Chapter 6. Environmental Effects

This chapter provides a summary of the environmental consequences of implementing the alternatives described in Chapter 2 and analyzed in Chapters 3 through 5 including physical, biological, cultural, and socioeconomic resources. The cumulative effects on the environment are described in Section 6.2.

6.1 Effect Ratings Description

The information used in this Draft CCP/EIS was obtained from relevant scientific literature, existing databases and inventories, consultations with other professionals, and personal knowledge of resources based on field visits, and experience. The thresholds and severity ratings defined below were used to analyze the scope, scale, and intensity of effects on natural, cultural and recreational resources.

- **Negligible.** Resources would not be affected, or the effects would be at or near the lowest level of detection. Resource conditions would not change or would be so slight there would not be any measurable or perceptible consequence to a population, wildlife or plant community, recreation opportunity, visitor experience, or cultural resource.

- **Minor.** Effects would be detectable but localized, small, and of little consequence to a population, wildlife or plant community, recreation opportunity, visitor experience, or cultural resource. Mitigation, if needed to offset adverse effects, would be easily implemented and successful.

- **Intermediate.** Effects would be readily detectable and localized; with consequences to a population, wildlife, or plant community; recreation opportunity; visitor experience; or cultural resource. Mitigation measures would be needed to offset adverse effects, and would be extensive, moderately complicated to implement, and probably successful.

- **Significant (major).** Effects would be obvious and would result in substantial consequences to a population, wildlife or plant community, recreation opportunity, visitor experience, or cultural resource within the local area and region. Extensive mitigating measures may be needed to offset adverse effects and would be large scale in nature, very complicated to implement, and may not have a guaranteed probability of success. In some instances, major effects would include the irretrievable loss of the resource.

Time and duration of effects have been defined as follows.

- **Short-term or Temporary.** An effect that generally would last less than a year or season.
- **Long-term.** A change in a resource or its condition that would last longer than a single year or season.

6.2 Summary of Effects for Lewis and Clark and Julia Butler Hansen Refuges

Table 6-1 CCP Alternatives Summary of Effects for Lewis and Clark Refuge

	Alternative 1	Alternative 2
EFFECTS TO WILDLIFE AND HABITAT		
Effects to Fish	Fishing occurs in navigable waters independent of the refuge.	Negligible difference in effects because fishing would likely occur in navigable waters independent of the refuge.
Effects to birds, mammals, reptiles, amphibians and invertebrates	No effects from current refuge management other than minor negative and temporary effects due to waterfowl hunting.	Negligible difference in effects, same habitat management and public use program as at present.
Effects to threatened and endangered (T&E) species	Negligible effects to T&E species due to small amount of refuge habitat compared to the entire estuary.	Same as Alternative 1.
Effects to wetland habitats and associated wildlife	Natural processes generally dictate habitat conditions; public use disturbance would be minimal.	Negligible difference in effects–natural processes dictate habitat changes, public use disturbance would be about the same as Alternative 1.
Effects to riparian forest and associated habitat	Natural processes generally dictate habitat conditions; public use disturbance would be minimal.	Negligible difference in effects–natural processes dictate habitat changes, public use disturbance would remain about the same as Alternative 1.
PHYSICAL ENVIRONMENTAL EFFECTS		
Effects to air quality	Negligible effect.	Negligible effect.
Effects to water quality	Negligible effect.	Negligible effect.
Effects to soils	Negligible effect.	Negligible effect.
SOCIAL EFFECTS		
Opportunities for wildlife observation and photography	No change in opportunities available under current management.	Negligible effect because opportunities would remain nearly the same as Alternative 1.
Opportunities for quality hunting	No change in opportunities under current management.	Negligible effect—same hunting program as Alternative 1.
Opportunities for quality fishing	No change in limited opportunities available under current management.	Negligible effect because of limited ability to affect fisheries resources and same management program as present.
Opportunities for quality EEI	No change in limited opportunities available under current management.	Negligible effect because of no changes to current program.
OTHER EFFECTS		
Effects to cultural/ historical resources	No management actions expected to affect these resources.	Same as Alternative 1.
Economic effects	Refuge management and public use programs have minimal effects on local economy	Same as Alternative 1.

Table 6-2 CCP Alternatives Summary of Effects for Julia Butler Hansen Refuge

	Alternative 1	Alternative 2	Alternative 3
EFFECTS TO WILDLIFE AND HABITAT			
Effects to waterfowl and waterbirds	Minor positive effects from management of wetlands pastures and minor negative effects due to waterfowl hunting.	Same as Alternative 1.	Same as Alternative 1.
Effects to shorebirds	Slight reduction in snipe habitat from converting 210 acres of unmanaged fields to riparian. Other shorebird habitat would remain unchanged.	Same as Alternative 1	Same as Alternative 1.
Effects to raptors	Habitat conversion of 210 acres of unmanaged fields to riparian sites will provide minor positive and negative effects depending raptor species.	Same as Alternative 1. Hunting disturbance expected to be minor and temporary.	Same as Alternative 2.
Effects to landbirds	Conversion of grasslands to riparian with reduce extent of habitat for grassland birds while increasing extent of habitat for forest birds.	Overall minor positive effects. Both minor positive/negative effects from habitat conversion however habitat acreages involved are relatively small. Minor hunting disturbance due to waterfowl hunting.	Similar to Alternative 1, but with minor disturbance as in Alternative 2.
Effects to predators	Minor and temporary negative effect on coyote population from existing predator control program. Neutral effect to bear or cougar due to limited take.	Overall intermediate negative effect. Effects to coyotes would be temporary. We would expect coyotes to repopulate quickly. Neutral effect to bear or cougar due to limited take.	Effects would be the same as Alternative 2.
Effects to elk	Minor negative effect due to reduction in elk numbers from fall elk hunt. Note this is offset by improved riparian conditions due to limited elk numbers.	Minor negative effect due to reduction in elk numbers from fall elk hunt. Note: this is offset by improved riparian conditions due to limited elk numbers.	Minor negative effect due to reduction in elk numbers from fall elk hunt. Note: this is offset by improved riparian conditions due to limited elk numbers.
Effects to reptiles and amphibians	Overall minor positive effects. Improved slough connectivity would provide better conditions for reptiles and amphibians.	Overall minor positive effects. Improved slough connectivity and increased wetland habitat would provide better conditions for reptiles and amphibians.	Overall minor positive effects. Improved slough connectivity would provide better conditions for reptiles and amphibians.
Effects to invertebrates	Minor positive effects from tidegate installations	Same as Alternative 1	Same as Alternative 1

	Alternative 1	Alternative 2	Alternative 3
Effects to endangered and threatened marine mammals	Marine mammals not present on refuge.	Marine mammals not present on refuge.	Marine mammals not present on refuge.
Effects to Columbian white-tailed deer	Significant negative effects on overall deer population resulting from limited predator control effort. Significant positive effects from reintroductions.	Significant positive effects on overall deer populations resulting from expanded predator control effort and population reintroduction/ expansion.	Intermediate positive effects on overall deer populations resulting from seasonally expanded predator control efforts and population reintro-duction/expansion.
Effects to endangered and threatened bird species	Occurrence of these birds on the refuge is very intermittent.	Negligible effects due to intermittent occurrence of these birds on the refuge.	Negligible effects due to intermittent occurrence of these birds on the refuge.
Effects to endangered and threatened fisheries species	Relatively small amount of Service owned habitat supports threatened and endangered fish species.	Overall negligible effects to fish habitat due to relatively small amount of Service owned habitat compared to the entire estuary.	Overall neutral effects to fish habitat due to relatively small amount of Service owned habitat compared to the entire estuary.
Effects to fish	Intermediate positive effects due to tidegate enhancement.	Same as Alternative 1	Same as Alternative 1
Effects to non-tidal wetland and slough habitats and assoc. wildlife	No change to acres.	Minor positive effect to wetland habitat from increased acres. Neutral effect to slough habitat.	Same as Alternative 1
Effects to short grass fields	Pasture improvement would proceed at about the current rate, future public use levels expected to remain about the same as at present.	Intermediate positive effect as additional acreage would be managed as pasture but with negligible disturbance factors from improved public use facilities.	Negligible effect as pasture improvement would proceed at about the same rate as at present with negligible disturbance factors from improved public use facilities.
Effects to non-tidal riparian forest (early-successional). **Conversion of unmanaged grasslands to early success-**	Minor positive effects from conversion of unmanaged grasslands to riparian forest. Future level of public use maintained.	Intermediate positive effects from conversion of unmanaged grasslands to riparian forest. (Doubling riparian plantings over Alternatives 1 and 3 but with negligible disturbance factors from improved public use facilities).	Minor positive effects from conversion of unmanaged grasslands to riparian forest and negligible disturbance factors from improved public use facilities.

	Alternative 1	Alternative 2	Alternative 3
sional riparian forest			
Effects to non-tidal riparian forest (mid–successional)	No Change	Same as Alternative 1	Same as Alternative 1
Effects to non-tidal riparian forest (late–successional)	No Change	Same as Alternative 1	Same as Alternative 1
Effects to tidally influenced freshwater wetlands and swamp habitats	No Change	Same as Alternative 1	Same as Alternative 1
Physical environment effects			
Effects to air quality	No Change	Same as Alternative 1	Same as Alternative 1
Effects to hydrology	No Change	Same as Alternative 1	Same as Alternative 1
Effects to soils	No Change	Same as Alternative 1	Same as Alternative 1
Effects to water quality	No Change	Same as Alternative 1	Same as Alternative 1
Social effects			
Opportunities for quality wildlife observation and photography	No change in availability of opportunities	Minor positive effect because facility enhancements and habitat management actions would increase opportunities to see wildlife and more visitors would be able to view wildlife.	Minor positive effect because facility enhancements and habitat management actions would increase opportunities to see wildlife and more visitors would be able to view wildlife.
Opportunities for quality hunting	No change in availability of opportunities	Minor positive effect stemming from increase of hunt area and initiation of a safety zone between the Mainland Unit and Hunting Island.	Minor positive effect stemming from increase of hunt area and initiation of a safety zone between the Mainland Unit and Hunting Island.
Opportunities for quality fishing	No change in availability of opportunities	Same as Alternative 1	Same as Alternative 1
Opportunities for quality environmental education/	No change in availability of opportunities	Minor positive effect because of trail improvements and interpretation/EE program enhancements.	Minor positive effect because of trail improvements and EEI program

	Alternative 1	Alternative 2	Alternative 3
interpretation			enhancements.
Other effects			
Effects to cultural/ historical resources	No management actions expected to affect these resources.	Same as Alternative 1	Same as Alternative 1
Economic effects	Minor positive effect due to increased operation and visitor expenditures.	Same as Alternative 1	. Same as Alternative 1

6.3 Cumulative Effect Analysis

6.3.1 Introduction

Cumulative effects can result from the incremental effects of a project when added to other past, present, and reasonably foreseeable future projects in the area. Cumulative impacts can result from individually minor but cumulatively significant actions over a period of time. This analysis is intended to consider the interaction of activities at the Julia Butler Hansen Refuge and the Lewis and Clark Refuge with other actions occurring over a larger spatial and temporal frame of reference. The interrelated effects of separate actions under the alternatives are also considered.

The Council on Environmental Quality (CEQ) regulations, which implement the provisions of NEPA, that define several different types of effects that should be evaluated in an EIS, including direct, indirect and cumulative effects. Direct effects are addressed in the resource-specific sections of this Draft CCP/EIS (Chapters 3-5). This section addresses indirect and cumulative effects.

The CEQ (40 CFR § 1508.7) (CEQ 1997) provides the following definition of indirect effects. *[Impacts that are] caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems including ecosystems.*

The CEQ (40 CFR § 1508.7) (CEQ 1997) provides the following definition of cumulative effects. *The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.*

It should be noted that the comprehensive nature by which direct and indirect effects associated with implementing the various alternatives has been conducted largely comprises a cumulative effects analysis. The analysis in this section primarily focuses on effects associated with reasonably foreseeable future events and/or actions regardless of what entity undertakes that action.

6.3.2 Cumulative Impacts Lewis and Clark Refuge

Both of the proposed alternatives are similar in terms of public use activities. Due to the lack of visitor facilities and limited access to the refuge (boat only), most visitor use activities are focused on the Julia Butler Hansen Refuge. Under both alternatives there would be no changes to the hunting and fishing programs on Lewis and Clark Refuge. There would potentially be a very slight temporary increase in visitor recreational use under Alternative 2, due to improved signs and information about the refuge and interest in the potential for wilderness designation. Overall, visitor use is expected to remain the same since the majority of boaters do not land on or explore the refuge islands. Impacts to refuge wildlife and habitats from this use are expected to be very similar to current levels.

6.3.3 Cumulative Impacts Julia Butler Hansen Refuge

6.3.3.1 Hunting and Migratory Waterfowl

Waterfowl populations throughout the United States are managed through an administrative process known as flyways, of which there are four (Pacific, Central, Mississippi and Atlantic). The review of the policies, processes and procedures for waterfowl hunting are covered in a number of documents.

The Service's NEPA considerations for hunted migratory game bird species are addressed by the programmatic document, "Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88– 14)," filed with the Environmental Protection Agency on June 9, 1988. The Service published a Notice of Availability in the Federal Register on June 16, 1988 (53 FR 22582), and the Record of Decision on August 18, 1988 (53 FR 31341). Annual NEPA considerations for waterfowl hunting frameworks are covered under a separate Environmental Assessment and Finding of No Significant Impact. Further, in a notice published in the September 8, 2005, Federal Register (70 FR 53776); the Service announced its intent to develop a new Supplemental Environmental Impact Statement for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006, as announced in a March 9, 2006, Federal Register notice (71 FR 12216).

Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations (50 CFR Part 20) establishing the Migratory Bird Hunting Frameworks. The frameworks are essentially permissive in that hunting of migratory birds would not be permitted without them. Thus, in effect, Federal annual regulations both allow and limit the hunting of migratory birds.

The Migratory Bird Hunting Frameworks provide season dates, bag limits, and other options for the States to select that should result in the level of harvest determined to be appropriate based upon Service-prepared annual biological assessments detailing the status of migratory game bird populations. In North America, the process for establishing waterfowl hunting regulations is conducted annually. In the United States, the process involves a number of scheduled meetings (Flyway Study Committees, Flyway Councils, Service Regulations Committee, etc,) in which

information regarding the status of waterfowl populations and their habitats is presented to individuals within the agencies responsible for setting hunting regulations. In addition, public hearings are held and the proposed regulations are published in the Federal Register to allow public comment.

For waterfowl, these annual assessments include the Breeding Population and Habitat Survey, which is conducted throughout portions of the United States and Canada, and is used to establish a Waterfowl Population Status Report annually. In addition, the number of waterfowl hunters and resulting harvest are closely monitored through both the Harvest Information Program (HIP) and Parts Survey (Wing Bee). Since 1995, such information has been used to support the adaptive harvest management (AHM) process for setting duck hunting regulations. Under AHM, a number of decision-making protocols render the choice (package) of predetermined regulations (appropriate levels of harvest) which comprise the framework offered to the States that year. Oregon's Fish and Wildlife Commission then selects season dates, bag limits, shooting hours and other options from the Pacific Flyway package. Their selections can be more restrictive, but cannot be more liberal than AHM allows. Thus, the level of hunting opportunity afforded each State increases or decreases each year in accordance with the annual status of waterfowl populations.

Each national wildlife refuge considers the cumulative impacts to hunted migratory species through the Migratory Bird Frameworks published annually in the Service's regulations on Migratory Bird Hunting. Season dates and bag limits for refuges open to hunting are never longer or larger than the State regulations. In fact, based upon the findings of an environmental assessment developed when a refuge opens a new hunting activity, season dates, and bag limits, and other aspects of a hunt may be more restrictive than the State allows.

As a result of the recent regulations, the estimated average annual duck harvest for the Pacific Flyway is 2.5 million birds, which represent approximately 18 percent of the estimated average annual U.S. harvest of 14 million ducks (USFWS 2004). The estimated average annual goose harvest for the Pacific Flyway is 383,091 which represent 12.4 percent of the estimated annual U.S. harvest of over 3.5 million geese.

For comparison, in 2005, the breeding duck population estimate for those areas surveyed (California, Oregon, Nevada, Utah and Washington) in the Pacific Flyway was 1,097,276 birds, which was a 22.7 percent increase from the 2004 average (USFWS 2005). The estimated average annual duck breeding population for these areas from 1994-2005 was approximately 1.10 million birds. These numbers serve to demonstrate the relative importance of the more southern portions of the Pacific Flyway for wintering waterfowl, rather than waterfowl production. In fact, the vast majority of birds wintering and subsequently harvested in the Flyway come from breeding grounds to the north. The estimated duck breeding population in traditional survey areas of the western and central U.S. (Alaska, prairie pothole region of the west, Canada) was 36.2 million (USFWS 2005).

In 2005, the midwinter survey index of ducks for the Pacific Flyway was over 5.7 million, an 18 percent increase from the 10-year (1995-2005) average of 4.9 million. The index for Canada geese was 416,000, down 1.7 percent from the 10-year average of 432,270. The index for total

geese (Canada, snow/Ross', white-fronted, and brant) was over 1.6 million, a 46 percent increase over the 10-year average of 1.1 million (USFWS 2005).

Regional Analysis

The estimated breeding duck population in 2005 in Oregon was 225,349. The estimate for neighboring Washington was 111,504 (USFWS 2005). Neither state is a major duck breeding area. Wintering birds from breeding areas farther north make up the bulk of the states' waterfowl populations.

The duck midwinter survey index for Washington was 956,979. The index for Oregon was 379,256. The midwinter surveys are conducted in January, after waterfowl that winter farther south (California, etc.) have passed through and more than two-thirds of the waterfowl hunting season is over. The Canada goose midwinter indexes were 43,908 for Washington and 125,763 for Oregon (USFWS 2005).

The estimated total duck harvests for Oregon and Washington in 2004 were 256,798 and 353,299 (USFWS 2005), respectively. The estimated total Canada goose harvest in 2004 was 67,610 in Oregon and 72,147 in Washington (USFWS 2005). Waterfowl numbers in the Pacific Flyway are remaining relatively stable. The 2005 midwinter survey indices for the 11 Pacific states were 18 percent and 46 percent above the 10-year average for ducks and geese, respectively.

The number of waterfowl hunters, as reflected in the sales of duck stamps, has been declining in both states. In 2004, duck stamp sales in Oregon and Washington were 28,086 and 28,184 respectively, far below the 50,000-70,000 that was typical in both states during the 1970s (USFWS 2005).

Local Analysis

The lower Columbia River in Oregon and Washington has long been a popular place for waterfowl hunting. Ridgefield Refuge, Lewis and Clark Refuge, and the State of Oregon's Sauvie Island Wildlife Management Area are well known hunting destinations. Most of the Julia Butler Hansen Refuge is closed to hunting. Many other areas of the lower river are in state or private ownership and are also used by waterfowl hunters. In many cases, there is no check in or mandatory reporting procedure, so harvest estimates for the region are not available. At Sauvie Island, where reporting is mandatory, a total of 19,720 ducks (2.2 ducks per hunter visit) and 140 Canada geese (2.2 geese per hunter visit) were harvested during the 2005/2006 hunting season. The 2006/2007 season harvests at Ridgefield Refuge were 3,268 ducks and 283 geese. No estimates are available for Lewis and Clark Refuge, but area managers/biologists estimate that the total harvest ranges between harvest numbers at Ridgefield Refuge and Sauvie Island.

Direct effects of hunting on waterfowl are mortality, wounding, and disturbance (DeLong 2002). Hunting can alter behavior (e.g., foraging time), population structure, and distribution patterns of wildlife (Owens 1977, Raveling 1979, White-Robinson 1982, Thomas 1983, Bartelt 1987, Madsen 1985, and Cole and Knight 1990). These impacts can be reduced by the presence of adjacent sanctuary areas where hunting does not occur, and birds can feed and rest relatively

undisturbed. Sanctuaries or non-hunt areas have been identified as the most common solution to disturbance problems caused from hunting (Havera et. al 1992). The Mainland and Tenasillahe Island units, with a total acreage of about 4,000, are closed to waterfowl hunting and often draw many thousand ducks and geese. Closed areas are also available within Lewis and Clark Refuge, Ridgefield Refuge, and Sauvie Island Wildlife Management Area.

All the alternatives propose continuation of the existing refuge hunting program. Additionally, alternatives 2 and 3 for the Julia Butler Hansen Refuge propose to open Price and Crims Island to waterfowl and snipe hunting. Opening these areas is not expected to be additive to waterfowl mortality because of declining hunter numbers and the fact that hunting already occurs on state-owned tidelands immediately adjacent to the islands.

Conclusion

Waterfowl hunting in the United States is based upon a regulatory-setting process that involves numerous sources of waterfowl population and harvest monitoring data. As a result of the regulatory options produced in recent years and despite continued hunting nationwide, waterfowl continue to be abundant and available for both hunting and viewing. Current harvest levels are not threatening waterfowl populations at the flyway, regional, or local level. Allowing hunting at Julia Butler Hansen Refuge is not expected to have any effect on either harvest levels or waterfowl populations.

6.3.3.2 Non-Hunted Migratory Wildlife

Migratory species other than waterfowl that are present on or near the refuge include other waterbirds, neotropical migrant birds, migratory bats, raptors, salmon, other migratory fish, and various invertebrates (butterflies, etc). California sea lions and harbor seals frequent the mainstem Columbia River, but are not expected to be present close to the islands where the hunt would occur during the waterfowl season (late fall and early winter).

Flyway, Regional and Local Analysis

While non-hunted migratory wildlife would not be targeted, some individual animals might be disturbed by hunting activities. Human disturbance associated with hunting includes loud noises and rapid movements, such as those produced by shotguns and boats powered by outboard motors, as well as the presence of humans. This disturbance, especially when repeated over a period of time, may compel some wildlife species to change food habits or move to other areas.

Waterfowl hunting takes place during the late fall and winter, generally from about mid-October to late January (the season length may vary from year to year, depending on waterfowl breeding success rates and other factors). Many species, such as migratory bats, migratory invertebrates, and many neotropical migrant birds, have migrated south for the winter and are not present during the hunting season.

Hunting would occur only on the shorelines. The interior of the islands is forested swamp with thick underbrush; that is not suitable for waterfowl hunting. Migratory wildlife that is disturbed

by hunting could escape the disturbance by moving to the island's interior or to other nearby areas of the lower Columbia River. The Tenasillahe Island and Mainland units, which total about 4,000 acres, are closed to waterfowl hunting and could act as sanctuaries for wildlife disturbed by hunting. Sanctuaries or non-hunt areas have been identified as the most common solution to disturbance problems caused from hunting (Havera et al. 1992).

Hunting season would not coincide with the nesting season of migratory birds. Long-term future impacts that could occur if reproduction was reduced by hunting are not relevant for this reason. Disturbance to the daily wintering activities of birds, such as feeding and resting, might occur and be temporary and localized. Disturbance to birds by hunters would probably be commensurate with that caused by nonconsumptive users.

Hunting, as proposed for Julia Butler Hansen Refuge under alternatives 2 and 3, would not be expected to result in an increase in the relatively small number of hunters using the refuge area of the river. It is doubtful that more than 4 or 5 hunting parties would use the refuge on any given day. The river surrounding the islands is open to hunting and would remain so. One of the reasons for proposing hunting is that a closure would be virtually unenforceable given the lack of a clear boundary between refuge-owned "uplands" and State-owned tidelands.

Conclusion

Waterfowl hunting on the Julia Butler Hansen Refuge would result in some minor disturbance to other migratory wildlife. We conclude that the impacts to migratory wildlife would be temporary and localized and result in negligible effects to non-hunted migratory wildlife.

6.3.3.3 Resident Wildlife

The term resident wildlife refers to those wildlife species that are not migratory. The ODFW and WDFW are the lead agencies for managing the States' fish and wildlife. Resident wildlife species are protected by State regulations to ensure their continued existence.

Resident wildlife found on and near the refuge would include river otters, mink, muskrats, nonmigratory species of bats, Columbian white-tailed deer (see Section 4.3), ruffed grouse and other resident birds, a variety of small mammals, reptiles, amphibians, nonmigratory fish, many invertebrates, and plants.

The refuge would not be open to hunting of resident wildlife; therefore, there are unlikely to be any direct impacts. The human presence and activities (boating, shooting, etc.) associated with hunting have the potential to cause disturbance to non-hunted resident wildlife. This disturbance, especially when repeated over a period of time, may compel some wildlife species to change food habits or move to other areas.

Relatively few hunters would be expected to use the refuge hunting areas and these would likely be people who already hunt on the State-owned tidelands adjacent to the islands. Opening the shorelines to waterfowl hunting is not expected to add to existing disturbance caused by hunters and other users of the river such as boaters, anglers, sightseers, and marine workers.

Waterfowl hunting takes place during late fall and winter, generally from about mid-October to late January (the season length may vary from year to year, depending on waterfowl breeding success rates and other factors). Most resident wildlife produce and rear their young in the spring and summer, so disturbance caused by hunting would be unlikely to have long-term regional or local effects on reproduction of resident wildlife. Reptiles and amphibians are largely in a state of winter torpor during the hunting season, so it is unlikely they would be affected at all. Terrestrial invertebrates are also largely inactive during winter and would be unlikely to come in contact with hunters. Fish are underwater and are not likely to be affected by waterfowl hunting.

Conclusion

Hunting might result in disturbance to other wildlife species on or near the refuge's units; however, the cumulative effects, if any, of the disturbance would be temporary, localized, and result in only negligible effects to resident wildlife.

6.3.3.4 Endangered Species

It is our policy to protect and preserve all native species of fish, amphibians, reptiles, birds, mammals, invertebrates, and plants, including their habitats, which are designated as threatened or endangered with extinction. Endangered, threatened, proposed, and candidate species that could occur on or near the refuge include Columbian white-tailed deer, marbled murrelet, northern spotted owl, Howellia (a plant), Nelson's checkermallow (a plant), streaked horned lark, Mazama pocket gopher, and Pacific fisher. There are also endangered and threatened salmonids and bull trout in the waterways; however, they would not be affected by the waterfowl hunting program.

The marbled murrelet, northern spotted owl, streaked horned lark, Mazama pocket gopher, Howellia, Nelson's checkermallow and Pacific fisher are not known to occur on the refuge, so they would not be affected by a waterfowl hunt.

Regional and Local Analysis

A Section 7 consultation (USFWS 2007) concluded that waterfowl hunting at Wallace Island would not likely adversely affect Columbian white-tailed deer and bald eagles, and would have no effect on the other endangered, threatened, proposed, or candidate species listed in the paragraph above.

Conclusion

We conclude that waterfowl hunting at Julia Butler Hansen Refuge would have no adverse cumulative effects on endangered, threatened, proposed, or candidate species or critical habitat.

6.3.3.5 Anticipated Direct and Indirect Effects of Proposed Action on Refuge Programs, Facilities, and Cultural Resources

Other Wildlife-dependent Recreation

Hunting affects other wildlife-dependent recreation opportunities in a variety of ways. Many nonhunters plan their vacations or visits to avoid being on a refuge during hunting seasons. Many refuge visitors tend to seek out areas that offer amenities such as trails, parking areas, and information kiosks, as is available at the Mainland Unit. These facilities provide bird watchers, photographers, and students an opportunity to experience a safe, informally guided refuge visit. The bulk of wildlife-dependent recreation use on the refuge occurs during the spring and summer months, when waterfowl hunting is not occurring. The Mainland Unit, which receives the bulk of visitor use, is not open for waterfowl hunting.

All of the alternatives propose to continue the present hunting program. Crims and Price Islands would also be opened to waterfowl hunting under alternatives 2 and 3. These islands receive very little visitor use. Access is by boat only and the thick vegetation on the islands is not conducive to hiking. However, substantial numbers of recreational boaters and anglers pass by the island and it is reasonable to assume that many enjoy viewing wildlife on the islands. There is the potential that hunting activity could detract from the enjoyment of nonhunters. That potential exists throughout the lower Columbia River. Waterfowl hunting on Price and Crims Islands would not be expected to increase the number of hunters in that area and thus would not affect the potential for conflicts between nonhunters and hunters. Hunting already occurs, and will continue to occur, on State-owned tidelands adjacent to the island. Also, hunting occurs during late fall and early winter when other recreational use is at a minimum. The cumulative effects of hunting on other wildlife-dependent recreation would be minimal.

Refuge Facilities

There are no refuge buildings, roads, trails, or other facilities on Price and Crims Islands. Hunters accessing the island do not pass through other refuge units. Therefore, the hunt would have no effect on refuge facilities.

Cultural Resources

There are no known cultural resources on the refuge. Prior to construction of Columbia River dams, the islands would have been inundated by the river's annual spring freshet (Christy and Putera 1992). Flooding still occurs at high river levels. If historical artifacts were ever present, they have either washed downstream or were buried under sediments where they would not be readily accessible by visitors, and therefore would not be affected by waterfowl hunting.

Conclusion

The Service concludes that waterfowl hunting at the refuge would have few if any cumulative effects on other wildlife dependent recreation, refuge facilities, or cultural resources.

6.3.3.6 Anticipated Effects of Proposed Hunting on Refuge Environment and Community

Hunting would be conducted by boat and on foot along the shoreline. Impacts to refuge soils and vegetation by hunters would be expected to be minimal, such as insignificant soil compaction. Impacts to air and water quality would be minimal and restricted to automobile emissions as hunters travel to and from public boat ramps, and boat motor emissions. Boat motors sometimes discharge oil and gasoline into the water. These impacts would be a minute fraction of the impacts caused by refuge visitors' automobiles and general boat traffic on the river. Hunting at the refuge would not be expected to result in an increase in hunting activity; therefore, the hunt would have no cumulative effect on air and water quality.

Impacts associated with solitude would be expected to be minimal given time and space zone management techniques such as seasonal access and area closures used to avoid conflicts among user groups. Hunting already occurs on State-owned tidelands adjacent to the islands. The proposed hunt would have no additional effects on solitude.

The refuge would work closely with State, Federal, and private partners to minimize impacts to adjacent lands and its associated natural resources; however, no indirect or direct impacts are anticipated. The newly opened hunt would result in a net gain of public hunting opportunities positively impacting the general public, nearby residents, and refuge visitors, although no gain in the actual number of hunters is would be expected. The Service expects that as a result of opening Crims and Price Islands to hunting (alternatives 2 and 3) there would be no effect upon the area's economy.

Conclusion

The Service concludes that waterfowl hunting at the refuge would have few if any effects to air quality, water quality, soils, vegetation, adjacent lands and natural resources, the general public, nearby residents, and refuge visitors. There would be negligible, if any, economic benefit to local communities.

6.3.3.7 Other Past, Present, Proposed, and Reasonably Foreseeable Hunting and Anticipated Effects

Past

The refuge was established in 1971 to preserve habitat for the Columbian white-tailed deer. Prior to that, the land was in multiple small, private ownerships where traditional hunting had been conducted for generations. Hunting ceased on the refuge mainland and Tenasillahe Island once the refuge was established. Waterfowl and snipe hunting were allowed on the Hunting Islands Unit. Hunting has long been a traditional activity along the lower Columbia River. Waterfowl hunting in the marshes and lowlands was popular during fall and winter. Elk, black-tailed deer, and small game were hunted in the uplands.

Present

Hunting continues to be a popular activity along the lower Columbia River. Wintering waterfowl draw thousands of hunters to Federal, state, and private lands in southwest Washington and northwest Oregon. Elk hunting in the uplands attracts hunters from all over Washington and other states. Hunting for black-tailed deer and small game is also popular with hunters.

The small hunting program on the refuge is insignificant compared to overall hunting activity in the lower Columbia River area. Local and regional populations of hunted wildlife continue to thrive. Hunting is a highly regulated activity, and generally takes place at specific times and seasons (at dawn, during fall and winter) when game animals are less vulnerable (e.g., not in breeding season) and other wildlife-dependent activities (e.g., wildlife observation and photography, environmental education and interpretation) are less common, reducing the magnitude of disturbance to refuge wildlife. We did not find any evidence that managed and regulated hunting of wildlife would reduce species populations to levels that would affect other wildlife-dependent uses.

Reasonably Foreseeable Hunts

The most important consideration in the maintenance of wildlife populations is the protection of their habitat. The Service, ODFW, WDFW, The Nature Conservancy, the Columbia Land Trust, and a multitude of other agencies and organizations are all working to protect and restore native habitat along the lower Columbia River. Habitat protection and restoration helps the Service fulfill the U.S. Congress mandate to preserve, restore, and enhance riparian habitat for threatened and endangered species, songbirds, waterfowl, other migratory birds, anadromous fish, resident riparian wildlife, and plants. Habitat restoration would also have a positive effect on wildlife populations on the refuge.

Hunting is carefully regulated by Federal and State laws and regulations to ensure that wildlife populations and habitats are not jeopardized. Moreover, the amount of hunting on the refuge is not expected to increase significantly in the future.

Conclusion

We conclude that waterfowl hunting at the refuge, taken in context with other past, present, and reasonably foreseeable hunts, would have no effects or only minor effects on populations of waterfowl and other wildlife, other refuge resources, and other wildlife-dependent activities and public uses.

6.3.3.8 Anticipated Effects if Individual Hunts are Allowed to Accumulate

There are 18 national wildlife refuges in Oregon and 22 in Washington. Hunting, fishing, wildlife observation, photography, environmental education, and interpretation are enjoyed by millions of visitors annually. These refuges are also wild places where people can find solace and reconnect with nature. For the reasons cited earlier, the proposed waterfowl hunting

program at Julia Butler Hansen Refuge would be expected to have no effects on wildlife populations on other refuges.

National wildlife refuges, including Julia Butler Hansen Refuge, conduct hunting programs within the framework of State and Federal regulations. The proposed waterfowl hunting program is as restrictive as the State of Oregon's. By maintaining hunting regulations that are as restrictive as or more restrictive than the State, we ensure that individual refuges are maintaining seasons which are supportive of hunting management on a more regional basis. The proposed hunt plan has been reviewed and is supported by ODFW. Additionally, refuges in Oregon coordinate with ODFW annually, to maintain regulations and programs that are consistent with the State management program. Therefore, there should be no cumulative effects from an accumulation of hunts.

Conclusion

The Service has concluded that hunting would not cause significant cumulative effects on the refuge's hunted and non-hunted wildlife populations. The Service has also concluded that the proposed action would not cumulatively affect the refuge environment or refuge programs. This determination was based upon a careful analysis of the potential environmental impacts of hunting on the refuge together with other projects and/or actions. Hunting is an appropriate wildlife management tool that can be used to manage wildlife populations. Some wildlife disturbance would occur during the hunting seasons. Proper regulations and refuge seasons would be designed to minimize any negative effects on wildlife populations using the refuge.

6.3.3.9 Cumulative Effects from Predator Control

Coyotes

Local and Regional Analysis

The authority for managing coyote populations in Oregon and Washington rests with the states' respective departments of fish and wildlife. There are an estimated 50,000 coyotes in Washington (WDFW 2008a) and 160,000 in Oregon (USDA 1997a). In both states, coyotes may be hunted year-round and there is no bag limit. Coyotes may also be taken for fur and damage control by shooting or trapping, although leg-hold traps are banned in Washington (there is an exception on the trap ban for removal of animals that are causing damage).

The Mainland Unit is located in Wahkiakum County, Washington. We are aware of no estimates of the number of coyotes in the county, although they appear to be abundant, and likely number in the many hundreds, if not thousands. In response to damage complaints, the U.S. Department of Agriculture's Wildlife Services removed 5 coyotes from the county in 2007, in addition to the 8 removed from the Mainland Unit as part of the refuge's predator management program. No coyotes were reported taken in the county during the Washington fur harvest season in 2006 (WDFW 2008b). There is no available data on the number that were taken by hunters and in

private control efforts. Statewide, Wildlife Services removed 585 coyotes in 2006 (USDA 2008) and 113 were reported taken during the State furbearer harvest season (WDFW 2008b). There is no data on the number of coyotes taken by sport hunters and in private control efforts, although it was probably not more than 4,100 as was estimated in 1996 (approximately 9 percent of the estimated population) (USDA 1997b).

The Tenasillahe Island and Crims Island units are respectively located in Clatsop and Columbia Counties, Oregon. Coyote populations are not monitored in these counties, so there is no data on numbers. It is reasonable to assume that there are thousands of coyotes in the two counties. Wildlife Services removed 14 coyotes in 2006 in Columbia County (none in Clatsop County) in response to damage complaints. The numbers taken by sport hunters and in private control efforts are not known. The total number taken annually in these counties apparently is not enough to negatively impact the population, as coyotes are abundant. Statewide, Wildlife Services removed 1,168 coyotes in 2006 (USDA 2008) and 5,451 were reported taken during the 2005 state furbearer harvest season (ODFW 2006a). There is no data on the number that were taken by sport hunters and in private control efforts. Given the abundance of coyotes in the State, it is unlikely that the total number taken each year is enough to negatively impact the population.

Coyote populations are able to compensate for high annual losses by increasing their rate of reproduction. Connolly and Longhurst (1975) found that through compensatory reproduction coyotes could withstand an annual control level of 70 percent. Although the total numbers of coyotes taken each year by hunting, trapping and damage control efforts in Washington and Oregon are unknown, it is reasonable to conclude that they are much less than 70 percent of the states' populations, and probably less than 10 percent. The expected annual take from the refuge under any of the three alternatives would be a maximum of about 40 individuals. The refuge control program would have a negligible effect on local and regional coyote populations.

National Analysis

Coyotes occur throughout most of North America. They are not migratory wildlife; therefore, the removal of coyotes from the refuge would have no effect on national coyote populations.

Conclusion

Coyotes are plentiful in both Oregon and Washington. The small annual take resulting from the refuge predator control program would have negligible cumulative effects on local, regional, and national coyote populations.

6.3.3.10 Other Predators of Deer

Black bears are quite common in western Oregon and Washington. There are an estimated 25,000-30,000 black bears in each state (ODFW 2008a, and WDFW 2003). Both states have hunting seasons for bears. In western Oregon, 657 bears were taken by hunters in 2006 (ODFW 2007). In western Washington (Coastal and Puget Sound units), 367 bears were taken by hunters in 2006 (WDFW 2008c).

Although less numerous than black bears, cougars are also fairly common with a widespread distribution in Oregon and Washington. The statewide populations are estimated at 5,100 in Oregon (ODFW 2006b) and 2,600 in Washington (WDFW 2003). Both states have hunting seasons for cougars. In 2006, the numbers reported taken by hunters were 292 cougars in Oregon (ODFW 2008b), and 146 cougars in Washington (WDFW 2007).

Both cougars and black bears—should individuals of either or both species include the refuge in their home range—are capable of inflicting severe predation losses on CWT deer. If it becomes necessary to remove either predator from the refuge, the Service would work closely with the appropriate state. The state would decide whether the offending animal(s) needed to be removed by relocation or by lethal means. To date, there has not been a need to remove either cougars or bears from the refuge. If a need arose, it is unlikely that more than a very few (probably 1 or 2) animals would be involved.

Both Oregon and Washington manage cougar and black bear populations on a sustainable basis. The very small numbers that might be removed from the refuge would have no discernable cumulative effects on cougar or bear populations locally or regionally.

6.3.3.11 Columbian White-tailed Deer

There are numerous ongoing efforts to protect and enhance the CWT deer population and achieve the recovery of the species. These include:

- Management of refuge habitat to provide maximum benefits for the deer.
- Acquisition of CWT deer habitat by the Service and private conservation organizations.
- State and Federal laws protecting CWT deer from take.
- Technical assistance to private landowners to improve CWT deer habitat.
- Reintroductions of CWT deer to suitable habitat within their former range.
- Predator control.

The loss of excessive numbers of CWT deer to predators, especially coyotes, undermines other recovery efforts. Alternatively, predator control on the refuge complements these recovery efforts. A more effective predator control program, as proposed in alternatives 2 and 3, in concert with proposed reintroduction and population expansion efforts, are expected to have significant beneficial cumulative effects on the deer.

6.3.3.12 Impacts to Fisheries

In Washington State, fishing season options are developed each year in the late winter and early spring by the WDFW in conjunction with State and Tribal fish managers based on the best available scientific information on the number of fish a given stream or lake is capable of supporting. Even after seasons are set each April, WDFW monitors in-season activity to gauge what is actually happening on the water and whether seasons should be adjusted accordingly. For example, a fishery may be closed because a quota has been reached; fishing rules may be modified to allow recreational fishing to increase or decrease by limits, or fishing opportunities may be changed if information from test fisheries indicates the number of fish actually returning is substantially different from preseason estimates.

For anadromous fish such as salmon, the annual process of setting scientifically sound fishing seasons begins each year with a preseason forecast of the abundance of various individual fish stocks. These forecasts are based on estimates of the number of juvenile wild salmon produced in a river system, surveys of adult fish spawning in the wild, counts of fish returning to hatcheries, and samples from fisheries in "terminal" areas—the waters near the home streams where fish are returning. Taken together, these numbers usually can give an indication of the strength of the upcoming season's fish populations.

The forecast is added to a base of information on the historic run size strength and fishery impacts for the various fish populations. The primary tool used to develop this base of information for Chinook salmon is coded wire tags, which bear identifying information and are inserted into the snouts of young fish. Later, the coded wire tags can be extracted from fish sampled in fisheries or recovered from spawning grounds.

The WDFW participates in three separate harvest management panels including: The Pacific Salmon Commission which consists of representatives of Alaska, Washington, Oregon, and Canada; the treaty Indian tribes of Washington and the Columbia River and the Federal government; the Pacific Fisheries Management Council (PMFC) which includes the principal fisheries officials from the states of California, Oregon, Washington and Alaska; the Regional Director, NOAA Fisheries Service and eight private citizens appointed by the U.S. Secretary of Commerce; and the North of Falcon public planning process in which Federal, state and tribal fish managers meet in tandem with PFMC deliberations on ocean seasons, to set recreational and commercial salmon fisheries for waters within three miles of the coast of Washington and northern Oregon, as well as Puget Sound.

Because we allow people to fish from the refuge we expect a relative small number of fish to be taken from refuge and adjacent waters. The number of fish taken on the refuge is minor compared to the number of fish harvested from other fishing activities (sport and commercial) on the lower Columbia River; therefore, the refuge fishing program would have a negligible effect on local and migratory fish populations. Fishing rules and regulations are in general governed by the individual states. While there are no specific refuge regulations regarding the number of fish that can be taken, the interior sloughs of the Mainland and Tenasillahe Island units are closed to all public access including fishing.

In Washington State in 2006 there were an estimated 538,000 recreational freshwater anglers with a total of 7,524,000 fishing days amassed during the year. In Oregon, the number of freshwater anglers was 491,000 with an estimated 7,053,000 fishing days in the State (USFWS 2006). While no overall surveys have been completed for fishing activities that occur on refuge lands, it is obvious to the casual observer that the amount of recreational anglers is very small.

On the Mainland Unit there are at the most 10-15 anglers per day. Expanding this out to the entire refuge would produce a figure of around 40 anglers per day. An average daily rate of 40 anglers per day would result in a total of 14,400 fishing days per year which is less than 0.002 percent of the total yearly freshwater fishing days for the state of Washington.

6.3.3.13 Public Use Program

The Mainland Unit is the focus of the public use program for both refuges. This is the only area where the public can drive to access the refuge and associated facilities. Most of the lower river refuge islands receive limited visitor use. Access is by boat only and the thick vegetation on the islands is not conducive to hiking. However, substantial numbers of recreational boaters and anglers pass by the islands and it is reasonable to assume that some scan the shoreline for birds and other wildlife.

Based on current public use program, cumulative impacts from refuge visitors who visit both by car and by boat are expected to be minimal when put in the context of overall recreational use of the lower Columbia River. Other local/regional areas that provide public recreational facilities include Vista Park in Skamokawa, Lewis and Clark National Historic Park near Astoria, Fort Clatsop State Park near Warrenton, Fort Stevens State Park near Ilwaco, and the Mount Saint Helens National Monument. In addition, much of the public use in the lower Columbia is not site specific, with many visitors coming to spend time on the river as opposed to a park or other recreational unit.

Although no recreational use data was found specifically for the Lower Columbia River Counties of Washington and Oregon State (Columbia, Cowlitz, Wahkiakum and Pacific Counties), survey results were found for Washington State. The Washington State IAC has compiled statewide participation data and conducted recreational use surveys on a somewhat regular basis. A 2003 report by the IAC provides estimates of future participation in 13 of 14 major categories over periods of 10 and 20 years. The estimates are based on:

- National Survey on Recreation and the Environment (NSRE) projections for the Pacific Region, including Washington State;
- Age group participation and age trends in Washington;
- Estimates of resource and facility availability;
- User group organization and representation;
- Land use and land designations; and
- Other factors including the economy and social pressures.

The resulting estimates, as a percent of change in the number of people participating in the future compared to current levels, are depicted in the following table.

Table 6-3 Estimates of the Percent of Change to Occur in Recreation Participation over the next 10 to 20 Years (IAC 2003)

Activity	Estimated 10 year change	Estimated 20 year change
Walking	+23%	+34%
Hiking	+10%	+20%
Outdoor team and individual sports	+6%	+12%
Nature activities	+23%	+37%
Sightseeing	+10%	+20%
Bicycle riding	+19%	+29%
Picnicking	+20%	+31%
Motor boating	+10%	No estimate
Non-pool swimming	+19%	+29%

Activity	Estimated 10 year change	Estimated 20 year change
Visiting a beach	+21%	+33%
Canoeing/kayaking	+21%	+30%
Downhill skiing	+21%	No estimate
Cross-country skiing	+23%	No estimate
Snowmobile riding	+42%	No estimate
Fishing	-5%	-10%
Camping (primitive dispersed)	+5%	No estimate
Camping (backpacking)	+5%	+8%
Camping (developed for RVs)	+10%	+20%
Off-road vehicle riding	+10%	+20%
Hunting-shooting	-15%	-21%
Equestrian	+5%	+8%
Air activities	No estimate	No estimate

The survey indicates that hiking, nature activities, sightseeing, canoeing and kayaking are expected to increase between 20 percent and 37 percent depending on the activity throughout the State over the next 15 to 20 years. Other recreational activities such as hunting and fishing are expected to decline between 10 and 20 percent. The hunting and fishing figures are especially telling because even with population gains throughout the state these activities are expected to decline over time.

Cumulative impacts from public uses are based on anticipated population gains in this region during the next 15 years as well proposed new/improved recreational opportunities and facilities which would potentially bring in additional refuge visitors. Managing the refuge under Alternative 1 would continue current management. Management under Alternatives 2 and 3 would provide for improvements to public recreation including: improvements for wildlife observation and photography with a designed foot trail proposed to allow the public to easily view wildlife; allowing additional refuge islands to be opened for waterfowl hunting; establishment of a YCC program (Alternative 2); and installation of new interpretive panels along with development of school curriculum and study sites (Alternative 3).

Impacts from the various alternatives are expected to have minimal affect on refuge resources. Because hunting and fishing activities are expected to decline over time, even if we provide additional hunting opportunities on refuge islands, impacts from these activities should be less than current levels over time. Other nonconsumptive activities such as wildlife observation and photography are expected to increase. Current visitor use is relatively minimal and the recreational activities planned for specific locations and times will not have any significant impacts to the refuge's habitats or its wildlife.

6.3.3.14 Refuge Habitat Management Activities and Actions

Long-term management of the Julia Butler Hansen Refuge will be focused on upland, riparian and wetland habitats. Short-term uses that enhance long-term productivity within the Mainland and Tenasillahe Island units are primarily related to habitat restoration and ongoing pasture management.

The following habitat restoration activities would be undertaken under all alternatives.

- Mowing and discing in preparation of planting trees and pastures.
- Recontouring wetland sites to allow for better water manipulation.
- Removing vegetation—usually invasive species—through chemical or physical means (e.g., mowing, discing, chopping).

The short-term effects of these activities would include temporary effects on aesthetics, connectivity, and localized wildlife use of the site. Over time impacts from the various alternatives are expected to have a positive affect on refuge resources.

6.4 Placement of Dredged Spoil Material

Columbia River channel maintenance and deepening activities continue to generate dredge spoil accumulations within the refuge boundary. Dredge spoil provides habitat for colonial nesting birds and streaked horned larks. While dredged spoils are generally placed on State-owned islands the activity does occur within the acquisition boundary of the Lewis and Clark Refuge.

Colonial nesting birds (great blue herons, gulls, terns, and cormorants) occur throughout the Lower Columbia River Estuary. The management of these birds is generally limited to protection of the roosting and nesting areas from disturbance. Colonial nesting birds have been the focus of recent attention because they feed on young salmon smolts as well as other fish that travel through the estuary. Continued placement of dredged spoils at existing spoil sites can be expected to encourage use by colonial nesting birds as well as horned larks, and Canada Geese.

Impacts from placement of dredged spoils would be negligible as long as dredge spoils continue to be placed at existing locations. Continued use of dredge spoil areas by the wildlife species discussed above, would be the likely result of this action. Predation on salmon smolts in the vicinity of these islands would be expected to continue at an increased rate over non-dredged spoil sites. There are not expected to be any additional cumulative impacts resulting from refuge habitat management of the islands.

6.5 Columbia River Channel Dredging

According to the Corps the Columbia River channel deepening project is designed to improve the deep-draft transport of goods on the authorized navigation channel and to provide ecosystem restoration for fish and wildlife habitats. The project proposes to deepen the existing 40-foot channel to 43 feet, enabling the use of larger, more efficient vessels to transport commodities. Construction will remove approximately 14.5 million cubic yards (mcy) of material. Approximately 11-13 mcy of material is removed to maintain the Columbia River navigation channel at the current authorized depth of 40 feet. Following construction, maintenance of the 43-foot channel will require the removal of about 8 mcy per year initially and decline to 3 mcy per year as the channel reaches equilibrium. Dredging operations are conducted so as not to conflict with movement of endangered salmonids and other fish species. Impacts from Columbia River dredging operations have been extensively discussed in the 1999 Columbia River

Feasibility Study and Channel Deepening Environmental Impact Statement (EIS), completed by the Corps.

6.6 Proposed Bradwood Liquefied Natural Gas Plant

Northern Star Natural Gas has proposed the Bradwood Landing Liquefied Natural Gas (LNG) receiving terminal on 55 acres of a 420-acre site at Bradwood, located between Astoria and Clatskanie at about River Mile 38 on the Columbia River. The facility would be designed to have a peak send out capacity of 1.3 billion cubic feet of natural gas per day, and would be capable of continuous operation. The proposed project also includes a 34-mile long pipeline that would run from the site to Port Westward and then under the Columbia River into Washington. The proposed site is located approximately one mile northwest of Tenasillahe Island on the Oregon side of the Columbia River.

Overall impacts from the proposed facility are still being debated although a final EIS was issued by the Federal Energy Regulatory Commission (FERC) in June 2008. According to FERC the Bradwood LNG project would have limited adverse environmental impacts if appropriate mitigating measures are taken. The states of Washington and Oregon have yet to officially review the project and issue permits, and both states have filed lawsuits over the approval process for the project.

NOAA's Fisheries Service has joined Washington and Oregon in challenging federal regulators' approval of the Bradwood Landing LNG terminal. The Fisheries Service, which has raised concerns about the proposed Columbia River terminal's effect on salmon, is among six or more state agencies and environmental groups challenging the decision in the U.S. 9th Circuit Court of Appeals.

Impacts to off-refuge CWT deer from the project are currently being reviewed by the Service's Western Washington Ecological Services Office with input from the refuge. Likely impacts to refuge habitat and wildlife are expected to be minimal as the project site and pipeline are generally located away from refuge resources.

6.7 Other Wildlife Management Actions on the Lower Columbia River

In addition to the Service, other conservation agencies and groups that manage and protect habitat in the area include the Nature Conservancy, The Columbia Land Trust, the Lower Columbia River Estuary Partnership, WDFW, and ODFW. Impacts to area habitats resulting from the enhancement of rivers, streams, wetlands, riparian forests, and managed pastures will result in an overall long term benefit to a wide variety of native birds and animals.

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