public Use Opportunities			
Wildlife Observation and Photography	Maintain current viewing/interpretive areas at State Highway 4 and refuge headquarters.	Same as Alt. 1 plus develop Brooks Slough Road (as a foot/cycling trail) and Indian Jack Slough (as a walking trail).	Same as Alt. 2 plus develop Brooks Slough Road and additional wildlife viewing points and install spotting scopes.
Hunting	Maintain waterfowl hunting on Wallace and Hunting Islands and elk hunting as needed on the Mainland Unit.	Same as Alt. 1 plus open Price and Crims Islands to waterfowl hunting. Close a section of Hunting Island for safety.	Same as Alt. 2
Fishing	Fishing on mainland at Steamboat Slough.	Same as Alt. 1	Same as Alt. 1
Interpretation and Environmental Education	Provide brochures and maps, and work with other agencies to provide refuge information. Maintain viewing areas.	Same as Alt. 1, plus establish YCC program, update interpretive media, and work with partners to provide information.	Same as Alt. 1, plus install new interpretive exhibit panels, and develop school curriculum and refuge study sites.
Wilderness			
Wilderness	No Wilderness	Wilderness inventory and future study	Same as Alt. 1

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