

Julia Butler Hansen Refuge for the Columbian White- Tailed Deer

**Steamboat Slough Restoration
Environmental Assessment**



**Prepared by
Columbia River Estuary Study Task Force**

For

**U.S. Army Corps of Engineers
May 2013**

**United States Department of Defense- U.S. Army Corps of Engineers
United States Department of The Interior- U.S. Fish & Wildlife Service**



**US Army Corps
of Engineers®**

Executive Summary

The purpose of this draft Environmental Assessment (EA) is to inform members of the public about, and solicit comments on, the proposed restoration actions within the Julia Butler Hansen Refuge for Columbian White-tailed Deer at the site called Steamboat Slough. The United States Army Corps of Engineers and United States Fish and Wildlife Service are proposing these actions to address habitat loss for listed anadromous species, particularly the loss of tidal estuarine wetlands in the Lower Columbia River estuary. The action agencies will consider comments received during the public comment period prior to developing the final EA. The final EA will include a summary of comments received and agency responses to those comments.

The proposed project described in this EA covers restoration actions intended to reconnect a historically estuarine wetland with tidal flows of the Columbia River through levee breaching. Restoring this area would provide access to preferred off-channel foraging and rearing habitat for juvenile salmonids. Restoration actions would also address the flood safety risks that currently exist at the site due to a failing levee system. Specific project actions include:

- Constructing a 4,900 linear foot setback levee in front of Winter Slough
- Excavating 8,500 linear feet of tidal channels
- Creating hummocks and terraces within the restoration area that mimic historical topography
- Installing large wood habitat structures within the tidal channel network
- Removing invasive plant species
- Revegetating the area with native wetland and riparian plants
- Modifying the existing levee in 2 locations to restore tidal connection to the Steamboat Slough site

Under the National Environmental Policy Act (NEPA), public review is required and is an integral part of the agencies' planning process. This draft EA for the Steamboat Slough Restoration will be available for public comment for 15 days.

List of Acronyms and Abbreviations

BMPs	Best Management Practices
Bi- Op	Biological Opinion
BGEPA	Bald and Golden Eagle Protection Act
BPA	Bonneville Power Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability
CEQ	Council on Environmental Quality
CWA	Clean Water Act
Corps/ USACE	U.S. Army Corps of Engineers
CREST	Columbia River Estuary Study Taskforce
DAHP	Department of Archeology and Historic Preservation
DEM	Digital Elevation Model
DOD	Department of Defense
DPS	Distinct Population Segment
EA	Environmental Assessment
EFH	Essential Fish Habitat
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESUs	Evolutionary Significant Units
HIP II	Habitat Improvement Program
JARPA	Joint Aquatic Resources Permit Application
JBH	Julia Butler Hansen Refuge for the Columbian White- Tailed Deer
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPCC	Northwest Power and Conservation Council
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
PCBs	Polychlorinated Biphenyls
PDT	Project Delivery Team
SCS	Soil Conservation Service
SPIF	Specific Project Information Form
USFWS	U.S. Fish and Wildlife Service
WDOE	Washington Department of Ecology

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Chapter 1: Introduction

The United States Army Corps of Engineers (Corps/ USACE), in cooperation with the United States Fish and Wildlife Service (USFWS), is proposing to restore tidal connection and fish access to 68 acres of historically tidal wetlands on the mainstem of the Columbia River. The Steamboat Slough project site is located within the mainland portion of the Julia Butler Hansen Refuge for the Columbian White-tailed Deer (JBH) in Wahkiakum County, Washington. This project would be implemented under the Corps Section 536 Program, which promotes the improvement of tidally influenced off-channel habitat in the Lower Columbia River and Tillamook Estuary.

Project Background

Action Area

The Steamboat Slough project area is located on the Washington side (north side) of the Columbia River at approximately river mile 35.5, near Cathlamet (See Figure 1). The site is part of the 5,600 acre JBH Refuge for the Columbian White-Tailed Deer. This refuge is owned by the United States Department of the Interior, and managed by the USFWS. The refuge was established in 1971, with the mission to protect and manage the remaining population of the endangered Columbian white-tailed deer (USFWS 2004). In addition to its mainland properties, the JBH Refuge encompasses several mid-channel islands which include Tenasillahe, Wallace, Price and Hunting Islands in Washington State, and Crims and Westport Islands in Oregon. The refuge contains a variety of landscapes including pastures, forested tidal swaps, woodlots, marshes and sloughs.

The JBH Refuge is protected by a federally authorized flood control levee. The levee is part of the Wahkiakum County Diking District No. 4, which was organized in 1922. A county road (Steamboat Slough Road) exists on the top of the flood control levee. Currently, the levee is in a state of failure and the county road has been partially closed due to safety issues. Vehicular access along much of the county road in the project area is completely restricted.

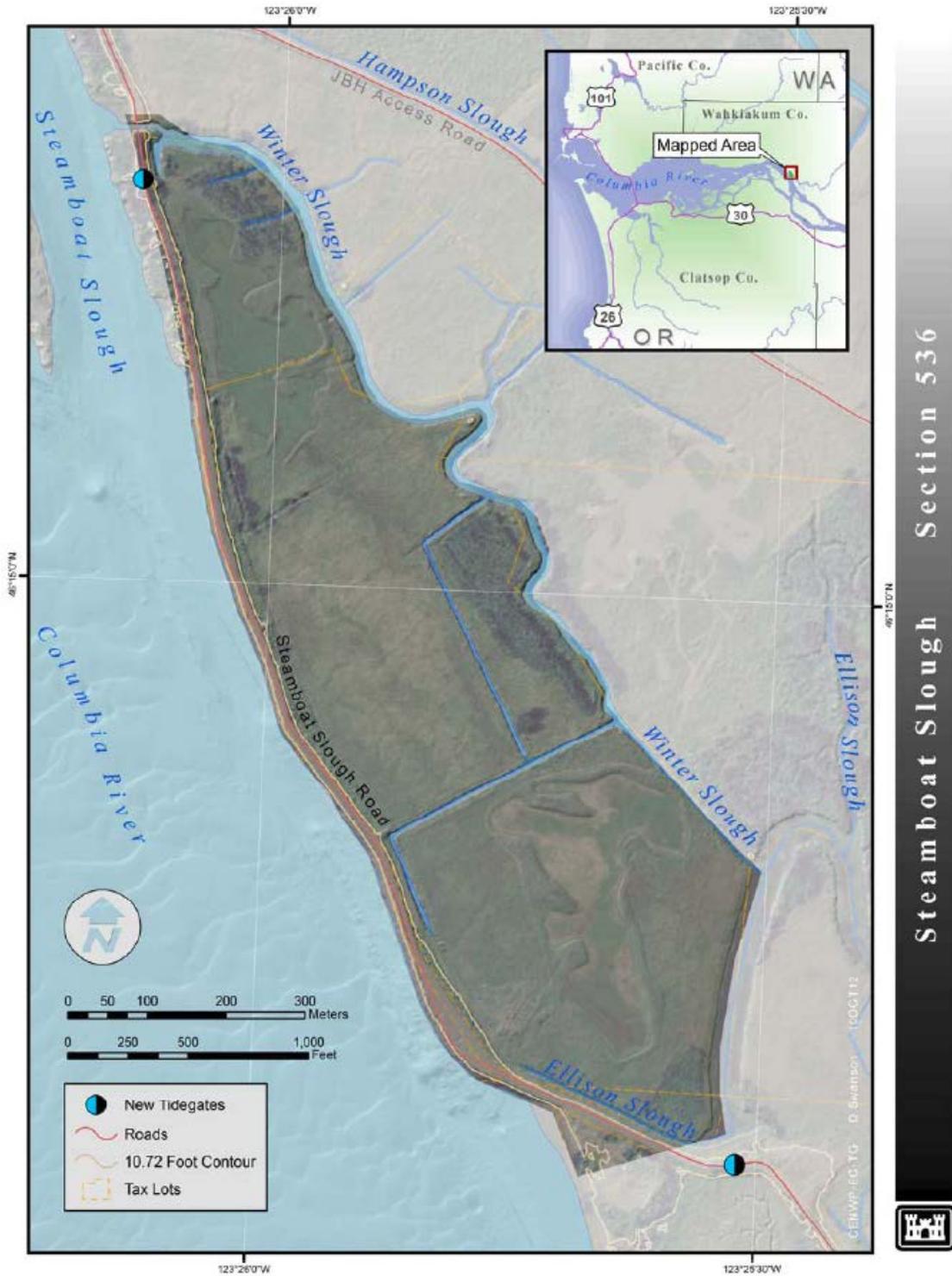


Figure 1. Steamboat Slough Site Location

Proposed Action

Historically, the entire Steamboat Slough site consisted of intertidal wetlands. Prior to the establishment of the wildlife refuge, these tidelands were diked, drained and converted to pastureland. A flood control levee currently separates the Steamboat Slough area from the tidal and riverine flows of the Columbia River. This levee system also inhibits tidal influence to the slough network that bisects the site.

The primary goal of this restoration project is to restore floodplain connection and wetland function to the Steamboat Slough area. Improving floodplain connection and restoring tidal influence would allow for improved access to preferred off-channel habitat for threatened and endangered species of salmonids. It would also improve the overall quality of habitat by returning the site back to the historical tidal wetland conditions. Proposed restoration actions for this project include:

- Constructing a setback levee for flood protection of the areas surrounding the Steamboat Slough site
- Excavating a tidal channel network that transects the Steamboat Slough site
- Shaping and compacting excavated materials into terraces and hummocks throughout the site to create topographic diversity
- Installing large woody debris
- Removing invasive plants prevalent at the site during ground disturbing activities
- Revegetating disturbed areas with beneficial native wetland and riparian plant species
- Removing segments of the existing levee in 2 locations

The combination of these proposed measures is designed to fully restore tidal habitat in the project area and provide for the largest habitat improvement for the restoration area.

Previously Completed Actions

In 2008/ 2009, the USACE partnered with the USFWS to replace four tide gates and eight culverts within the mainland properties of the JBH Refuge. Among the restoration actions included in this project was the installation of a 72- inch culvert with a side- hinged, restrained tide gate on Winter Slough (See Figure 2). The culvert was installed under the Steamboat Slough levee, just downstream of the proposed project site, and improved both water quality and fish access to Winter Slough. Additionally, 20 acres of riparian forest vegetation was planted along Winter Slough.

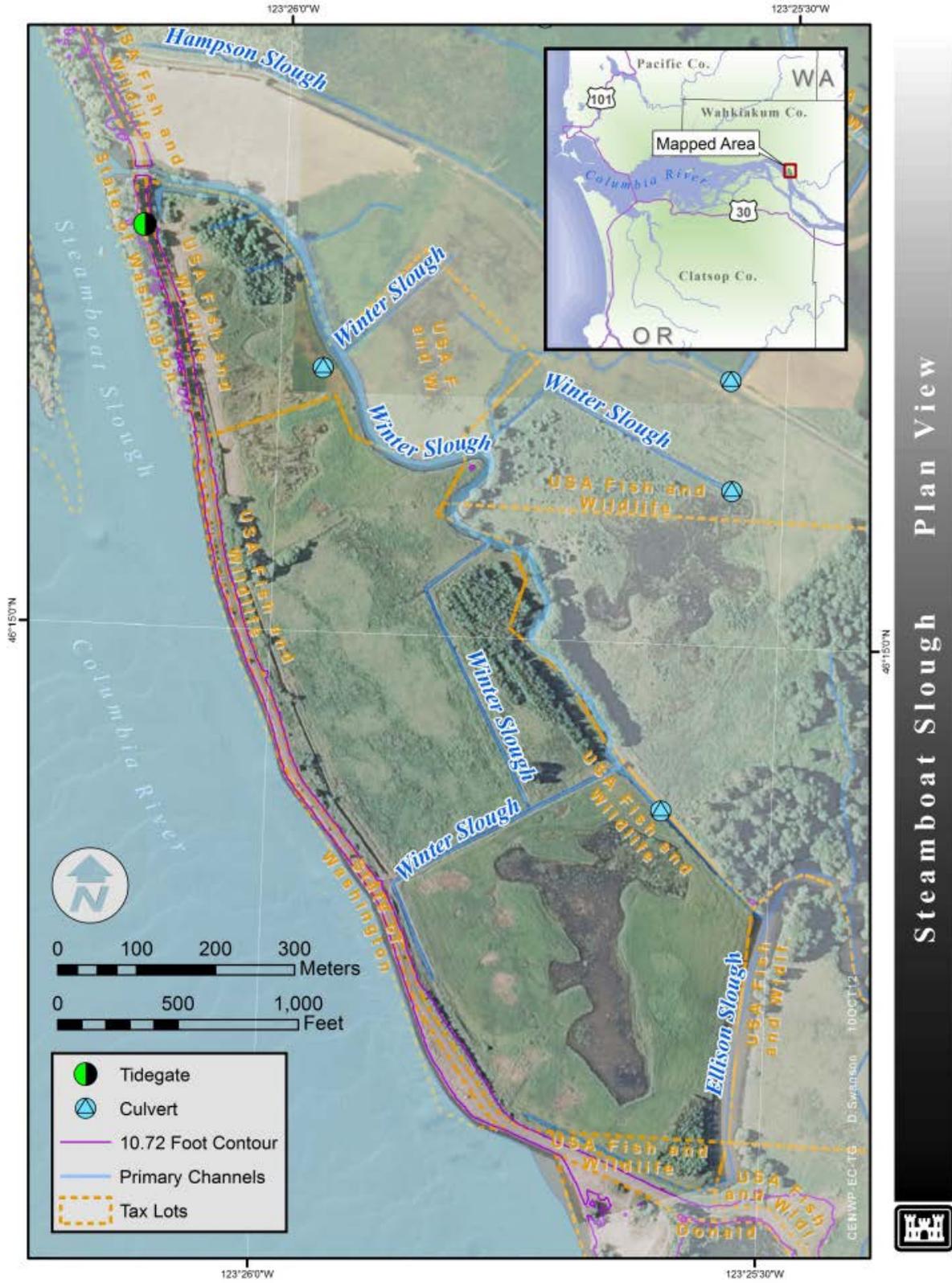


Figure 2. Steamboat Slough Existing Features

Chapter 2: Purpose and Need

Purpose

The purpose of the Steamboat Slough project is to restore ecological process and tidal influence to the floodplain, and develop riparian forest habitat.

Restoring the estuarine marsh conditions of Steamboat Slough would benefit juvenile salmonids and other wetland- dependent wildlife species in the lower Columbia River and estuary. Proposed restoration actions would provide improved habitat conditions and ingress/egress to juvenile salmonid rearing and foraging habitat for threatened fall Chinook salmon (*Oncorhynchus tshawytscha*), threatened chum salmon (*Oncorhynchus keta*), and threatened coho salmon (*Oncorhynchus kisutch*) all of which are Endangered Species Act (ESA) – listed Evolutionarily Significant Units (ESUs). Other salmonids, including threatened and endangered spring/summer Chinook salmon (*Oncorhynchus tshawytscha*), endangered Snake River sockeye salmon (*Oncorhynchus nerka*), threatened steelhead trout (*Oncorhynchus mykiss*), and coastal cutthroat trout (*Oncorhynchus clarki*) which is currently a species of concern, also are expected to utilize the Steamboat Slough site after the proposed project actions reestablish tidal slough and tidal marsh habitat conditions. This project would also provide for habitat improvements for waterfowl, bald eagles (*Haliaeetus leucocephalus*), and neotropical migratory birds (USACE 2012).

Need

The Steamboat Slough restoration project is needed to increase available juvenile salmonid rearing and refugia habitat, which has been greatly reduced in the Columbia River and estuary due to landscape alterations.

Much like the other tidal wetlands and slough networks throughout the Lower Columbia River, the Steamboat Slough site was altered for grazing and agriculture. As a result, it became disconnected to the adjacent floodplain due to the construction of a levee system, and the natural tidal sloughs through much of the wetlands were channelized. The simplification of available aquatic habitat has contributed to the decline of native salmonids within the lower Columbia River estuary, particularly by diminishing habitats associated with the juvenile life history stage. The altered hydrology of the system has resulted in reduced floodplain inundation, less foraging opportunities for rearing salmonids, and decreased refugia habitat from high flows.

Tidal, estuarine wetlands are one of the most impacted habitats in the Lower Columbia River system, and are a priority for restoration, particularly for their high functional value to threatened and endangered salmonids that use these areas as refugia, rearing and feeding before migrating to sea. Flood control measures, which include diking, filling, and ditching, have fragmented the estuary structure along the Columbia River and its tributaries. These actions limit and reduce the available habitat for juvenile salmonids throughout the greater Columbia River Basin, including the Steamboat Slough restoration site. By addressing the factors that limit available habitat, this project would help to satisfy the requirements of the Federal Columbia River Power System

Biological Opinion and the 536 program. Restoring degraded areas with high intrinsic potential for increasing off-channel habitat quality is a specific management action prescribed by the Columbia River Estuary Endangered Species Act (ESA) Recovery Plan Module for Salmon and Steelhead (NOAA 2011).

2008 Biological Opinion

In 2008, in response to a court order, the Bonneville Power Administration (BPA) entered into an agreement with the Corps, several tribes, and other government agencies to implement projects that would benefit the Columbia River Basin salmon over a ten year period. The 2008 Federal Columbia River Power System Biological Opinion (FCRPS Bi-Op) includes an implementation plan that outlines a comprehensive program of habitat improvements, hatchery reforms, and hydrosystem operations and improvements to protect Columbia and Snake River fish. The plan outlines a broad array of projects to improve spawning and rearing habitat, in order to boost the survival rates of fish listed under the Endangered Species Act. One of the key methods recommended in the FCRPS Bi-Op to improve estuarine rearing habitat is to breach levees to restore degraded areas with high intrinsic potential for high-quality habitat. The FCRPS Bi-Op also states that federal agencies are required to comply with the recommendations of the document, unless there is valid evidence as to why restoration efforts cannot be executed (NOAA 2008).

Section 536 Program

The Section 536 program was authorized by the Water Resources Development Act of 2000. The 536 program, specific to the Lower Columbia River and Tillamook Bay Ecosystem Restoration, enables the USACE to conduct studies and implement ecosystem restoration projects on the Lower Columbia River and estuary with the intention of protecting, monitoring, and restoring fish and wildlife habitat. The proposed Steamboat Slough Project complies with all the requirements of the Section 536 program. The project design provides the opportunity to restore and protect fish and wildlife habitat within the Columbia River estuary without affecting the water related needs of the Columbia River, or adversely affecting private property rights (USACE 2012).

Project Goals and Objectives

The primary goal of the Steamboat Slough project is to restore ecological processes and tidal influence to the floodplain in the project area. The main objectives of the restoration are:

1. Reestablish tidal connection between the Steamboat Slough site and the mainstem of the Columbia River, in order to restore estuarine floodplain habitats
2. Provide improved access to foraging and rearing habitat for juvenile salmonids
3. Restore high-quality, off-channel tidal habitat
4. Restore native wetland plant communities and functions to enhance productivity of the Steamboat Slough site
5. Prevent mortality of Columbian white-tailed deer from failure of the existing levee

Chapter 3: Project Alternatives

Descriptions of Reasonable Alternatives

Reasonable alternatives, including the No Action alternative, were evaluated for the Steamboat Slough site. Alternatives investigated included Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough (Preferred Alternative); and a No Action alternative, as required under NEPA (Alternative 1).

In 2012, the Corps began an engineering feasibility study of the Steamboat Slough site to develop a range of possible restoration actions. Preliminary site investigation included ground surveys, soil surveys, and hydraulic and hydrologic analysis of the proposed project location and its surrounding areas.

The Corps assembled an agency Project Delivery Team (PDT), which also included USFWS staff from the wildlife refuge, to evaluate the possible range of actions and refine them into the alternatives described in this document. The PDT then evaluated each alternative against screening criteria to determine whether it met the minimum level of acceptability required to merit further consideration. Evaluations ascertained whether the alternative is consistent with the Section 536 restoration goals, and wildlife refuge management goals. Restoration measures that facilitate tidal inundation, aquatic, wetland, and riparian habitat formation, and continued flood protection for the refuge were considered (USACE 2013). Evaluation criteria included public health and safety criteria, ensuring that the alternative poses no threat to the health or safety of the public or refuge staff, and is in compliance with applicable health or safety requirements and guidelines.

No Action Alternative

Under this alternative, the USFWS would continue managing the Steamboat Slough site through existing methods as part of the JBH Refuge for the Columbian White-Tailed Deer General Management Plan. Active restoration methods would not be implemented to restore floodplain connection between the Steamboat Slough site and the Columbia River estuary. The current levee system surrounding the proposed project site would also remain in a state of failure, and the existing public and wildlife safety risks would not be addressed.

Current management actions performed at the Steamboat Slough site include wildlife, vegetation and habitat maintenance and monitoring. USFWS staff work to maintain the early and mid-successional riparian forests and non-tidal wetland habitat within the Steamboat Slough proposed project area. Management efforts conducted by the USFWS also include treating invasive plant infestations, planting native trees and brush to mimic historical conditions, as well as managing potential white-tailed deer predators (USFWS 2010). For the evaluation process, these existing management activities are considered part of the No Action alternative. Proceeding with this alternative would not meet the purpose and need as restoration of ecological processes and tidal influence would not occur and juvenile salmonid rearing and refuge habitat would not be increased.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

The preferred alternative was determined through evaluation by the Corps and USFWS based on its ability to meet restoration objectives, as well as its potential impact on the environment and surrounding areas. The Active Restoration alternative for the Steamboat Slough Wetland site is the alternative preferred by the Corps and USFWS based on its ability to satisfy both the restoration objectives set by the 536 program and FCRPS Bi-Op, and the management goals of the JBH Refuge to the greatest extent possible.

The Preferred Alternative proposes to restore the Steamboat Slough site to estuarine wetland conditions. Project implementation would occur in two separate phases, and involve a combination of actions, which would include constructing a levee in front of Winter Slough, excavating a tidal channel network that transects the Steamboat Slough site, installing large woody debris, removing invasive plants, revegetating the site with native wetland and riparian plants, and removing segments of the existing levee in two locations (See Figure 3). Phase I construction activities are anticipated to begin during the summer/ fall of 2013. Phase II restoration activities would be completed in the summer/fall of 2014. Project elements include:

1. Construction of a Setback levee in front of Winter Slough
 - Remove two existing water control structures and piping currently connecting Winter Slough with constructed ponds in the project area
 - Construct setback levee approximately 4,900 feet in length, with a crest elevation of sixteen feet (NAVD88), crest width of twelve feet, and a base width of approximately seventy feet using off-site materials that meet Corps standards for levee construction
 - Construct a 26 foot to 76 foot wide bench at an elevation of 10.5 feet on the downstream terminus of the setback levee for a length of approximately 1,150 feet
 - Construct a terrace bench at an elevation of 10.5 feet near the center of the setback levee
 - Construct a 20 foot to 40 foot wide bench at an elevation of 8 feet near the upstream terminus of the setback levee
 - Plant native vegetation on all benches and terraces

2. Excavate approximately 4,500 linear feet (5.7 acres) of primary channel for direct inundation from the Columbia River
3. Excavate approximately 6,000 linear feet (2.0 acres) of secondary channels
4. Install large woody debris using imported logs to create in-stream complexity in the excavated tidal channel network
5. Construct berms adjacent to the primary and secondary channels using excavated materials to provide elevations that foster diversity of wetland vegetation and shade to the constructed channels
6. Revegetate berms and all disturbed project areas with beneficial native wetland and riparian plant species
7. Remove two segments of the existing levee along the Columbia River (approximately 450 linear feet each)
 - Northern levee segment removal would take out the levee section completely, with a channel invert of -2.0 feet and mimicking the interior channel geometry
 - Southern levee segment removal would lower a 450 linear section to an elevation of 10 feet

Channel Excavation:

The proposed channel plan is designed to mimic a natural dendritic channel network that was present historically prior to anthropogenic manipulation of the site. The proposed excavation follows some historical channels evident in the project digital elevation model (DEM). The channel geometry is designed under the recommendations of the Design Guidelines for the Enhancement and Creation of Estuarine Habitats in the Middle Reaches of the Lower Columbia River Phase 2 Report, by ESA, PWA, Ltd and PC Trask, dated September 21, 2011. The main network varies from 20 to 76 foot top width and up to nine feet below prevailing ground level, with wider and deeper channels nearer to the outlet to the Columbia River. The channel invert is set at -2.0 feet in order to provide sufficient water depths for Coho salmon. The southern levee segment removal is set at 10.0 feet, a stage only reached infrequently during unusually high tides. In addition to the main system, smaller channels are proposed to connect low areas back to the main system, thereby creating positive drainage and minimizing fish stranding (USACE 2013).

A hydraulic model of the site indicates that maximum channel velocities are expected to be about 2.6 feet per second. This value is in line with recommendations from Chow's Open Channel Hydraulics for erodible channels. In addition the model shows that the southern levee lowering segment removal is a one-way structure. Water would come into the site during high stages and exit through the channel of the northern full levee segment removal. This mechanism increases water circulation, decreasing the likelihood of habitat isolation within the project. The Corps PDT has determined that the project design entailing 6.6 acres of excavation is sufficient to achieve the project objectives (USACE 2012).

The proposed tidal channels have an engineered trapezoidal shape upon completion of construction. Large woody debris or similar engineered wood structures would be placed in the project area to provide channel complexity and refuge for salmonids from predators. It is

anticipated that after the two segments are removed from the Steamboat Slough levee and daily inundation ensues, the excavated channels would evolve into more natural channel cross sections, and that morphological change of the channels would occur. This evolution would restore the site to a natural floodplain state with stable estuarine habitats (USACE 2012).

Excavated material would be placed in key areas within the project site to develop berms or planting pads adjacent to primary and secondary channels. Placement areas would be selected to avoid ponding and potential fish stranding. These locations would facilitate growth of diverse wetland plants and provide shade and food sources for aquatic species.

Invasive Species Removal and Revegetation:

Excavation of primary and secondary channels would cause a substantial amount of disturbance to the vegetation that currently exists at the project site. Clearing of the disturbance areas associated with project implementation would facilitate removal of the invasive species that dominate the wetland habitat. Excavated organic materials would be hauled off site and disposed of at an approved upland location.

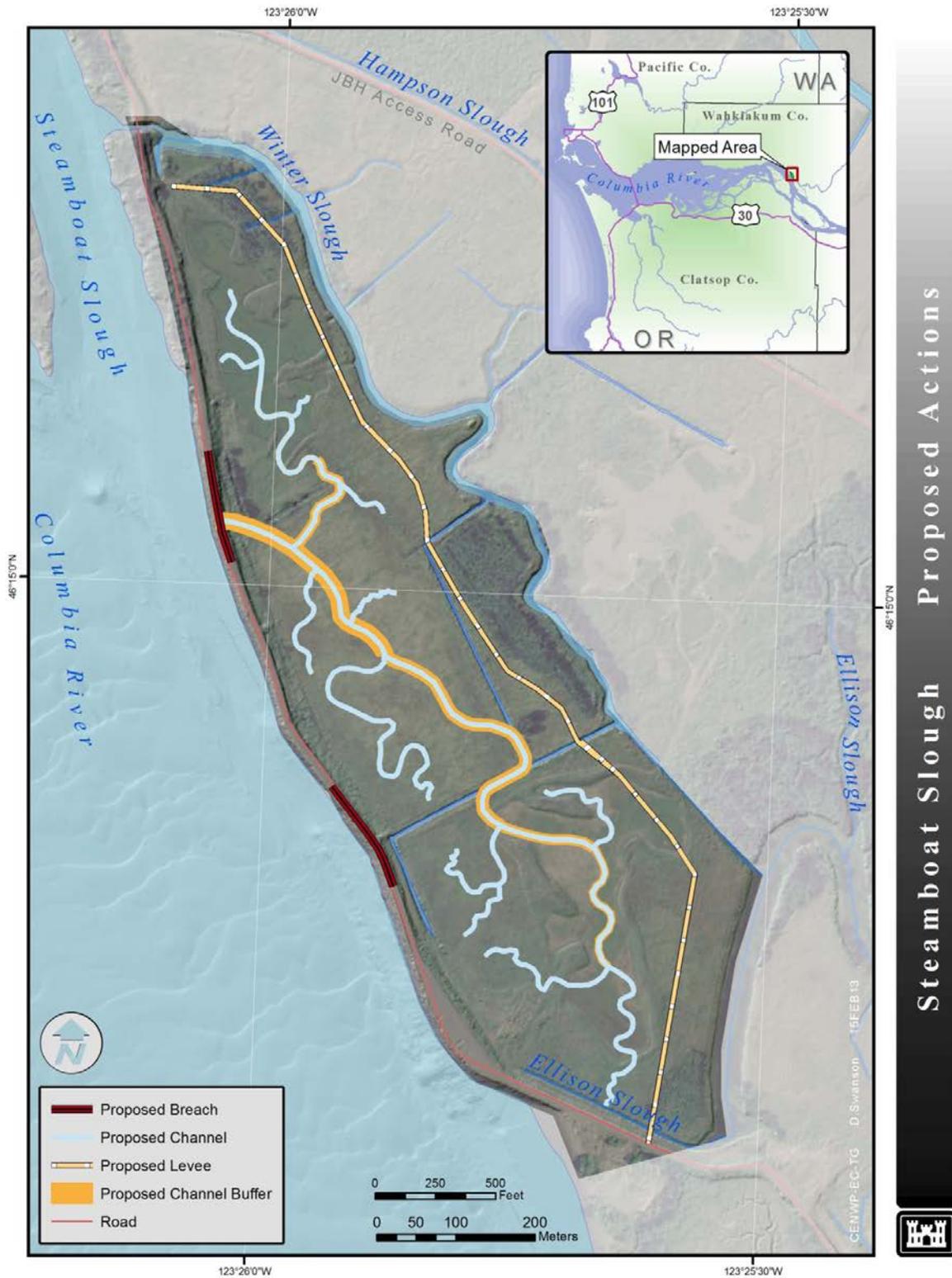
Constructed berms, levee benches, and planting pads would be seeded with native wetland plants and planted with native wetland shrubs and trees for improved habitat complexity. Establishment of native vegetation would further facilitate the control of invasive species, along with increased inundation of the project site.

Levee Segment Removal:

There would be two levee segment removal locations along the existing levee, which would involve removing approximately 20% of the total levee length. The full channel levee segment removal is immediately upstream of Steamboat Slough, with a levee lowering upstream of the full levee segment removal for additional hydraulic connectivity in the area of the current failure location (See Figure 3).

The largest excavated channel would connect to the Columbia River through the northern (downstream) levee segment removal, connecting at its invert elevation of -2.0 feet and mimicking the channel geometry to elevation 8.0 feet. A shelf at this elevation would run until a 4 horizontal to 1 vertical cut slope is necessary to return to existing ground. The southern (upstream) levee segment removal would only be activated during high flow conditions with elevations of 10 feet and higher. This arrangement would ensure greater site connectivity to the Columbia River than only one levee segment removal, and minimizes the earthwork necessary on the current levee failure area (USACE 2013).

The full levee segment removal would allow migrating salmonids full ingress and egress to the site. The volume of material removed from the levee would range from approximately 2,800 cubic yards to 4,900 cubic yards per segment, for a total of 7,700 cubic yards. Levee openings have been sized to allow exchange while maintaining sufficient velocity to keep the excavated tidal channels from filling in with sediment over time. The levee segment removal would not result in a loss of flood protection to other areas of the JBH Refuge, or nearby infrastructure such as Washington Highway 4, as the constructed setback levee would offer protection from Columbia River flooding.



Steamboat Slough Proposed Actions

Figure 3. Proposed Restoration Actions for the Preferred Alternative

Other Alternatives Considered but Eliminated from Further Consideration

Along with the alternatives selected for impact analysis, another alternative that was considered but rejected included constructing the setback levee behind Winter Slough. This alternative would entail the same restoration measures described for the preferred alternative; however, the area of potential inundation would be larger. This alternative was rejected because placing the setback levee further back would require removing the structures installed during the 2008/ 2009 restoration project, as well as destroy native riparian communities, some of which were installed by the USFWS as part of their refuge riparian planting plan. This alternative was also rejected because it would involve inundation of high-quality habitat for the Columbian white-tailed deer.

Table 3-1. Summary of Alternatives Considered

Alternative	Result/ Considerations
No Action Alternative	<ul style="list-style-type: none"> • This highly impacted valuable ecosystem would not be restored to high functioning habitat. • Wildlife and endangered species would not benefit from restored off-channel salmonid habitat and diversified estuarine wetland habitat. • Action would not meet goals and requirements of the Section 536 Program and FCRPS Bi-Op, or the management goals of the JBH Refuge for Columbia White- Tailed Deer. • Flood risks from failing levee system would persist at the Steamboat Slough site. • No currently available Columbian white-tailed would be converted to tidal wetland habitat.
Preferred Alternative: Active Restoration Approach	<ul style="list-style-type: none"> • Restoration actions have the potential to improve current wetland conditions by restoring tidal inundation and floodplain connectivity. • Alternative provides potential for off-channel habitat for endangered species of salmonids, as well as a more diverse wetland ecosystem. • Actions are consistent with Section 536 Program and FCRPS Bi-Op goals to implement ecosystem restoration projects on the Lower Columbia River and estuary, as well as projects that would benefit Columbia River Basin Salmon. • Actions are consistent with JBH Refuge management goals to restore altered areas of the refuge to historical habitat conditions that would benefit a variety of fish and wildlife. • Alternative would reduce flood risk at the JBH Refuge and surrounding areas, and address existing flood hazards associated with the failing levee. • Provided that all regulatory standards are met, the actions associated with the Active Restoration Alternative would not cause long-term, adverse impacts to adjacent land uses.

Best Management Practices

The action alternative for this project would primarily result in beneficial effects. In areas where there is the potential for either short-term or long-term adverse effects, best management practices (BMPs) would be used to minimize negative impacts. All project actions would incorporate the BMPs recommended by the Endangered Species Act- Section 7 Programmatic Consultation Biological Opinion & Magnuson- Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Implementation of the Bonneville Power Administration Habitat Improvement Program in Oregon, Washington, and Idaho, CY2007-CY2012. The Corps would also follow all recommendations specified in the permitting and compliance documents associated with the Steamboat Slough restoration project. BMPs proposed include, but are not limited, to the following:

- Clearing/grading would be limited to minimum practicable extent.
- There would be no tree cutting or vegetation removal outside of the project area.
- Sediment fencing would be installed in selective areas along the ordinary high water line to prevent siltation from any adjacent upland work.
- All completed bank sloping & stream channel work would be covered with mulch or fiber matting and re-vegetated.
- Work would be done during the summer and fall to limit erosion and sedimentation.
- Staging areas would use, to the extent possible, previously graveled areas within the project area. Any newly created staging areas would be restored after construction.
- All disturbed areas of the project would be seeded after construction is complete to prevent erosion and sedimentation.
- Construction signs would be placed on site, and access to Steamboat Slough Road would be restricted during project implementation.
- The Corps would implement the recommended guidance of the Washington Department of Archeology and Historic Preservation (DAHP) for pre- implementation archeological surveys and archeological monitoring during ground disturbing activities.

Long-Term Monitoring

Under the MOA between the Corps and USFWS, the Corps would monitor ecosystem habitat changes and species response for the first three years following project implementation. Monitoring parameters would include vegetation surveys to measure wetland, riparian, and floodplain vegetative health, cover, and composition. Vegetation surveys would be conducted through transects and photo point monitoring.

Channel morphology and site geomorphic function would also be observed and recorded at the Steamboat Slough site following project implementation. Sediment pins would be used to evaluate accretion, erosion, and settlement in the tidal channels. Survey transects within the primary channel would also be taken annually (USACE 2013).

Species response to ecosystem change, particularly presence of juvenile salmonids within the tidal channel network would be observed and recorded as well. Bench seining would be conducted in the primary and secondary channels at least once a year to confirm the presence/absence of juvenile salmonids and to identify and estimate the general fish community composition (USACE 2013).

Monitoring in addition to the parameters described, as well as any monitoring conducted beyond the initial post- project monitoring period of three years, would be conducted by refuge staff.

Chapter 4: Affected Environment

This section describes the environment expected to be affected by the project alternatives proposed in this assessment. The resource descriptions provided in this chapter serve as a baseline with which to compare the potential effects of the project alternatives considered in this environmental assessment (EA). The environments and issues discussed include the physical environment, biological and natural resources, critical habitat, recreation and public access factors, human health and safety, and cultural resources.

Physical Environment and Topography

The Steamboat Slough restoration site is located on the Washington site of the Columbia River at approximately River Mile 35.

This reach of the Lower Columbia River once contained extensive Sitka spruce swamp habitat, as well as prevalent estuarine marshes, freshwater tidal wetlands and bottomland riparian vegetation. Historical logging, grazing, and hydrologic manipulation of the River through construction of levees and channel dredging, as well as more recent rural development, prevent the natural tidal interactions between the Columbia River and its adjacent lands. It is estimated that nearly 80% of all the historically tidal floodplain habitats within the Grays- Elochoman Watershed have been lost to diking. Much of the former tidal, estuarine wetlands are now owned by private landowners who actively manage it for agriculture. Due to active land use of the watershed, very few restoration opportunities are currently available in the area (NPCC 2002).

Similar to the surrounding landscape, the proposed project site has been altered by the construction of a flood control levee, and by the excavation of a ditch network that transects the former wetland area (USACE 2012). As a result of this anthropogenic manipulation, the topography is unnaturally uniform and flat, with scattered depressional wetted areas.

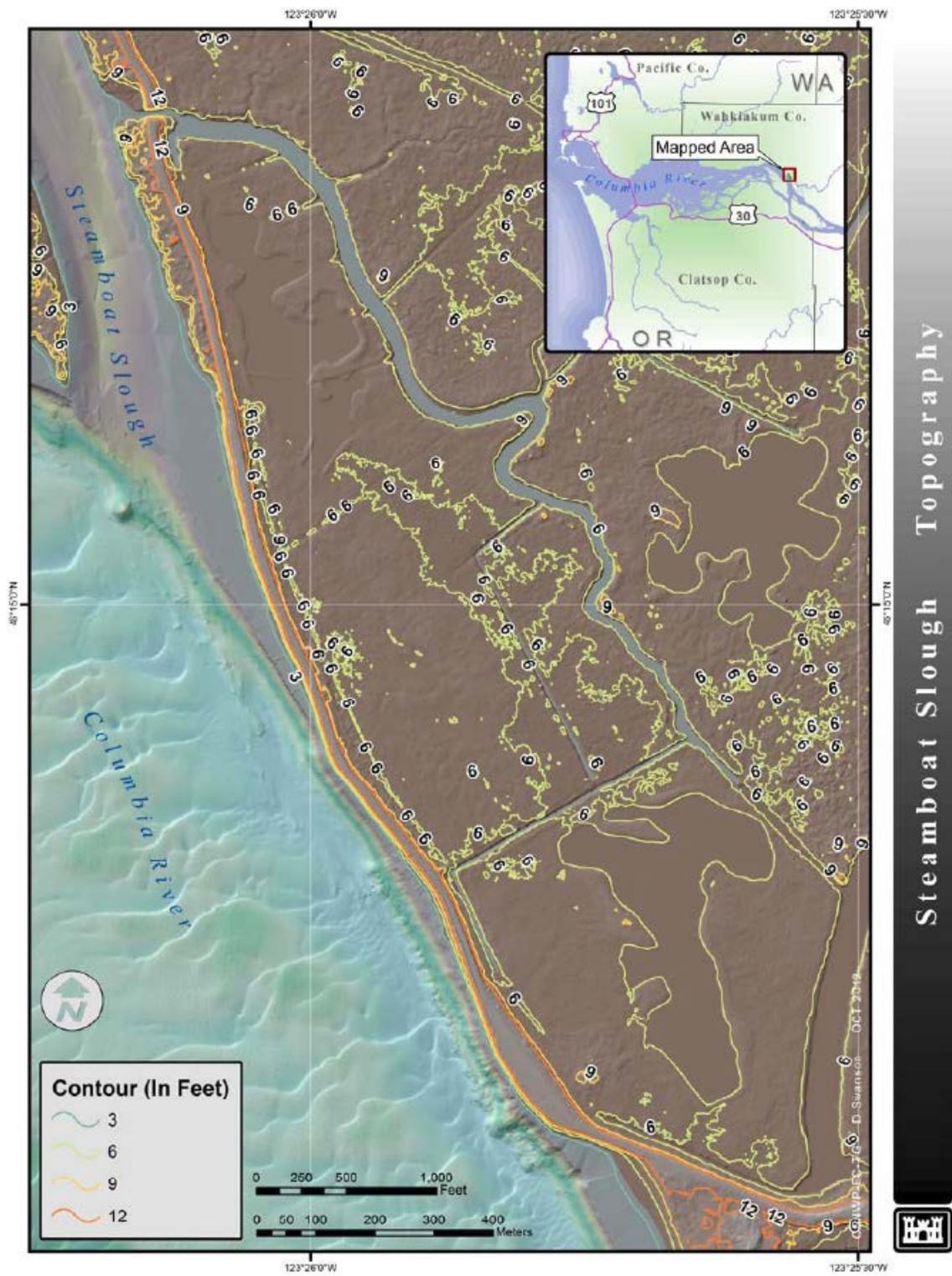


Figure 4. Steamboat Slough Site Existing Topography

Geology and Soils

The Soil Survey of Wahkiakum County (SCS, 1986) classifies the soil on the refuge as Ocosta silty clay loam. The typical profile is described as follows: 7-inch-thick surface layer of dark grayish brown silty clay loam; 5 inches of mottled, dark grayish brown silty clay loam; 8 inches of dark grayish brown silty clay; 2 inches of black sapric material (highly decomposed organic soil material); and very dark grayish brown clay to a depth of 60 inches or more (USACE 2013).

Recent soil samples taken by the Columbia River Estuary Study Taskforce (CREST) confirm the mottled, dark grayish brown, silty clay soil characteristics at the Steamboat Slough site.

Sediment Quality

In 2008/ 2009, the Corps completed a restoration project within the JBH Refuge, which included work near the proposed Steamboat Slough project site. This Section 536 project entailed replacing four tide gates with new tide gates, as well as replacing the existing culverts at eight separate side channel outlets. The project aimed to improve water quality conditions and enhance habitat value for endangered salmonids, Columbian white-tailed deer and other wetland species through increased hydraulic exchange.

Prior to completing this restoration, sediment samples were taken at the site to determine the presence of contaminants in the sediment within the restoration area. Sediment screening ensured that the proposed restoration project would not release harmful contaminants with sediments into the surrounding aquatic habitat when the tide gates were replaced. Samples were collected from the channels both up- and down-stream of tides gates to be replaced. Contaminant screening included organochlorine pesticides (EPA 8081A), polychlorinated biphenyls (PCBs; EPA 8082), physical grain size, total metals, and total organic carbon (EPA 9060). Although small amounts of contaminants were detected in the sediment samples analyzed, the concentrations were below allowable levels, and the sediments were determined to be suitable for unconfined, in-water disposal, or could be exposed to water after excavation without further characterization (USACE 2013).

Although the previously conducted sediment screening at the Steamboat Slough site was limited to the areas affected by the tide gate replacement, it is anticipated that similar results for contaminants in existence and concentration levels would be found throughout the project site.

Hydrology

The Steamboat Slough Project site is surrounded by a network of historically tidal sloughs. Winter Slough runs along nearly the entire eastern border of the project site, and feeds into the remnant ditch network that transects the project area and enters the Columbia River just north of the Steamboat Slough site. Ellison Slough runs to the south of the project site and is also directly connected to the Columbia River. In the northwestern corner of the project area, Steamboat Slough converges with the Columbia River and separates Price Island from the Washington mainland.

Although the Steamboat Slough project site is located directly on the mainstem of the Columbia River, tidal influence to the interior sloughs and ditches is truncated due to the levee system that was constructed around the perimeter of the wildlife refuge. However, the fish friendly tide gate installed just north of the project site in 2008/ 2009 does allow limited tidal connection with the Columbia River (See Figure 5). Several water control structures also exist within the proposed project area which retain water for longer periods, and thereby create wetland areas within the project site.



Figure 5. Steamboat Slough Existing Hydrology

Water Quality

Water temperature, dissolved oxygen and the presence of contaminants are all issues of concern at river and restoration sites throughout the Columbia River estuary. National Marine Fisheries (NMFS) has placed a conservation emphasis on the oligohaline and brackish aquatic transition zones because of their role in acclimatizing sub-yearling salmon to salt water. Loss of these habitats is a major concern in the lower Columbia River estuary where more than half of the historical tidal floodplains and wetland complexes have been altered (Lev et al., 2006).

The Steamboat Slough project site is located along the mainstem of the Columbia River. The Columbia River is listed for several parameters on the State of Washington's 303(d) inventory of impaired water bodies. Listed parameters specific to the Grays- Elochoman reach of the Columbia River, where this project is located, include temperature, dissolved oxygen, invasive exotic species, dioxin, polychlorinated biphenyls (PCBs), heavy metals and pesticides (WDOE 2012).

Water quality sampling was conducted within the sloughs at the Steamboat Slough project site in 2006, in conjunction with sediment sampling, prior to completion of the tide gate replacement project. Parameters measured included temperature, depth, dissolved oxygen, pH, conductivity, and turbidity. The majority of the internal sloughs sampled indicated lower dissolved oxygen and pH levels and higher turbidity levels. Decreased water quality readings were likely caused by an inundation of algae and macrophytes. Replacement of the tide gates at the Steamboat Slough improved the water quality of the internal sloughs by allowing an increase of water exchange and reduction in the amount of stagnated water within the sloughs (USACE 2012).

Vegetation

Vegetation on the Steamboat Slough site has been influenced by the historical disturbances mentioned elsewhere in this document. The levee system along the perimeter of the project site largely prevents tidal waters or river flows from impacting the area. As a result, plant communities have generally remained unchanged since it became part of the wildlife refuge. The plant species that dominate the project site include non-native pasture grass and the non-native variety of common rush (*Juncus effusus var. effusus*). This plant species is often present in wet pastures and is generally thought to reduce overall vegetative complexity.

Invasive plant species are also prevalent throughout the project site. Reed canarygrass (*Phalaris arundinaceae*), which is classified as a Class C noxious weed by the Washington Noxious Weed Control Board, can be found throughout the Steamboat Slough site, particularly in the northwestern corner near the Winter Slough tide gate. Due to the stagnant nature of the interior sloughs and constructed wetlands, Parrotfeather milfoil (*Myriophyllum aquaticum*), another non-native noxious weed, is widespread within the project site.

The riparian plant communities along the perimeter of the project site do contain beneficial native trees and shrubs such as Red Alder (*Alnus rubra*), Elderberry (*Sambucus racemosa*), Huckleberry (*Vaccinium parvifolium*), Sitka spruce (*Picea sitchensis*), Red-Osier Dogwood (*Cornus sericea*) and willows (*Salix* sp.). Many of these species have been planted by the USFWS as part of a native planting effort throughout the JBH Refuge to improve habitat

quality for a variety of wildlife species. However, few of these beneficial native plant species are present within the footprint of the proposed project area.

Wetlands

All lands present within the project area landward of the existing levee are considered wetland. The area is dominated by non-native reed canarygrass and the non-native variety of common rush. Two deeper wetlands, constructed by USFWS, are connected to Winter Slough through underground piping. No tidal influence directly from the Columbia River influences these wetlands. The constructed wetland pond water for most of the year and supports mainly common rush and cat-tail (*Typha* sp.), while the rest of the site is seasonally wet. Several irrigation ditches connected to Winter Slough support water throughout the year. Vegetation diversity in wetland on-site is low, and comprised mainly of non-native species.

Fish and Wildlife

In spite of its altered state, the Steamboat Slough project site provides habitat for a variety of wildlife species, including the endangered Columbian white-tailed deer. Threatened and endangered species are described in more detail in the following section.

In its current condition, the Steamboat Slough site provides marginal habitat for fish and wildlife including Roosevelt elk, beaver and nutria, various small mammals, waterfowl, amphibians, and a variety of bird species. Inventories and on-site observations have documented a diverse array of mammals, birds, amphibians, reptiles and fish.

Mammals

Roosevelt elk (*Cervus elaphus*) is the largest mammal species that inhabits the Steamboat Slough site. Historically, this species was of critical importance to both the native people of the area, as well as early European settlers. Elk provided food, clothing, weapons and tools. However, by the early 1900s, elk populations in western Washington were severely depleted. Populations have slowly rebounded since then, with the exception of a decline in the 1980s and 1990s. The Washington Department of Natural Resources closely regulates elk harvest to ensure stable populations.

Within the Steamboat Slough site, elk are direct competitors for food and shelter with the endangered Columbian white-tailed deer. As a result, elk are subject to management measures to limit their population to reduce conflicts (USACE 2012).

Beaver (*Castor canadensis*), and non-native nutria (*Myocastor coypus*), are also prevalent with the Steamboat Slough project site, along with a variety of other small mammals including mink (*Neovison vison*), raccoons (*Procyon lotor*), muskrats (*Ondatra zibethicus*), river otters (*Lutra canadensis*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), non-native Virginia opossum (*Didelphis virginiana*), and coyotes (*Canis latrans*). Evidence of beaver and nutria activity are evident in and around the sloughs within the project site. Otters, harbor seals (*Phoca vitulina*), and California sea lions (*Zalophus californianus*), are abundant in the lower Columbia River, and have been spotted in the river along the project site and in Steamboat Slough, but are not anticipated to inhabit the interior portions of the project site.

Smaller mammals such as mice, shrews and voles are also expected to utilize the project area. Evidence of voles can be seen by the small mounds that exist throughout the project area.

Birds

A wide variety of waterfowl are common both behind the levee, and in the adjacent open waters surrounding the Steamboat Slough project site. Canadian and Cackling geese (*Branta canadensis*, *Branta hutchinsii*), mallards (*Anas platyrhynchos*), wood ducks (*Aix sponsa*), teals (*Anas* sp.), and northern pintails (*Anas acuta*), utilize the area for nesting and foraging habitat. Shorebirds such as sandpipers (*Calidris* sp.) have also been observed within the Steamboat Slough wetlands.

Songbird species commonly observed at the Steamboat Slough site include red-winged blackbirds (*Agelaius phoeniceus*), marsh wrens (*Cistothorus palustris*), ruby-crowned kinglets (*Cistothorus palustris*), and purple finches (*Haemorhous purpureus*). Numerous species of raptors also inhabit the project site, and the surrounding wildlife refuge, including owls, hawks, harriers, falcons and bald eagles (*Haliaeetus leucocephalus*). Among the resources available information from the JBH Refuge is a list of observed bird species of the refuge.

Amphibians and Reptiles

The JBH Wildlife Refuge is known to have at least twelve different species of amphibians and reptiles; many of which inhabit the Steamboat Slough site (USFWS 2004). Amphibian species observed within the project area include Pacific tree frogs (*Pseudacris regilla*), Red-legged frogs (*Rana aurora*), rough-skinned newts (*Taricha granulosa*), and non-native bullfrogs (*Rana catesbeiana*). Reptiles recorded within the project site include the northwestern garter snakes (*Thamnophis ordinoides*), common garter snake (*T. sirtalis*), northern alligator lizard (*Elgaria coerulea*), and painted turtle (*Chrysemys picta*) (USFWS 2004).

Fish

The Steamboat Slough project site is located directly along the northern shoreline of the Columbia River. Therefore, it is considered habitat for several species of anadromous fish including coho, Chinook, sockeye, chum and pink salmon, as well as steelhead and cutthroat trout. These species are described in more detail in the following section.

Other common fish species of the Columbia River estuary that may also be present within the slough networks of the project site or in the open waters adjacent to the site include three-spined stickleback (*Gasterosteus aculeatus*), Pacific eulachon (*Thaleichthys pacificus*), Pacific herring (*Clupea pallasii*), surf smelt (*Hypomesus pretiosus*), and starry flounder (*Platichthys stellatus*). Several species of non-native fish known to utilize the aquatic habitat within the Steamboat Slough site include peamouth (*Mylocheilus caurinus*), banded killifish (*Fundulus diaphanus*), American shad (*Alosa sapidissima*) and common carp (*Cyprinus carpio*).

Threatened and Endangered Species

The ESA directs federal and state agencies to protect and conserve animals and plants listed as threatened or endangered species. The habitat of threatened and endangered species takes on special importance because of these laws, and conservation of these species requires careful management. Federally listed threatened and endangered species that may be present at the Steamboat Slough site, or could be potentially affected by the proposed restoration actions are described in this section. According to the USFWS endangered species list for Wahkiakum County, several species could potentially inhabit the JBH Refuge that are state and/or federally protected as threatened, endangered, or candidate species, including mammals, birds, fish and plants. Because the Steamboat Slough project site is located within the refuge, all species are discussed below.

Coho Salmon (*Oncorhynchus kisutch*)

- Lower Columbia River ESU Coho salmon (Threatened)

Coho are anadromous fish that spawn in small, freshwater streams with stable gravel substrates. Young coho spend one to two years in their freshwater natal streams, feeding on plankton and insects, and switch to a diet of small fishes as adults when in the ocean (NOAA 2008). Once the young coho transform into their smolt stage, they migrate to the ocean, usually between the months of March to July. Coho salmon live in salt water for one to three years before returning to spawn. Some precocious males known as "jacks" return as two-year-old spawners (NOAA 2008).

The traditional range of the coho salmon runs from both sides of the north Pacific Ocean. Salmonid species on the west coast of the United States have experienced dramatic declines in abundance during the past several decades as a result of human-induced and natural factors. The NMFS has identified seven populations, called Evolutionary Significant Units (ESUs), of coho salmon in Washington, Oregon and California. Four of these ESUs are listed under the U.S. Endangered Species Act. These are the Lower Columbia River (threatened), Oregon Coast (threatened), Southern Oregon and Northern California Coasts (threatened), and Central California Coast (endangered). Lower Columbia River coho have been documented in several streams and sloughs within the refuge, including Steamboat Slough.

Chinook Salmon (*Oncorhynchus tshawytscha*)

- Snake River ESU, fall run Chinook salmon (Threatened)
- Snake River ESU, spring/summer run Chinook salmon (Threatened)
- Upper Columbia River ESU spring run Chinook salmon (Endangered)
- Lower Columbia River ESU, fall run Chinook salmon (Threatened)
- Upper Willamette River ESU, spring run Chinook salmon (Threatened)

The Chinook salmon is the largest species in the salmon family. Chinook are typically divided into "races". Races are determined by the timing of adult entry into freshwater (NOAA 2009). Chinook salmon spend one to eight years in the ocean (averaging from three to four years) before returning to their home rivers to spawn. Fry and parr (young fish) usually stay in freshwater

twelve to eighteen months before traveling downstream to estuaries, where they remain as smolts for several months.

Nine of the seventeen ESUs of Chinook salmon that have been identified by the NMFS have been listed as threatened or endangered under the Endangered Species Act. Of those populations, all were listed as threatened except for the Upper Columbia River Chinook, which was designated as endangered. The NMFS has also designated critical habitat for all of the listed Chinook salmon ESUs. Chinook critical habitat includes all Columbia River estuarine areas and river reaches from the Clatsop and Peacock jetties to the confluence of the Columbia and Snake Rivers, the Snake River, all river reaches from the confluence of the Columbia River upstream to Palouse Falls, the Clearwater River and North Fork Clearwater River from its confluence with the Snake River to its confluence with Lolo Creek (NOAA, FR: 226.205). Juvenile Chinook salmon are known to utilize the sloughs at the JBH Refuge.

Chum Salmon (*Oncorhynchus keta*)

- Columbia River ESU Chum salmon (Threatened)

The chum salmon is a Pacific salmon that migrates to estuarine and ocean waters between March and July, almost immediately after becoming free swimmers. They spend one to three years traveling very long distances in the ocean, and are the last salmon to spawn (November to January). Their preferred spawning habitat is in the lowermost reaches of rivers and streams, typically within 75 miles of the ocean. As a result, chum salmon are more dependent on high quality estuarine habitats than freshwater conditions. There are only a few healthy groups of chum remaining in North America outside of Alaska (NOAA 2007).

Two populations of Chum have been listed under the U.S. Endangered Species Act, as threatened species. These are the Hood Canal Summer Run population and the Columbia River Population. Critical habitat for Columbia River chum was designated on September 2nd, 2005. Designated critical habitat includes the Columbia River mainstem and its tributaries in Oregon and Washington. Chum salmon are expected to pass through the refuge, and possibly utilize the Steamboat Slough area for forage and rearing habitat (NOAA 2007).

Steelhead Trout (*Oncorhynchus mykiss*)

- Lower Columbia River, summer run Steelhead (Threatened)
- Lower Columbia River ESU, winter run Steelhead (Threatened)
- Middle Columbia River ESU, winter run Steelhead (Threatened)
- Upper Columbia River ESU, winter run Steelhead (Threatened)
- Upper Willamette River ESU, winter run Steelhead (Threatened)
- Snake River Basin ESU Steelhead (Threatened)

Steelhead trout belong to the family Salmonidae, which includes all salmon, trout and chars. The steelhead is an anadromous sub-species of rainbow trout, sometimes called salmon trout. Like salmon, steelhead trout return to their original hatching ground to spawn. Similar to Atlantic salmon, but unlike their Pacific *Oncorhynchus* salmonid kin, steelhead are iteroparous and may

make several spawning trips between freshwater and salt water. Steelhead migrate through the estuary with similar timing and peak abundance as sockeye and coho salmon; between March/April through August/September with peak migration period during May/June (Behnke 1992).

All four Steelhead sub-species that reside in the Columbia River are designated as threatened. The NMFS also designated critical habitat for Steelhead on September 2nd, 2005 (NOAA 2009). Juvenile steelhead have been recorded as utilizing the JBH Refuge for habitat.

Sockeye Salmon (*Oncorhynchus nerka*)

- Snake River ESU Sockeye Salmon (Endangered)

Sockeye salmon is the most endangered run of Pacific salmon. Unlike other species of salmon, the majority of sockeye salmon spawn near lakes. Juvenile sockeye rear in lakes for one to three years before migrating to the sea. Most sockeye stay at sea for approximately two years before returning to spawn in the summer and fall, typically between the months of August and November. Some sockeye, known as kokanee, are non-anadromous and remain in their rearing lakes throughout their entire life cycle (NOAA 2007).

The Snake River Sockeye salmon is listed as an endangered species. In 1993, the NMFS also designated critical habitat for Snake River Sockeye. Critical habitat for the Snake River Sockeye includes all estuarine areas and river reaches of the Columbia River from the Clatsop and Peacock jetties to the confluence of the Columbia and Snake Rivers. Also included in the designation are all Snake River reaches, and all reaches of the Salmon River from Snake River confluence to the Alturas Lake Creek, Stanley, Redfish, Yellow Belly, Petit, and Alturas Lakes (NOAA, FR:226.205). Sockeye salmon have not been recorded at the JBH Refuge.

Pacific Eulachon (*Thaleichthys pacificus*) (Threatened)

The Eulachon, also known as smelt or candlefish, are anadromous fish inhabiting the eastern portions of the Pacific Ocean. Eulachon typically spend three to five years in ocean waters before returning to freshwater to spawn between late winter and early spring. Once their eggs hatch, the larvae are then carried downstream and dispersed in nearshore ocean waters by estuarine and ocean currents (NOAA 2012).

In March of 2010, the southern distinct population segment of Eulachon was designated as threatened by the NMFS. Critical habitat for the Pacific Eulachon was listed in October, 2011. In the absence of long-term fish monitoring data, it is unknown whether Pacific Eulachon are currently present within the refuge, or at the proposed project site. However, because Eulachon prefer to spawn in larger, snowmelt-fed rivers, it is unlikely that this species is present within the sloughs of the JBH refuge.

Green Sturgeon (*Acipenser medirostris*)

- Southern DPS, Green Sturgeon (Threatened)

Green sturgeon are long-lived, slow-growing anadromous fish. This sub-species is the most marine-oriented of the sturgeon species, living primarily in the sea, and the most broadly distributed and wide-ranging. They can be found along the west coast of Mexico, the United States and Canada. Green sturgeon require deep pools in the mainstem of large freshwater rivers. Clean, cold water is also important for proper embryonic development.

The greatest threat to the green sturgeon population is reduction of spawning habitat. Other limiting factors that affect the population size of green sturgeon include insufficient freshwater flow rates in freshwater spawning rivers, bycatch in fisheries, influence from exotic species, and water quality degradation from contaminants and elevated water temperature (NOAA 2012).

The Steamboat Slough site is located within the area designated as critical habitat for the Green sturgeon. It is possible that this species may exist in the Columbia River adjacent to the project site. However, there are not Green sturgeon present within the Steamboat Slough wetlands or sloughs.

Bull Trout (*Salvelinus confluentus*) (Threatened)

Bull trout are char native to western North America. Both resident and migratory forms of Bull Trout exist. Resident Bull trout spend their entire lives in the same creek or stream, whereas the migratory form move to larger water bodies to overwinter, and then migrate back to smaller streams for spawning. In comparison to other salmonids, bull trout have very specific habitat requirements. Bull trout need clean cold water with clean spawning and rearing gravels and stable stream channels. They also require complex habitats that include pools and riffles, in-stream large woody debris, diverse cover, and unblocked migratory corridors.

The combination of specific habitat requirements, extensive human alteration of native Bull Trout habitat, and competition from non-native introduced fish like brook and lake trout has led to the decline of Bull Trout populations throughout the northwestern United States and Canada. Due to their specific habitat requirements that entail clean and relatively pristine conditions, it is very unlikely that Bull Trout are present at or near the Steamboat Slough project site.

Columbian white-tailed deer (*Odocoileus virginianus leucurus*) (Endangered)

The Columbian white-tailed deer is the western-most subspecies of white-tailed deer, and the mammal of most concern at the JBH Refuge. Research indicates that this species was once prolific throughout western Oregon and Washington, but it is now endangered due to habitat alterations by human activities such as agricultural practices, timber harvest, and development. Today, Columbian white-tailed deer exist in two isolated populations in the lower Columbia River counties of Oregon and Washington, as well as in Douglas County in the Umpqua River Basin in southern Oregon (USFWS 1983). Both populations of Columbian white-tailed deer inhabit riparian regions including island habitats. The deer prefer tidal spruce environments characterized by densely forested marshlands with a range of vegetation cover including mature conifer stands, tall shrubs and deciduous trees (USFWS 1983).

The primary mission of the JBH Refuge is to provide habitat for Columbia white-tail deer, and encourage the sustainability of the species population. Long-term management plans are currently being carried out by the USFWS at the refuge to increase the populations of this species of deer.

Stellar Sea Lion (*Eumetopias jubatus*)

- Western DPS (Endangered)
- Eastern DPS (Threatened)

The Steller sea lion is the largest member of the eared seal, or Otariid family. They prefer the colder temperate to sub-arctic waters of the North Pacific Ocean. They are distributed mainly around the coasts to the outer continental shelf along the North Pacific Ocean rim from northern Japan through the central Bering Sea to the southern coast of Alaska and south to California. The population is divided into the Western and the Eastern Distinct Population Segments (DPSs) at 144° West longitude (Cape Suckling, Alaska). The Western DPS includes Steller sea lions that reside in the central and western Gulf of Alaska, Aleutian Islands, as well as those that inhabit the coastal waters and breed in Asia (e.g., Japan and Russia). The Eastern DPS includes sea lions living in southeast Alaska, British Columbia, California, and Oregon. Critical habitat has been defined for Steller sea lions as a 20 nautical mile buffer around all major haul-outs and rookeries, as well as associated terrestrial, air and aquatic zones, and three large offshore foraging areas (NOAA 2004). Seal lion haul outs and rookeries usually consist of beaches (gravel, rocky or sand), ledges, and rocky reefs (NOAA 2012).

Substantial declines in the Steller sea lion populations led NMFS to place this species on the threatened and endangered species list. Threats to the Steller sea lion population include pollution, illegal hunting, interactions with fisheries, and collision with boats (NOAA 2012).

The Steamboat Slough project site does fall within the habitat range for the Eastern DPS of Stellar sea lions. It is possible that this species could be present within the mainstem of the Columbia River near the proposed project site. However, it is unlikely that this species would utilize the Steamboat Slough site.

Marbled murrelet (*Brachyramphus marmoratus*) (Threatened)

The marbled murrelet is a small seabird that nests along the Pacific coast ranging from Alaska to California. Murrelets forage and roost at sea, but nest in old growth coniferous forests up to 50 miles from the coast. Habitat loss poses the greatest threat to the marbled murrelet. Murrelets require large trees with nesting platforms of at least 4 inches in diameter. Timber harvest has reduced the amount of old growth forested habitat along the Washington and Oregon coasts by upwards of 80 percent. It is estimated to take 100 to 250 years to grow marbled murrelet nesting habitat (USFWS 1996).

The Steamboat Slough project site does not contain any marbled murrelet nests. Landscape alterations during the past century have prohibited the growth of dense forest stands. Large,

mature conifer trees are sparsely located around the perimeter of the wetland. Vegetative cover consists primarily of grasses and shrubs, which do not offer the nesting habitat characteristics preferred by marbled murrelets.

Nelson's checker-mallow (*Sidalcea nelsoniana*) (Threatened)

Nelson's checker-mallow is a perennial herb with tall, pink or purple flowers. It grows most frequently in swales and meadows with wet depressions, or within riparian zones. It can also grow in wetlands with remnant prairie grasslands, or along roadsides at stream crossings. Nelson's checker-mallow requires open areas with little or no shade to grow and propagate. This plant will not tolerate shading from encroaching woody plant varieties. Although this plant species occurs primarily in the Willamette Valley of Oregon, it can also be found at several locations along the coasts of Oregon and southwestern Washington. (USFWS 2001).

Current site conditions of the Steamboat Slough site include pasture grasses and rushes throughout the interior portion, and trees and shrubs around the perimeter riparian areas. Long-term vegetation management conducted by USFWS throughout the site has not recorded the presence of Nelson's checker-mallow within the project area. Also, vegetation surveys conducted throughout the JBH Refuge has not yielded evidence that this plant is present within refuge properties.

Species of Concern

Coastal Cutthroat (*Oncorhynchus clarki*)

Coastal cutthroat trout use a large variety of habitat types, including lower and upper reaches of both large and small river systems, estuaries, sloughs, ponds, lakes, and nearshore ocean waters. They spend more time in the freshwater environment than do most other anadromous Pacific salmonids. Generally, anadromous coastal cutthroat trout spend only brief periods offshore during summer months and return to estuaries and fresh water by fall or winter. Habitat alterations, particularly estuary degradation, have been described as primary factors contributing to the coastal cutthroat species of concern listing (USFWS 2010). Coastal cutthroat have been documented in several streams within the JBH Refuge, including Steamboat Slough.

Pacific Lamprey (*Lampetra tridentata*)

The Pacific lamprey is an anadromous, jawless fish with an eel-like appearance. For the majority of its life, this species of lamprey lives in freshwater in its larval stage. After undergoing metamorphosis, the lamprey migrates to the ocean and becomes parasitic on other fish. After approximately one to two years, lamprey return to freshwater to spawn and end their life cycle. The Pacific lamprey is considered a species of concern in the eastern Pacific Ocean (USFWS 2011). Pacific Lamprey have not been confirmed in streams within the wildlife refuge, and are not anticipated to be found within the project area at Steamboat Slough.

Several other species were considered for potential impacts resulting from project alternatives. Other species considered include the Green turtle, Leatherback turtle, Bald eagle, and Streaked

Horned Lark. Although these species may be present nearby the Steamboat Slough projects site, or surrounding area, either the likelihood of them being present is very small, or the potential for impacts to these species is very unlikely. Therefore, these species were not evaluated further.

Air Quality

Areas that have experienced persistent air quality problems have been designated by the U.S. Environmental Protection Agency (EPA) as non-attainment areas. The federal Clean Air Policy Act requires air pollution controls in these areas. The Clean Air Act also states that the USACE, as a federal agency, is required to comply with all federal, state, and local air pollution control laws. The state agency that regulates air quality related concerns is the Washington Department of Ecology. Air quality monitoring is not conducted at the refuge because the JBH Refuge is not a non-attainment area, and because coastal winds generally maintain clean air conditions in the area. However, under certain conditions, air quality can occasionally be impacted by nearby forest slash (USFWS 2004).

Cultural Resources

A cultural resource overview and intensive survey of the JBH Refuge was conducted in 1980 by faculty and staff of Eastern Washington University. Site-specific archaeological surveys have also been conducted by USFWS archaeologists for refuge construction projects on the Mainland and Tenasillahe Island Units. No cultural resources have been discovered (USFWS 2004). None of the previous work mentioned above recorded the Steamboat Slough levee as a historic property, nor evaluated its potential eligibility for listing to the National Register of Historic Places.

Human Health and Safety

In addition to managing land and water to provide habitat for the Columbian white-tailed deer and a variety of other wildlife species, the JBH Refuge also provides recreation and education opportunities such as fishing, boating and wildlife observation. The USFWS is committed to providing high quality opportunities to enjoy the refuge, while also providing a safe environment for recreationalists and refuge employees. The proposed alternatives could result in impacts to public and staff safety.

Public Access and Recreation

Public access of the proposed project area is limited to the Steamboat Slough Dike Road that has not been affected by the severe levee erosion. The Center Road seasonal hiking trail that transects the JBH Refuge is completely outside of the boundaries of the proposed project area, and therefore would not be impacted by project activities. Recreational use on Steamboat Slough Road consists of wildlife viewing, fishing, walking, bike riding and photography. Uses along the road are not regulated by the refuge since the road is owned by Wahkiakum County. Although there are no public boat ramps or docks within or adjacent to the proposed project boundaries,

recreationalists launch their boats off the shoreline along Steamboat Slough Road into the Columbia River mainstem. Some motor home and tent camping also occurs on the beach shoreline. This beach site, called "Hornstra Beach," is in private ownership. Because of potential disturbance issues with the Columbian white-tailed deer and other wildlife, the remaining areas of the proposed project site are not open for public access (USFWS 2004). Due to excessive erosion and risk of levee failure, sections of Steamboat Slough Road are currently closed.



Figure 6. Trails and Recreation Map for the Julia Butler Hansen Refuge for the Columbian White-Tailed Deer

Chapter 5: Environmental Consequences

This section describes the impacts that the proposed restoration alternatives are expected to have on the affected resources at the Steamboat Slough site. Two alternatives were evaluated, the No Action alternative and the Active Restoration approach (Preferred Alternative). This chapter is organized by resources affected, and presents the potential impacts to each alternative. This organizational structure was chosen to evaluate the many resource topics in a systematic manner and to help facilitate interagency consultations and review of the impact analysis by various stakeholders and other interested parties. Implementing this style of analysis helps assure that impacts are thoroughly and comprehensively evaluated, but it does lend itself to overlap and repetition between similar impact types and resource topics.

Three categories of effects, or impacts, are considered and analyzed: (1) Direct Effects, which occur at the same time and in the same place as the action; (2) Indirect Effects, which occur later or at a location away from the action; and (3) Cumulative Effects, which are additive and include those that occur in the past, present, and foreseeable future. Direct, indirect, and cumulative effects are addressed for each affected resource under the proposed alternatives. The following resources described in Chapter 4: Affected Environment, were evaluated for potential effects:

1. Physical Environment and Topography
2. Geology and Soils
3. Sediment Quality
4. Hydrology
5. Water Quality
6. Vegetation
7. Wetlands
8. Fish and Wildlife
9. Threatened and Endangered Species
10. Air Quality
11. Cultural Resources
12. Human Health and Safety
13. Public Access and Recreation

Analysis Approach

The potential direct and indirect impacts of each alternative were analyzed for the restoration methods proposed. The resources expected to be affected by the proposed restoration alternatives are described in Chapter 4. Restoration actions and methods discussed in this environmental assessment are those currently approved and utilized by the USACE.

Approach for Evaluating Alternatives

The impact analysis for this assessment involved the following steps:

- Identifying the resource that could be affected.
- Identifying duration of impact (long-term or short-term) and intensity of impact (negligible, minor, moderate, or major).
- Identifying whether effects would be beneficial or adverse.
- Identifying impact minimization measures that may be employed to offset or avoid potential adverse impacts.

The impact analyses were based on professional judgment using information provided by project designs, Corps and USFWS staff, relevant references and technical literature citations, and subject matter experts.

Impacts and Effects

Under CEQ regulations the terms “effects” and “impacts” are used interchangeably (CEQ 1981). Impacts or effects of an action can be beneficial or adverse. Impacts, or effects, also consider spatial and temporal components. For this assessment, “place” is defined as the Steamboat Slough site, but the meaning of “time” varies. When evaluating direct impacts from restoration actions and specific methods, “time” is defined as the period of time when the restoration activity is occurring.

Duration of Impacts

Effects can be characterized by the duration of the effect. Short-term effects include actions that temporarily affect, or have the potential to affect, a resource for twelve months or less, such as disturbance during restoration activities. Long-term effects include actions that affect a resource for greater than twelve months, and may or may not be permanent.

Intensity of Impacts

For all adverse impacts, the intensity of a given impact topic is described as negligible, minor, moderate, or major. For each impact topic, a distinct set of impact thresholds is used to provide definition of what constitutes an impact of a given intensity. The impact thresholds are aligned to relevant standards based on regulations, scientific literature and research, or best professional judgment. The intensity of an impact on a given topic is determined by comparing the effect to the impact threshold definitions for that topic. Impact thresholds are used for adverse impacts only.

Thresholds for Intensity, Duration, and Type of Effect:

- **Negligible-** The affected environment would not be affected, or effects would be below or at the lower levels of detection. Any effects to the affected environment at the site would be slight and no long-term effects would occur.
- **Minor-** Effects to the Steamboat Slough resources or affected environment would be detectable, but small, as would be the area affected (< 1 acre). If mitigation is needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.
- **Moderate-** Effect on the affected environment of the site would be readily apparent and likely long-term. The resulting change to the affected environment would cover a relatively wide area (1-5 acres). Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.
- **Major-** Effect on the affected environment would be readily apparent, long-term, and substantially change the character of the Steamboat Slough over a large area (> 5 acres). Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.

Duration:

- **Short-Term** Impacts and effects to the affected environment of the Steamboat Slough site would last only during the construction period or no longer than a year following construction completion.
- **Long-Term** Impacts and effects to the affected environment of the area would be permanent following the completion of proposed activities.

Physical Environment and Topography

Methodology

Elevational surveys conducted by the Corps and CREST staff, examination of LiDAR data and aerial photographs of the site, and a review of historical land uses of the area were used in this analysis. Information from historical documents and experiences from restoration projects with similar actions were used to estimate the effects on the physical environment and topography of the project area.

No Action Alternative

Impact Analysis: The No Action alternative does not entail any changes to the physical characteristics or topography currently in existence at the Steamboat Slough site. This alternative would not affect the surface elevation or amount of wetted area within the site. The entire site would remain isolated from tidal action, and the topography would persist in its historically altered condition. The water control structures at the site would continue to create artificial freshwater wetlands. However, the No Action alternative would perpetuate the artificial topography and degraded habitat condition of the site. Also, implementation of this alternative would perpetuate the current risk of natural breaching of the existing levee system. When the levee breaches, there tidal exchange would be reestablished, but the interior Steamboat Slough site would remain in its altered condition. The physical characteristics and topographic features historically present at the site would be slower to reestablish in this scenario, or may not occur at all.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: This alternative involves excavating 10,500 linear feet of tidal channels, creating hummocks and terraces throughout the site, and removing segments of the outer levee to restore tidal inundation of the Steamboat Slough wetland. Proposed actions associated with this alternative would result in major long-term effects on the site. The physical changes would be readily apparent and would drastically affect the environmental conditions that currently exist on site by increasing the wetted area, reestablishing tidal conditions, and recreating more diverse topography within the site. This alternative provides a combination of habitat improvements at the site to restore the natural physical characteristics of a tidal wetland more readily than if the existing levee were allowed to breach naturally. The changes to the physical environment and topography of the site resulting from actions associated with this alternative would be permanent. This alternative also meets the management goals of the refuge by restoring degraded ecosystems to historical conditions, and improving habitat for a variety of wildlife species.

Geology and Soils

Methodology

Recent field surveys conducted by the Corps, CREST staff, and review of historical data of the geology, landscape morphology, and soil characteristics of the proposed project area, were used in this analysis. Findings of these assessments and professional knowledge of landscape morphology and soils were used to estimate the effects on the geology and soils of the area.

No Action Alternative

Impact Analysis: The No Action alternative would not affect the existing geology or soils at the Steamboat Slough site. The area would remain isolated from tidal action, and there would be no risk of altered landscape morphology, or natural erosion or deposition that occurs within tidal marsh areas. The No Action alternative would also perpetuate the altered geology experienced at the site. However, this alternative would not address the risk of levee failure that exists at the site due to the levee's condition of disrepair. A natural levee breach would likely result in short-term negative impacts from excessive soil deposition within the site immediately following the levee breach.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: This alternative involves large-scale alteration of the Steamboat Slough site, including levee construction, channel excavation, topographic manipulation, and levee segment removal. Project actions would reconnect the site with riverine and tidal flows, creating the potential for dynamic alteration of surface and channel grades throughout the restored wetland. In most cases, minor changes in grade are not a cause of concern, and may even be beneficial. The potential for soil erosion or adverse landscape morphology effects would be reduced through erosion control methods and other actions to stabilize the excavated channels such as strategically placing large woody debris in areas with increased tidal action, and vegetating stream banks to stabilize soils. Short-term adverse effects during construction would be minor or negligible, and would be minimized by implementing BMPs such as installing erosion control fencing, excavating the tidal channels during the dry season prior to removing segments of the levee, and during the low tide cycle, and by reseeding and planting disturbed areas of the project site following construction activities. An erosion and sediment control plan would be developed as part of the final design phase, and would be followed throughout the implementation phase of the Steamboat Slough restoration.

Sediment Quality

Methodology

Available sediment quality monitoring data collected at the Steamboat Slough site prior to implementing the 2008/ 2009 restoration project was utilized to estimate the effects of the proposed alternatives on sediment quality.

No Action Alternative

Impact Analysis: The No Action alternative suggests no actions would be taken to change the existing surface water hydrology or sediment transport patterns within Winter Slough, the constructed wetlands, or the remnant ditches that transect the Steamboat Slough site. Sediment analysis conducted prior to the 2008/ 2009 restoration project indicated the presence of multiple contaminants in the soil; however, all were below levels of concern. Although the sampling analysis only represented a small percentage of the project area, based on the uniformity of historical uses of the site, it is anticipated that conditions are similar throughout the proposed project area.

Under this alternative, the overall existing sediment conditions would not change. On the other hand, no potential contaminants would be introduced to the site from the greater Columbia River system. However, because estuarine marshes function as natural filtration systems, that should not be considered a benefit to the sediment quality at the site; nor is it a benefit to the Columbia River system, the fish and wildlife species living within it and the human populations that utilize it.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: Reestablishing floodplain connection to the Steamboat Slough site would also reestablish the natural sediment transport processes to the Steamboat Slough system. Because it is not likely that the levels of contaminants within the sediment at the Steamboat Slough site exceed sediment quality standards, there is little risk of releasing harmful contaminants into the Columbia River system. On the other hand, restoring wetland function would reactivate the sediment holding capacity of the site, thereby improving overall conditions in the Columbia River estuary.

Hydrology

Methodology

On-site surveys, flow measurements, and design analysis were utilized to determine water surface elevations and horizontal velocity components for free-flows from within the Steamboat Slough project area, its interior sloughs and the adjacent reach of the Columbia River.

No Action Alternative

Impact Analysis: The No Action alternative suggests that taking no action at the site would not change the existing surface water hydrology or water storage capacity of the Steamboat Slough site. The historically estuarine wetland would remain isolated from the Columbia River, with the exception of restricted flows from the Winter Slough tide gate, and would not provide additional water storage capacity or pollutant filtration. The water control structures within the site that retain water to create artificial wetlands would remain in place. These wetlands would remain disconnected from natural surface water exchange and therefore, provide essentially no habitat benefits for salmonids. Overtime, if the conditions of the site remained unaltered, it is likely that the existing levee at the Steamboat Slough site would breach. If this were to happen, natural tidal connection to the floodplain would be reestablished. However, without additional flood control

improvements, it is likely that the effects to hydrology would result in negative impacts to the surrounding area because of uncontrolled tidal inundation. Without adequate flood control, it is likely that areas that are currently inhabited by the endangered Columbian white-tailed deer would be flooded, and the deer would be displaced. Loss or damage of property such as storage structures and mechanical equipment would also likely occur.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: This alternative would restore hydrologic connectivity between the Steamboat Slough wetland and the Columbia River. Reestablishing surface connectivity at the site would recreate the ecological complexity of a tidal wetland. The Active Restoration alternative would also increase water storage capacity within the Columbia River floodplain, and rehabilitate the wetland filtration functions of the Steamboat Slough site. Implementation of the preferred alternative would also result in indirect hydrologic benefits by addressing potential hydrologic risks associated with the strong possibility of a natural breach in the existing levee system if the site is left undisturbed.

Water Quality

Methodology

Site visits and available water quality monitoring data were utilized to estimate the effects of the proposed alternatives on surface water quality.

No Action Alternative

Impact Analysis: The No Action alternative suggests no action would be taken to change the existing surface water hydrology or drainage patterns of water within Winter Slough, the constructed wetlands, or the remnant ditches that transect the Steamboat Slough site. Although the 2008/ 2009 restoration project improved water quality conditions within Winter Slough, other areas within the site remain disconnected from riverine or tidal flows, and therefore experience degraded water quality. Under this alternative, the existing degraded water quality levels would persist.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: Floodplain wetlands provide water quality benefits by filtering potentially harmful nutrients and pesticides from stormwater runoff. Therefore, restoring the natural estuarine wetland functions at Steamboat Slough does have the potential for long-term, positive impacts on water quality by increasing the pollutant filtration component of the floodplain. Also, reconnecting the proposed project area would improve the water quality of the Steamboat Slough habitat by reducing stagnation within the project site. Potential adverse effects to water quality that could occur during construction due to increased turbidity can be prevented through proper BMPs and erosion control methods.

Vegetation

Methodology

Multiple site visits, vegetation community surveys and the professional knowledge of the USFWS staff were used to determine potential effects of proposed alternatives at the Steamboat Slough site.

No Action Alternative

Impact Analysis: Immediate removal of invasive species would not be conducted under the No Action alternative. Invasive species removal and native plant installations at the Steamboat Slough site may occur overtime as part of the maintenance and management activities conducted by USFWS staff at the JBH Refuge. There would be negligible negative impacts to existing vegetation, and no change in extent or competition at this time.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: The Active Restoration alternative project design would improve existing vegetation conditions at Steamboat Slough by reducing the prevalence of invasive plant species and increasing the number of beneficial native wetland and riparian plants. Reconnecting the wetland area with tidal inundation would recreate conditions conducive for the cultivation of emergent native wetland plants. Areas disturbed during construction would be revegetated with native wetland and riparian plant species. Furthermore, all invasive plants removed during ground disturbing activities would be hauled off-site to an approved location to avoid repropagation at the Steamboat Slough site.

Wetlands

Methodology

Multiple site visits, vegetation community surveys and the professional knowledge of the USFWS staff were used to determine potential effects of proposed alternatives at the Steamboat Slough site.

No Action Alternative

Impact Analysis: Under the No Action Alternative, the hydrologic regime on the project site would not change. The project area would continue to receive no influx of water from the Columbia River, except during very extreme events. The constructed wetlands would continue to function. Low vegetation diversity would persist, and cattle would continue to graze the area seasonally.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: Hydrology would be the driving force determining the post-restoration project vegetation. The duration and frequency of tidal and seasonal inundation would return to a more natural hydrologic regime, and is expected to increase the abundance and diversity of native wetlands plants and reduce the number non-native species over time. The sites low elevation would experience twice a day tidal inundation throughout the year on most days. This is expected to flood out the majority of non-native Reed canary grass, and in combination with planting stimulate a native plant community. Species planted in lower elevation would include Wapato (*Sagittaria latifolia*), Bulrush (*Scirpus spp.*), Creeping spike-rush (*Eleocharis palustris*), and Slough sedge (*Carex obnupta*). Higher elevations would be planted with a combination of native “wet” tolerant shrubs and trees including Willow, Snowberry, Indian plum, Red-osier dogwood, Black cottonwood, and Oregon ash. The plant community is expected to undergo successional changes, largely seeding itself from surrounding sources over the long-term. With construction of the set-back levee, approximately 10.5 acres of wetland would be lost. Although acreage of wetlands would be lost with implementation of the Preferred Alternative because of construction of the set-back levee, a substantial net gain in wetlands would occur, because of the increase in quality of wetlands. Changes to wetland value have been evaluated through the Washington Department of Ecology Wetland Rating System, and will be submitted to this agency.

Fish and Wildlife

Methodology

On-site visits and wildlife surveys conducted by USFWS staff were used to estimate the effects of the proposed actions in the various alternatives.

No Action Alternative

Impact Analysis: In spite of its altered condition, the Steamboat Slough site does provide habitat for various wildlife species. The No Action alternative proposes to leave the existing wetland unchanged. The limited habitat value of the isolated, created wetlands, and restricted tidal flows to Winter Slough would persist. The diversity of wildlife species utilizing the site for habitat would not change with this alternative.

However, like the other resources discussed in this chapter, if the flood risks associated with the failing levee are not addressed, it could result in major negative impacts to wildlife if the levee breached naturally without additional flood protection measures in place. Levee failure would likely result in displacement or mortality of many of the species that inhabit the site such as Roosevelt elk, coyotes, fox, beavers, raccoons, skunk and other small mammals such as mink, voles, field mice and muskrats. If the levee failure occurred during nesting season, nearly all of the bird species that currently inhabit the Steamboat Slough site would be negatively affected by inundating nesting areas with riverine and tide water. Bird species that would be impacted by this outcome include waterfowl such as mallards, pintails, Canadian geese and Cackling geese, as well as song birds such as Red-winged black birds and marsh wrens. Amphibians and reptiles would also be negatively impacted by a natural levee breach by inundating terrestrial reptile habitat and potentially washing out frog eggs.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: Activities associated with the Active Restoration alternative entail actively restoring 68 acres of estuarine habitat. Over one and a half miles of tidal channel network would be recreated for in-stream habitat, specifically for juvenile salmonid foraging and rearing habitat. Excavated materials would be utilized to create areas of higher elevation, encouraging a variety of vegetation species, and therefore more diverse macroinvertebrate prey inputs into the system. Furthermore, increased edge habitat created would also benefit birds and smaller mammals native to the region. Currently, the Steamboat Slough site is utilized by waterfowl and a variety of other species. Fish monitoring at Winter Slough has confirmed the presence of salmon within the system. Because fish and wildlife already inhabit the Steamboat Slough site, there is potential for both short-term and long-term impacts to wildlife. The potential for short-term wildlife displacement is high with this alternative due to the noise and activity associated with project construction. Wildlife displacement would be minimized by performing construction work during the late summer and fall when birds have completed their nesting cycles. Precautionary measures such as completing in-water work during the period recommended by the USFWS and WDFW, and conducting fish salvage prior to beginning work would further ensure that the least amount of aquatic wildlife would be displaced. Sweeps of the wetland to clear out amphibians and other terrestrial fauna would also help lessen the potential for short-term adverse impacts.

Long-term negative effects to fish and wildlife that could occur from implementation of the preferred alternative include permanent displacement of species both from reestablishing tidal connection and inundating the area with water, and because the areas currently used by wetland-dependent species would convert from freshwater wetlands to estuarine wetlands. Negative long-term impacts to wildlife currently utilizing the Steamboat Slough site would be off-set by improving the quality of riparian habitat at the site, and by creating upland hummocks that can be utilized for habitat by species such as Roosevelt elk, raccoons, small mammals, reptiles and song birds.

The Active Restoration alternative would address flood risks to the site by improving flood control conditions at the JBH Refuge. Addressing the risks associated with levee failure would also prevent the negative impacts to fish and wildlife species inhabiting the Steamboat Slough area, such as displacement and mortality that would occur from a levee failure at the site.

Threatened and Endangered Species

Methodology

On-site fish presence data collected from Winter Slough and available research on the Columbia River estuary, as well as wildlife survey information from staff at the JBH Refuge were used to estimate the effects of the proposed actions on threatened and endangered species. Post-project monitoring data collected after the implementation of the 2008/ 2009 tide gate replacement indicates the presence of juvenile salmonids in Winter Slough. Also, as part of the wildlife refuge, the Steamboat Slough site is utilized by the Columbian white-tailed deer.

No Action Alternative

Impact Analysis: Under the No Action alternative, valuable estuarine ecosystem habitat would not be restored. Off-channel salmonid refugia would not be recreated, and the floodplain would remain isolated from tidal connection. Although the primary objective of the JBH Refuge for the Columbian White-tailed Deer is to manage the remaining populations of the Columbian white-tailed deer, the No Action Alternative would not fully meet the goals of the refuge either, which include restoring the historical habitat conditions at the Refuge, and improve habitat quality for a variety of native wildlife species. Also, the No Action alternative does not immediately address the risks of the failing levee system. If the levee fails, it could destroy both Columbian white-tailed deer critical habitat and possibly individual deer as well.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: This potential alternative would restore tidal connection to the Steamboat Slough site and create additional in-stream habitat for threatened and endangered species of salmon. Although the site does experience minimal use by Columbian white-tailed deer that inhabit the refuge, the Steamboat Slough site is not considered to be high quality deer habitat because it lacks vegetative cover, and other habitat characteristics preferred by the Columbian white-tailed deer. It is likely that conversion of the Steamboat Slough area would result in reduced use of the new estuarine wetland by the endangered white-tailed deer in the long-term. This would be balanced by improved native vegetation for future browsing on the restored upland and hummock areas. Habitat loss impacts would also be indirectly eliminated by this alternative because it would address the flood risks posed by the existing levee system by constructing a setback levee that would provide increased long-term flood protection for more valuable Columbian white-tailed deer critical habitat. The Active Restoration alternative would have greatest long-term, positive impact to threatened and endangered salmon.

For species under the jurisdiction of NMFS, consultation is being done through the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Biological Opinion (NMFS, 2008). Determination of *may affect and likely to adversely affect* were made for chum salmon and all runs of coho salmon, Chinook salmon, sockeye salmon, and steelhead that occur in the Columbia River, with the exception of Snake River sockeye salmon (*may affect but not likely to adversely affect*). Eulachon and green sturgeon were listed subsequent to issuance of this Biological Opinion; determinations of *no effect* were made for these species.

For species under the jurisdiction of USFWS, the USFWS made a determination *may affect but not likely to adversely affect* for Columbian white-tailed deer and *no effect* for bull trout

(*Salvelinus confluentus*), marbled murrelet (*Brachyramphus marmoratus*), and northern spotted owl (*Strix occidentalis caurina*) (USFWS 2013).

Air Quality

Methodology

Familiarity of the air quality designation at the refuge, as well as past experience with other restoration projects within the refuge boundaries were used to determine potential effects of proposed alternatives on air quality at the Steamboat Slough site, and the surrounding area.

No Action Alternative

Impact Analysis: This alternative would not involve utilizing heavy equipment to implement restoration work at the Steamboat Slough site. There would be no negative impacts to existing air quality from increased exhaust or additional dust from the No Action alternative.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: Restoration actions associated with the Active Restoration alternative would involve the use of heavy equipment for implementation. Localized impacts to air quality could occur from exhaust emitted by heavy equipment at the proposed project site, and additional dust in the air during implementation of restoration actions. Impacts to air quality outside of the immediate project vicinity are also likely due to trucks hauling materials to and from the Steamboat Slough site. Impacts to air quality from exhaust from heavy equipment and additional dust in the air would be perceptible for brief periods during project construction. Air quality impacts would be minimized by acquiring construction materials from the closest feasible locations, identifying disposal sites that require only the shortest distances possible, and planning out haul loads so that the least number of trips are taken during project construction.

Cultural Resources

Methodology

As required under Section 106 of the National Historic Preservation Act (NHPA), the Corps would conduct a historic properties inventory study of the Steamboat Slough proposed project area prior to beginning implementation of any restoration activities. No known archeological sites exist in the project area. The Steamboat Slough levee was constructed in 1922 and is a historic structure. The inventory study would recommend whether or not the Steamboat Slough levee is potentially eligible for the National Register of Historic Places (NRHP). Based on preliminary research of historical aerial photos and topographic maps, the Corps does not anticipate having adverse effects to cultural resources.

No Action Alternative

Impact Analysis: Under this alternative, activities that are currently taking place at the Steamboat Slough site would continue into the future. These actions would not adversely affect the historic and cultural resources at the site. However, failure to repair the existing Steamboat Slough levee would allow the severe erosion that is currently taking place to continue. The erosion would likely result in levee failure if left unaddressed. Therefore, not addressing the levee erosion could cause long-term negative impacts because it would result in the partial destruction of a historic structure.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: With the exception of the Steamboat Slough levee itself, no known historical properties, cultural features, artifacts, or modern refuse exist on the proposed project site. Archival research conducted in the past has not located any additional historic structures within the Steamboat Slough project area. Implementation of this alternative would follow the recommended guidance of the DAHP for archeological monitoring during ground disturbing activities such as excavation and clearing. The pre-implementation inventory study would recommend whether the Steamboat Slough levee is eligible for the (NRHP). Therefore, it is not anticipated that implementation of restoration activities proposed for the Active Restoration alternative would pose a threat to cultural features or artifacts.

Prior to implementing restoration- related construction, a USACE approved archeological survey would be conducted at the Steamboat Slough site, to further determine the presence or absence of any historic properties within the proposed project area.

Human Health and Safety

Methodology

Considered health and safety hazards to the general public and refuge employees associated with the construction and implementation of proposed alternatives were analyzed qualitatively, using information provided by Corps engineers and the USFWS staff.

No Action Alternative

Impact Analysis: Under the No Action alternative, no additional work would be completed at the project site. There would be no increased hazards to public safety due to construction activities or heavy equipment within areas of recreational use. Human health and safety conditions would stay the same, and existing accident rates would remain low. However, because this alternative does not address the flood risks present because of the failing levee system, the long-term risk to health and human safety is high due to the strong possibility of levee failure. The No Action alternative would not adversely or positively impact human health and safety at the present time. This alternative does indirectly have a high risk to health and human safety in the long-term because of the lack of a new setback levee to reduce flood risk from the likely failure of the existing levee.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: Implementation of the Active Restoration alternative would involve construction activities within the Steamboat Slough site, and its surrounding areas, and would include the use of heavy machinery and other potentially dangerous equipment. Although most of the area proposed for construction under this alternative currently has minimal recreational use, construction activities would still be a concern because of the potential for accidents or injuries to either refuge staff or members of the public. Safety measures would be taken to reduce the risk of accidents. These measures would include a construction safety plan for the work crew, construction barriers and signs at the site with information on potential safety hazards, closing of Steamboat Slough Road to car and foot traffic, and traffic controls when necessary. Public announcements and notices would also be posted on the refuge website and at popular recreational locations within the refuge to inform recreationalists about construction activities. Unlike the No Action alternative, the Active Restoration alternative indirectly addresses the risks associated with the failing levee system by proposing to construct a setback levee around the project site. This setback levee would provide the ancillary benefit of improved flood protection to the surrounding areas, and would minimize the flood risks associated with the existing levee system.

Public Access and Recreation

Methodology

Potential impacts to public access, recreational use of the area, and adjacent private properties associated with the project alternatives were analyzed qualitatively, using information provided by Corps engineers and the USFWS staff.

No Action Alternative

Impact Analysis: Under the No Action alternative, no additional work would be completed at the project site. There would be no impacts to the existing public access or recreational opportunities at the site, or the adjacent private properties, due to restricted access or disruptions caused during construction. Public access and recreation at the site would stay the same. However, because this alternative does not address the flood risks present because of the failing levee system, there could be indirect, long-term negative impacts to public access and recreation at the proposed project site due to the strong possibility of levee failure. Levee failure at the site would restrict access to Steamboat Slough Road and the adjacent shoreline, and eliminate most recreational opportunities currently available for an indeterminable amount of time. Levee failure could also restrict access to neighboring private properties. The No Action alternative would not adversely or positively impact public access or recreation at the present time. Because this alternative does not address the extensive levee erosion that exists on the Steamboat Slough Road levee, there could potentially be indirect, long-term adverse impacts to public access and recreation at the site, and the surrounding areas if the levee were to fail.

Preferred Alternative: Active Restoration of the Steamboat Slough Wetland with a Set Back Levee In Front of Winter Slough

Impact Analysis: Implementation of the Active Restoration alternative would involve construction at the Steamboat Slough site, including Steamboat Slough Road, and would include the use of heavy machinery and other loud equipment. Although most of the area proposed for construction under this alternative currently has minimal recreational use, construction activities would still affect public access and recreation at the site. Public access restrictions to Steamboat Slough Road would increase for public safety purposes during construction activities, and to provide sufficient space for heavy equipment traffic and material staging. Restricted access on Steamboat Slough Road would impede recreational opportunities at the site such as fishing and boat launching because access to the shoreline would be temporarily eliminated. These impacts would exist only during the duration of project implementation. Once construction activities have been completed, access on Steamboat Slough Road would return, although the section of road between the two levee modifications would no longer be accessible. This project would not improve existing road conditions, or repair the levee road to restore complete traffic accessibility. Other recreational opportunities currently available at the Steamboat Slough site and surrounding areas of the JBH Refuge such as wildlife viewing and photography would also be impeded. Restoration actions associated with this alternative would not only restrict access to wildlife viewing locations, the noise generated by heavy equipment during implementation may reduce the number and variety of wildlife utilizing habitat in the immediate vicinity of the project area. Permanent impacts include removal of access on the segment of Steamboat Slough Road for fishing, walking, and bicycling; currently the existing southern breach limits these activities.

Although the Active Restoration alternative may result in short-term negative impacts to public access and recreation at the Steamboat Slough site, it would also indirectly address the risk of levee failure by constructing a setback levee to protect surrounding properties. Protecting the area from potential flooding risks would safeguard public access and recreational opportunities both at the site, and for surrounding areas.

Table 5-1. Summary of Alternative Impacts to the Affected Environment

	No Action Alternative	Preferred Alternative
	No Action	Active Restoration
Physical Environment and Topography	<p>Negligible, long-term negative effects</p> <p>The No Action alternative would perpetuate the artificial topography and degraded habitat condition of the site, and therefore would not meet the goals of the 536 Program, FCRPS Bi-Op, or JBH Refuge to restore native ecosystems on the lower Columbia River, and</p>	<p>Major, long-term positive effects</p> <p>The Active Restoration alternative would create physical and topographical features within the Steamboat Slough site that mimic the characteristics that would have historically existed prior to human alteration. This alternative also meets the management goals of the refuge by restoring degraded ecosystems to historical conditions, and improving habitat for a</p>

	improve habitat for Columbia River salmon and other native species of fish and wildlife.	variety of wildlife species.
Geology and Soils	<p>Negligible, long-term negative effects</p> <p>The No Action alternative would perpetuate the artificial geology of the wetland and therefore would not meet the goals of the 536 Program or the JBH Refuge.</p>	<p>Major, long-term positive effects</p> <p>Actively restoring 68 acres of tidal wetland would result in benefits for landscape morphology, and soil transport, and soil productivity.</p>
Sediment Quality	<p>Negligible, long-term negative effects</p> <p>The Steamboat Slough site would remain isolated and, therefore, would not experience improvements to natural sediment transport processes.</p>	<p>Minor, long-term positive effects</p> <p>Reestablishing floodplain connection to the Steamboat Slough site would also reestablish the natural sediment transport processes to the Steamboat Slough system, and reactivate the natural sediment holding capacity and filtration functions of the site, which would benefit the greater Columbia River system.</p>
Hydrology	<p>Negligible, long-term negative effects</p> <p>The degraded hydrologic conditions that currently exist at Steamboat Slough, such as an inability to provide natural wetland functions of filtration and water storage, would persist. This alternative would also fail to meet the goals set by the refuge, as well as the 536 program and the FCRPS Bi-Op.</p>	<p>Major, long-term positive effects</p> <p>This alternative would reestablish surface connectivity, as well as increase the water storage capacity at the Steamboat Slough site. It would also help to satisfy the goals set by the Section 536 program, FCRPS Bi-Op, and the management goals of the JBH Refuge.</p>
Water Quality	<p>Negligible, long-term negative effects</p> <p>Existing surface water hydrology or drainage patterns within the wetland system would not be altered. Poor water quality conditions associated with lack of riverine and tidal flows would persist.</p>	<p>Minor, long-term positive effects</p> <p>The increase in wetland function, and reconnection to tidal and riverine flows that would result from the actions proposed for this alternative would provide minor, long-term benefits from increased filtering capabilities within the Columbia River floodplain, and reduced stagnation within the Steamboat Slough site. Potential impacts to water quality during construction would be minimized through implementation of BMPs.</p>
Vegetation	<p>Moderate, short-term negative effects</p>	<p>Major, long-term positive effects</p> <p>Removing invasive plants within the</p>

	Invasive species removal and native plant installations at the Steamboat Slough site would not occur at this time. However, similar vegetation improvement efforts may occur at the site in the future as part of maintenance and management activities conducted by the USFWS.	project area, restoring conditions that promote tidal wetland vegetation, and replanting the site with native plant species would provide major improvements to the wetland and riparian vegetation communities at the Steamboat Slough site.
Fish and Wildlife	Minor, long-term negative effects The limited habitat value of the isolated, created wetlands, and restricted tidal flows to Winter Slough would persist under the No Action alternative.	Major, long-term positive effects Implementation of the Active Restoration alternative would result in higher quality estuarine wetland habitat for aquatic and terrestrial wetland-dependent species. Negative impacts to wildlife caused by construction activities would be minimized by conducting pre-construction salvage efforts, and abiding by the recommendations of the WDFW and USFWS.
Threatened and Endangered Species	Minor, long-term negative effects The No Action alternative would perpetuate site isolation from tidal and riverine flows, and exclusion of juvenile salmonids (Chinook salmon, coho salmon, sockeye salmon, chum salmon, and steelhead trout) from off-channel habitat at the Steamboat Slough site. It also does not meet the requirements of the 536 program, FCRPS Bi-Op, or the management goals of the JBH Refuge.	Major, long-term positive effects This alternative would increase off-channel salmonid refugia and provide additional rearing habitat for juvenile salmonids. It would also prevent potential catastrophic losses to the Columbian white-tailed deer and their habitat due to levee failure.
Air Quality	Negligible, long-term positive effects The No Action alternative would not involve construction activities, and there would be no increase in exhaust or dust. However, this alternative would not satisfy the requirements of the 536 program or the FCRPS Bi-Op.	Minor, short-term negative effects Construction activities associated with this alternative may decrease local air quality through the production of additional exhaust from heavy machinery. Air quality may also be reduced during the construction period through the introduction of dust into the air by earthwork.
Cultural Resources	Final determination of effects to Cultural Resources would be ascertained following the completion of the historic properties inventory study.	Final determination of effects to Cultural Resources would be ascertained following the completion of the historic properties inventory study.
Human Health and	Major, long-term negative effects	Negligible, short-term negative effects

<p>Safety</p>	<p>Under the No Action alternative, no additional work would be completed at the project site. There would be no increased hazard to public safety due to construction activities or heavy equipment within areas of recreational use. However, by not addressing the existing threat posed to human health and safety by the failing levee system, this alternative could result in catastrophic negative impacts to safety over the long-term if the levee were to fail.</p>	<p>Implementation of the Active Restoration alternative would involve construction activities within the Steamboat Slough project area and on the adjacent road would include the use of heavy machinery and other potentially dangerous equipment. Although the area proposed for construction under this alternative currently has minimal recreational use, construction activities would still be a concern because of the potential for accidents or injuries to either refuge staff or members of the public. Risks to human health and safety would be minimized by restricting access to the project site during construction.</p>
<p>Public Access and Recreation</p>	<p>Negligible, short-term positive effects</p> <p>The No Action alternative would not affect adjacent public access or recreation. Existing access to Steamboat Slough Road and other areas surrounding the project site would not be impeded during construction activities. However, leaving the Steamboat Slough levee in its current condition does pose a future risk for restriction and loss of recreation areas if the levee failed.</p>	<p>Moderate, short-term negative effects</p> <p>Construction actions associated with this alternative would require closing off additional portions of Steamboat Slough Road to public access. Restricted road access would impede current public access and recreation of the site. Also, noise generated during construction activities would negatively impact wildlife viewing in the areas surrounding the project site by causing wildlife to avoid the area.</p>

Chapter 6: Cumulative Effects

The CEQ regulations to implement NEPA require an assessment of cumulative effects or impacts. Under CEQ regulations a “cumulative impact is 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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” For the purposes of this environmental assessment, cumulative impacts include other ongoing or reasonably foreseeable future projects and plans at the JBH Refuge or the adjacent reach of the Columbia River, and the contribution of those actions on cumulative effects to the resource. The area of consideration for the cumulative effects analysis is the JBH Refuge.

Past Actions

Past project actions that have occurred at the project site, and may be affected by the actions proposed at the Steamboat Slough site include the restoration project completed at Winter Slough in 2008/2009, which involved replacing the existing tide gate with a fish friendly tide gate, and the existing levee construction in 1922.

Present and Reasonably Foreseeable Future Actions

Actions that may occur at the Steamboat Slough site at present or in the reasonably foreseeable future include removing the water control structures that were installed at the site to retain water and create artificial wetland conditions. Removal of these structures has been proposed as a management action of the JBH Refuge in order to reduce the stagnant water quality within the site. Also, because of the flood risks associated with the failing levee, some of the Columbian white-tailed deer have been relocated to other wildlife refuges in the region. This was done as a precautionary measure to prevent the loss of a large portion of the remaining Columbian white-tailed deer population. If the risks associated with the failing levee are addressed, it is likely that at least some Columbian white-tailed deer would be introduced back to the JBH Refuge.

Cumulative Effects Summary

An analysis of cumulative impacts is presented in Table 6.1. This effects analysis assumes that the natural breach that is currently occurring on the existing levee would be repaired and not allowed to completely breach, which would result in flooding of the refuge and mortality of endangered Columbian white-tailed deer.

Table 6-1. Analysis of Cumulative Impacts to the Affected Environment

	No Action Alternative	Preferred Alternative
	No Action	Active Restoration
Physical Environment and Topography	<p>The No Action alternative would not create conditions that would alter the physical environment and topography of the project site. Past actions to improve habitat conditions (Winter Slough fish-friendly tide gate and the water control structures to create freshwater wetlands within the site) would not be affected.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action itself.</p>	<p>The Active Restoration alternative would create another artificial topographical features (setback levee) within the Steamboat Slough site, resulting in 10.5 acres of fill over a distance of approximately 1 mile. This restoration project would not affect the physical environment and topography of the Winter Slough area resulting from the fish-friendly tide gate installation at Winter Slough. It would result in topographic changes from channel construction, and partial filling of the constructed wetlands with the setback levee.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would result in a change in topography of the constructed wetlands in that they would be partially filled from construction of the setback levee.</p>
Geology and Soils	<p>The No Action alternative would not alter current geological conditions or soil characteristics, nor would it not substantially add to soil erosion or reduced productivity within the scope of existing land use at the project site. Any impacts to the geology and soils that may have occurred following the past restoration efforts at the site, or may occur because of future restoration efforts would remain unchanged with this action.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action itself.</p>	<p>This alternative would change the benefits to soil productivity that resulted from the earlier restoration projects by increasing the amount of sediment exchange experienced at the site. Sediment will now come from the Columbia River as opposed to from the limited connection of the constructed wetlands to Winter Slough. No connection to Winter Slough would exist with implementation of the Action Alternative.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would result in increased benefits compared to the effects of the Action Alternative itself in that the area currently occupied by constructed wetlands would receive greater sediment exchange.</p>
Sediment Quality	<p>The No Action alternative would not alter the current sediment quality conditions at the project site. The Steamboat Slough site would remain isolated and, therefore, would not experience changes in sediment quality.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action itself.</p>	<p>Sediment testing on-site yielded clean sediment. Sediment entering the site would be influenced by the Columbia River with implementation of the Action Alternative, as opposed to the limited sediment input to the site from hydrologic connections between the constructed wetlands and Winter Slough.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would not result in changes to benefits to sediment quality compared to the effects of the Action Alternative itself.</p>
Hydrology	<p>The No Action alternative would not alter the current hydraulic and hydrologic conditions at the project site.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action</p>	<p>This alternative would result in tidal influence to the site from the Columbia River and eliminate the hydrologic connection between the constructed wetlands and Winter Slough because of the position of the setback levee.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would result in changes to the</p>

	itself.	hydrology associated with the past constructed wetlands project because areas within the project site influenced by connection to Winter Slough would now be influenced by connection to the Columbia River.
Water Quality	<p>The No Action alternative would not alter the current water quality conditions at the project site.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action itself.</p>	<p>Project actions associated with the preferred alternative would expand the water quality benefits that have resulted from the previous tide gate installation on Winter Slough. They would also eliminate the stagnant, low water quality conditions created by the water control structures present at the site.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would result in positive effects to water quality because the previous action of levee construction cut off Columbia River tidal influence to the site which, in combination with the constructed wetlands, resulted in establishment of ponded water conditions that result in poor water quality during summer months.</p>
Vegetation	<p>The No Action alternative would allow invasive vegetation to continue to thrive at the Steamboat Slough site.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action itself because invasive vegetation is not associated with the previous tidegate and constructed wetland projects.</p>	<p>The preferred alternative would restore conditions that promote the propagation of native plant species and revegetate the site with native wetland and riparian plants.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would result in positive effects to vegetation because the previous action of levee construction cut off Columbia River tidal influence to the site which resulted in establishment of non-native vegetation; primarily reed canary grass and a non-native variety of common rush. These plants will be reduced in abundance with invasive management prescriptions and daily tidal inundation of the site.</p>
Wetlands	<p>The No Action alternative would not result in alteration of wetlands created by the previous tidegate work and constructed wetlands. Non-tidal wetlands, converted from tidal wetlands were created by the previous levee construction and would remain in a degraded state dominated by non-native vegetation.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action itself.</p>	<p>The preferred alternative would restore less favorable wetland conditions created by the previous levee construction to tidally influenced wetlands.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would result in positive effects to vegetation because the previous action of levee construction cut off Columbia River tidal influence to the site which resulted in establishment of low quality wetlands dominated by invasive plants. These plants will be reduced in abundance with invasive management prescriptions and daily tidal inundation of the site. Constructed wetlands would be converted to more valuable tidally influenced wetlands.</p>
Fish and	<p>The No Action alternative would not alter the current conditions for fish and wildlife at the project site.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action</p>	<p>The preferred alternative would restore fish access directly from the Columbia River to the site, which was eliminated with previous levee construction, providing rearing and refuge habitat to juvenile salmonids; it will also result in reduced area of white-tailed deer habitat because 68 acres will be inundated daily (the project site currently is marginal deer habitat because of the lack of trees). It will also reduce</p>

Wildlife	itself.	breeding/egg laying habitat of the rare red-legged frog that resulted from levee construction and subsequent development of emergent wetland. Wildlife currently associated with constructed wetlands would be altered; red-legged frog and habitat for some species of wintering waterfowl would be reduced, while wildlife habitat associated with tidal inundation would benefit. This alternative combined with past, present, and reasonably foreseeable future actions would result in overall positive effects in that tidal inundation would be restored resulting in a more natural habitats characteristic of the Columbia River Estuary.
Threatened and Endangered Species	The No Action alternative would not alter the current conditions for endangered species at the project site. This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action itself.	Implementation of the Active Restoration alternative would address several key limiting factors to listed anadromous fish such as lack of off-channel habitat, lack of in-stream complexity, elevated water temperature and degraded riparian habitat. 68 acres of lower quality habitat for Columbian white-tailed deer, created by previous construction of the levee would be eliminated with tidal influence. This alternative combined with past, present, and reasonably foreseeable future actions would result in large positive effects to listed salmonids and minor negative effects to listed wildlife (Columbian white-tailed deer).
Air Quality	The No Action alternative would not alter the current conditions for endangered species at the project site. The construction of the project would be in compliance with the Clean Air Act. This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action itself.	Road traffic is very light on the refuge, and would continue to be light with implementation of the Active Restoration alternative. This alternative combined with past, present, and reasonably foreseeable future actions would not result in an appreciable difference in air quality.
Cultural Resources	The No Action alternative would not alter the current conditions for cultural resources at the project site. This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action itself.	Final determination of cumulative impacts to Cultural Resources would be ascertained following documentation of cultural resources during project construction.
Human Health and Safety	The No Action alternative would not alter the current conditions for human health and safety. This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action itself.	The road on top of the existing levee has functioned as an alternate route in case of flooding on Highway 4 that borders the refuge. The setback levee would also function, if need be, for this purpose. This alternative combined with past, present, and reasonably foreseeable future actions would not result in a change to human health and safety.

<p>Public Access and Recreation</p>	<p>The No Action alternative would not alter the current conditions for public access and recreation.</p> <p>This alternative combined with past, present, and reasonably foreseeable future actions would not result in more intensified effects than the effects of the No Action itself.</p>	<p>The Active Restoration alternative would alter existing recreation conditions on-site in that much of the existing levee (the stretch between the two planned levee modification segments) would no longer be accessible for activities such as walking, bird watching, and fishing.</p> <p>This alternative would alter the past action of levee construction such that the activities of walking, bird watching, and fishing along the Columbia River would be reduced but not eliminated.</p>
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Chapter 7: Compliance with Environmental Laws and Regulations

National Environmental Policy Act

The Corps PDT conducted multiple internal scoping meetings throughout the proposed project's inception from 2012 to 2013. Scoping was conducted to identify purpose and need for wetland restoration actions, establish objectives and goals for restoration, inventory an initial array of possible restoration techniques and methods for consideration, identify key environmental issues and analysis topics, and set screening and evaluation criteria against which method effectiveness would be judged and impacts would be analyzed.

As part of the NEPA process, the Corps will notify local, state, and federal agencies, the appropriate tribes, other interested organizations, and the general public of the proposed actions at the Steamboat Slough site. Notifications will occur in the form of a public notice sent to interested agencies and organizations and a press release in the local newspapers. A link to this EA will be provided in the public notice with directions on how to submit comments.

Endangered Species Act

On January 8th, 2008, the NMFS issued a Section 7 Programmatic Consultation Biological Opinion & Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Implementation of the Bonneville Power Administration Habitat Improvement Program in Oregon, Washington and Idaho, CY2007- CY2012. The consultation analyzed a suite of actions that BPA and other federal agencies will undertake to improve salmon habitat. Included in the analysis were two actions that describe the alternatives of this Environmental Assessment: (1) install habitat-forming natural material in-stream structures (large wood, boulders, and gravel) and (2) create, rehabilitate, and enhance riparian and wetland habitat (NMFS 2008). NMFS found that the habitat improvement program, including these actions, is not likely to jeopardize the continued existence of these species, nor is it likely to destroy or adversely modify their designated critical habitat.

A Specific Project Information Form (SPIF) describing all proposed project actions, and the anticipated effects determination will be submitted along the JARPA to the USACE regulatory branch. These forms provide an analysis for a determination of effects to ESA-listed species, their federally-designated critical habitat and to Essential Fish Habitat (EFH). For species under the jurisdiction of NMFS, consultation is being done through the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Biological Opinion (NMFS, 2008). Determination of *may affect and likely to adversely affect* were made for chum salmon and all runs of coho salmon, Chinook salmon, sockeye salmon, and steelhead that occur in the Columbia River, with the exception of Snake River sockeye salmon (*may affect but not likely to adversely affect*). Eulachon and green sturgeon were listed subsequent to issuance of this Biological Opinion; determinations of *no effect* were made for these species.

For species under the jurisdiction of USFWS, the USFWS made a determination *may affect but not likely to adversely affect* for Columbian white-tailed deer and *no effect* for bull trout, marbled murrelet, and northern spotted owl.

National Historic Preservation Act

The National Historic Preservation Act (16 U.S.C. 470) requires that the effects of proposed federal undertakings on sites, buildings structures, or objects included or eligible for the National Register of Historic Places must be identified and evaluated. A preliminary evaluation has been conducted to determine if historic or prehistoric sites are adjacent to the undertaking, or if the projects are within immediate view sheds that are eligible for the National Register. A determination of *no adverse effects* was made and the project is currently being coordinated with the Washington DAHP, and an archeological survey and analysis would be completed prior to project implementation.

Clean Water Act

Section 404 of the Clean Water Act (CWA) authorized a permit program for the disposal of dredged or fill material into waters of the United States, and defined conditions which must be met by federal projects before they may make such discharges. The Corps retains primary responsibility for this permit program. The USACE does not issue itself a permit under the program it administers, but rather demonstrates compliance with the substantive requirements of the Act through preparation of a 404(b)(1) evaluation. This project is in compliance with Section 404 regulations, and with CWA Nationwide Permit #27. Compliance will be demonstrated to the regulatory branch of the Corps in the JARPA documentation.

Section 401 of the Clean Water Act requires federal agencies to comply with EPA, state, or tribal water quality standards. EPA has delegated implementation of Section 401 to the Washington Department of Ecology (DOE). This work is compliant with the requirements of the pre-certified 401 Water Quality Certification (WQC) from DOE. Section 402 of the Act requires a National Pollutant Discharge Elimination System (NPDES) permit and the associated implementing regulations for General Permit for Discharges from large and small construction activities for construction disturbance over one acre (USACE 2013).

A Joint Aquatic Resources Permit Application (JARPA) has been completed for the Steamboat Slough project as a mechanism to ensure compliance with requisite laws. Acquisition of this joint permit would affirm project compliance with Section 10 of the Rivers and Harbors Act, and Section 404 of the Clean Water Act through the USACE, Section 401 of the Clean Water Act through Washington Department of Ecology, and authorize use of state-owned aquatic lands by the Washington Department of Natural Resources.

Clean Air Act

The Clean Air Act established a comprehensive program to preserve, protect and enhance air quality throughout the United States based on permitting of stationary sources of air pollution emissions, restricting the emission of toxic substances from stationary and mobile sources, establishing National Ambient Air Quality Standards and noise pollution standards. All federal actions resulting in the emission of air pollutants must comply with all federal, state, interstate and local requirements for control and abatement of air pollution in the same manner and extent as any non-governmental entity, unless the activity is explicitly exempted by the U.S. Environmental Protection Agency (EPA). The proposed restoration project does not involve the release of regulated substances. Neither does the plan use an incinerator, open burning, or releasing hazardous substances and/or chemicals. All motorized equipment used for construction

activities is not expected to result in excess levels of noise pollution, emissions, or greenhouse gas emissions. All equipment is required to meet State air quality standards, and any low-level noise pollution emitted during the proposed activities would be temporary, localized, and of short-term duration. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) CERCLA established a method to assign liability to parties responsible for the release of hazardous wastes and polluted sites. This Act also established a trust fund to pay for their cleanup to reduce associated dangers to public health and the environment.

The proposed restoration project does not occur within the boundaries of a designated Superfund site as identified by the EPA, or the State of Washington for a response action under CERCLA. Further, none of the proposed project sites are included on the National Priorities List. Therefore, the proposed project is in compliance with this Act.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 U.S.C. 661) requires that wildlife conservation receive equal consideration and be coordinated with other features of water resource development projects. The Corps is coordinating with the USFWS, as the Sponsor, in all aspects of project development.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 U.S.C. 703 *et seq.*) makes it unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. The actions proposed for this restoration project are in compliance with this Act because they would not result in the taking of any migratory birds.

Magnuson-Stevens Fishery Conservation and Management Act

The Sustainable Fisheries Act of 1996 amended the Magnuson- Stevens Act and established requirements for Essential Fish Habitat (EFH) for commercially important fish. Increase in turbidity due to project construction may have minor, short-term impacts on Salmonid EFH. The evaluation of project impacts to essential fish habitat EFH is being conducted as part of the SPIF.

Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d)

The Bald and Golden Eagle Protection Act (BGEPA) prohibits the taking, possession or commerce of bald and golden eagles, except under certain circumstances. Amendments in 1972 added penalties for violations of the act or related regulations. Although bald eagles are generally known to occur in the project area, no take of either bald or golden eagles is likely to occur during project construction. No nests are known to be present. Therefore, no adverse effects to eagles are anticipated. BGEPA management guidelines would be followed if any bald eagle nests are identified during the design or construction phases. Generally, the proposed restoration activities can be classified as Category A activities. If nests are constructed or identified, buffers of 660 feet should be maintained around nests if the construction work is visible from the nest. Buffers of 330 feet should be maintained around nests if the construction work is not visible from the nest. The Corps would coordinate with USFWS staff at the JBH Refuge to ensure compliance with the BGEPA.

Rivers and Harbors Act

This Act regulates project activities in navigable waters and harbors, including river improvements. Specifically, Section 10 of the Rivers and Harbors Act regulates structures in or over any navigable waters of the U.S., the excavating from or depositing of material into any such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters. Compliance with Section 10 of the Rivers and Harbors Act would be addressed in the JARPA submitted for the Steamboat Slough project.

Wild and Scenic Rivers Act (16 U.S.C. 1271-1287)

The Wild and Scenic Rivers Act prohibits federal support of actions that would adversely affect a river's free-flowing condition, water quality, and/or outstanding resource values. No waterways in the project area are designated as Wild and Scenic, therefore Act is not applicable to the proposed restoration activities at the Steamboat Slough site.

Executive Order 13175, Consultation and Coordination with Indian Tribal Governments (Government-to-Government)

Government-to-Government consultations were initiated by the Corps through letters dated April 26, 2013 to the Confederated Tribes of the Grand Ronde, Confederated Tribes of the Siletz Indians, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Reservation, the Cowlitz Indian Tribe, the Nez Perce Tribe, and the Yakima Nation.

Executive Order 11593, Protection and Enhancement of the Cultural Environment

This executive order advises federal agencies to provide leadership in preserving, restoring and maintaining the historic and cultural environment of the Nation. Federal agencies are directed to administer the cultural properties in a spirit of stewardship and trusteeship for future generations, initiating measures in such a way that federally owned and non-federally owned sites, structures and objects of historical, architectural or archaeological significance are preserved, restored and maintained for the inspiration and benefit of the people. The goals and objectives of the Steamboat Slough project, as well as the requirements of Section 536 program, directly correlate with EO 11593.

Executive Order 12898, Environmental Justice

Executive Order (EO) 12898 directs every federal agency to identify and address disproportionately high and adverse human health or environmental effects of agency programs and activities on minority and low-income populations. Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The federal government has this goal for all communities and persons across this nation. It would be achieved when everyone enjoys the same degree of protection from environmental and health hazards, equal access to the decision-making process, and the opportunity to have a healthy environment in which to live, learn, and work. Because the Steamboat Slough project area is completely within the boundaries of a National Wildlife Refuge, there are no concerns that this project would result in disproportionately high adverse impacts to minority and low- income populations.

Executive Order 11988, Floodplain Management, May 24, 1977

EO 11988 requires federal agencies to evaluate the potential effects of the proposed action on floodplains and avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of the floodplain, and to avoid direct and indirect support of floodplain development where there is a practicable alternative. In accomplishing this objective, “each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains.” This project would directly benefit floodplains by reestablishing floodplain connection, and attempting to restore natural floodplain conditions. It would also indirectly address existing flood hazards present at the Steamboat Slough site.

Executive Order 11990, Protection of Wetlands, May 24, 1977

The purpose of this EO is to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In planning their actions, federal agencies are required to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, November 6, 2000 EO 13175 requires federal agencies to formulate “an accountable process to ensure meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications.” This consultation is meant to work towards a mutual consensus and is intended to begin at the earliest planning stages, before decisions are made and actions are taken. The Steamboat Slough project would restore natural estuarine wetland conditions in an attempt to reclaim valuable wetland habitat within the Columbia River Basin. Tribal coordination would occur throughout the planning and implementation phases of this project, in compliance with the requirements of the NEPA.

Executive Order 13186, Migratory Birds

This order further strengthens the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, the Fish and Wildlife Coordination Act, the Endangered Species Act and the National Environmental Policy Act. Federal actions resulting in any “take” (intentional or otherwise) of a migratory bird are required to develop MOUs with USFWS to promote the conservation of migratory bird populations and resources. The Department of Defense (DoD) has an MOU with the USFWS, signed 31 July 2006, to comply with this EO. Furthermore, because the USFWS is the landowner and sponsor for this project, direct coordination would occur throughout all project phases. No adverse impacts to migratory birds are anticipated as a result of the Steamboat Slough restoration project.

Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance

This executive order requires that Federal agencies shall increase energy efficiency; measure, report and reduce their greenhouse gas emissions from direct and indirect activities; conserve and protect water resources through efficiency, reuse and storm-water management; eliminate waste, recycle and prevent pollution; leverage agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products and services; design, construct, maintain and operate high performance sustainable buildings in sustainable locations;

strengthen the vitality and livability of the communities in which federal facilities are located; and inform federal employees about and involve them in the achievement of these goals. BMPs to reduce potential greenhouse gas emissions and prevent potential pollution would be implemented as part of the project actions.

COORDINATION

This draft EA is being issued for a 15-day public review period. Review comments will be requested from federal and state agencies, as well as various interested parties. A press release will be published in the local newspaper. The document is also available for review at the JBH Refuge headquarters. Responses to public comments will be prepared. Public concerns identified in comments will aid in determination of whether or not an Environmental Impact Statement (EIS) is necessary for the proposed action. If it is determined that an EIS is not required, a Finding of No Significant Impact (FONSI) will be signed, concluding the National Environmental Policy Act process. A draft FONSI is attached to this EA.

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FINDING OF NO SIGNIFICANT IMPACT

STEAMBOAT SLOUGH SECTION 536 ECOSYSTEM RESTORATION PROJECT

WAHKIAKUM COUNTY, WASHINGTON

The United States Army Corps of Engineers (Corps/ USACE), in partnership with the United States Fish and Wildlife Service (USFWS), plans to implement ecosystem restoration actions under Section 536 of the Water Resources Development Act to improve habitat for juvenile salmonids in the Columbia River Estuary, particularly those species listed under the Endangered Species Act. The Steamboat Slough project will restore tidal connection and fish access to 68 acres of historically tidal wetlands on the mainstem of the Columbia River. The Steamboat Slough project site is located within the mainland portion of the Julia Butler Hansen Refuge for the Columbian White-tailed Deer (JBH) in Wahkiakum County, Washington.

The primary goal of this restoration project is to restore floodplain connection and wetland function to the Steamboat Slough area. Improving floodplain connection and restoring tidal influence will allow for improved access to preferred off-channel habitat for threatened and endangered species of salmonids. It will also improve the overall quality of habitat by returning the site back to the historical tidal wetland conditions. Proposed restoration actions for this project include:

- Constructing a setback levee for flood protection of the areas surrounding the Steamboat Slough site
- Excavating a tidal channel network that transects the Steamboat Slough site
- Shaping and compacting excavated materials into terraces and hummocks throughout the site to create topographic diversity
- Installing large woody debris habitat structures
- Removing invasive plants prevalent at the site during ground disturbing activities
- Revegetating disturbed areas with beneficial native wetland and riparian plant species
- Removing segments of the existing levee in 2 locations

The combination of these proposed measures is designed to fully restore tidal habitat in the project area and provide for the largest habitat improvement for the restoration area.

I have reviewed the Environmental Assessment (EA) and have determined that implementation of the preferred alternative will not significantly affect the quality of the human environment and that an Environmental Impact Statement is not required.

While acknowledging the impacts discussed in the EA and outlined above, the Corps is required by the National Environmental Policy Act (NEPA) to make a determination of the significance of those impacts. The Council of Environmental Quality has defined “significance” in 40 CFR 1508.27.

The EA and this Finding of No Significant Impact have listed all of the important considerations and their environmental impacts; these, both individually and cumulatively, are not *significant* as *significant* has been defined by NEPA regulations and case law.

While acknowledging the impacts discussed in the EA and outlined above, the Corps is required by the National Environmental Policy Act (NEPA) to make a determination of the significance of those impacts. A checklist of considerations that help in making the determination of whether impacts of a project rise to the level of *significantly affecting the quality of the human environment* is provided at 40 CFR 1508.27. Following is the checklist from (1) to (10).

- (1) Significant impacts include both beneficial and harmful impacts: Minor disturbances are expected from the construction of the proposed project. Benefits of the project will result by increasing juvenile rearing and refuge habitat for federally threatened and endangered runs of salmon.
- (2) Public health and safety: There will be no adverse impacts to public health and safety from implementation of the project. The preferred alternative results in an increase to public health and safety through the construction of a new levee as part of the restoration project.
- (3) Unique characteristics of geographical area: No unique geographical characteristics of the area were identified for the proposed project. There will be no impacts or changes to the geographical characteristics of the area with this project.
- (4) Are effects on quality of the human environment controversial? While there is some controversy from a portion of the community due to the loss of recreational access to Steamboat Slough Road the flood control benefits of the project are overwhelmingly positive.
- (5) Are the risks uncertain or unique? Restoration will result in the site returning to a state of full tidal inundation to the restoration area while providing flood control benefits through the construction of the cross levee.
- (6) Future Precedents: The action is not likely to establish a precedent for future actions with significant effects because this action is not unusual in and of itself, nor does it lead to any further actions that are unique.

- (7) Cumulative Impacts: The effects of the proposed project have been considered along with other reasonably foreseeable future actions within and adjacent to the project area. The proposed project is not expected to have any indirect effects beyond the benefits to fish and wildlife. Only minor construction impacts are expected from project implementation.

- (8) National Register of Historic Places and other historical and culturally significant places: The proposed project has been coordinated by the Corps' Cultural Resources Team and the Washington State Historical Preservation Office. No adverse impacts to cultural resources will result.

- (9) Endangered Species Act: Determinations of *no effect* are proposed for all listed species and designated critical habitats under the jurisdiction of National Marine Fisheries Service and the U.S. Fish and Wildlife Service with the exception of a determination of *may affect, but not likely to adversely affect* Columbian White Tailed Deer.

- (10) Other Legal Requirements: There are no known violations of any federal, state, or local laws in the proposed action.

Based upon the EA prepared for this project, I have determined that implementation of the preferred alternative will not significantly affect the quality of the human environment and that an Environmental Impact Statement is not required.

Date: _____

John W. Eisenhauer, P.E.
Colonel, Corps of Engineers
District Commander