Lewis and Clark National Historical Park

Colewort Creek Wetland Restoration
Environmental Assessment

Photo Courtesy of the Daily Astorian

Proposed by
National Park Service
June 1012

United Stated Department of Interior- National Park Service-
Pacific West Region

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Chapter 1: Purpose and Need

Purpose

The National Park Service (NPS) proposes to work with the Bonneville Power Administration (BPA) and other partners to restore the salmon habitat and tidal wetlands that comprise the historic landscape at a location known as South Clatsop Slough/ Colewort Creek within Lewis and Clark National Historical Park.

At the time of the Lewis and Clark Expedition, the site of Fort Clatsop was a hill above the river surrounded by tidal marsh on both the north and south. These tidelands were diked in the 19th and early 20th centuries and converted from wetland to pastureland. In 1995, the Park worked with partners and the public to complete a General Management Plan/ Environmental Impact Statement. This plan recommends restoring pasturelands to historic tidal wetland conditions where feasible. The Colewort Creek wetland, the subject of this assessment, is located south of the fort hill. Completing this project will contribute to re-creating the historic tidal marsh setting of Fort Clatsop.

Restoration of the historic scene will also restore historic salmon habitat in the Columbia River estuary. The Colewort Creek Wetland Restoration Project will not only improve salmonid habitat within the wetland site itself, but will also have cumulative benefits as part of a larger-scale effort to improve the habitat value and overall function of the Lewis and Clark River basin.

Need

This project is needed now to help the Federal Government satisfy its legal responsibility to recover anadromous fish populations in the Columbia River Basin. The 2008 Biological Opinion for the Federal Columbia River Power System (2008 Bi-Op) requires the Federal Government to take actions to restore salmon habitat throughout the Columbia River basin, when feasible (NOAA Fisheries 2008: 13-3).

Tidal, estuarine wetlands are one of the most impacted habitats in the Youngs Bay watershed and are a priority for restoration, particularly for their high functional value to 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 in Youngs Bay. These actions limit and reduce the available habitat for juvenile salmon throughout the Lewis and Clark River system and the greater Columbia River Basin, including the Colewort Creek restoration sites (Youngs Bay Watershed Assessment, 2001). By addressing the factors that limit available habitat, this project will help to satisfy the requirements of the 2008 Bi-Op. 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: 5-52).

Figure 1-1. Colewort Creek Westland Restoration Project Location

Project Goals

The first goal is to recreate the historic conditions of Fort Clatsop to reflect those that were experienced by the Lewis and Clark Expedition. The Park's General Management Plan/ EIS recommends restoring wetlands to an approximation of their historic condition (Duer 2008:3).

The second goal for the Colewort Creek wetland restoration project is to restore anadromous fish habitat within the Lewis and Clark River system, and the overall Columbia River estuary. The NPS proposes to restore and enhance the Colewort Creek wetland to address key limiting factors for anadromous fish recovery in the Columbia River estuary, such as lack of off-channel habitats and altered nutrient exchange processes. Completion of this restoration project will promote habitat connectivity, increase complexity within the watershed system, and increase access to preferred rearing and refuge habitat.

Figure 1-2. Aerial View of the Colewort Creek Project Site

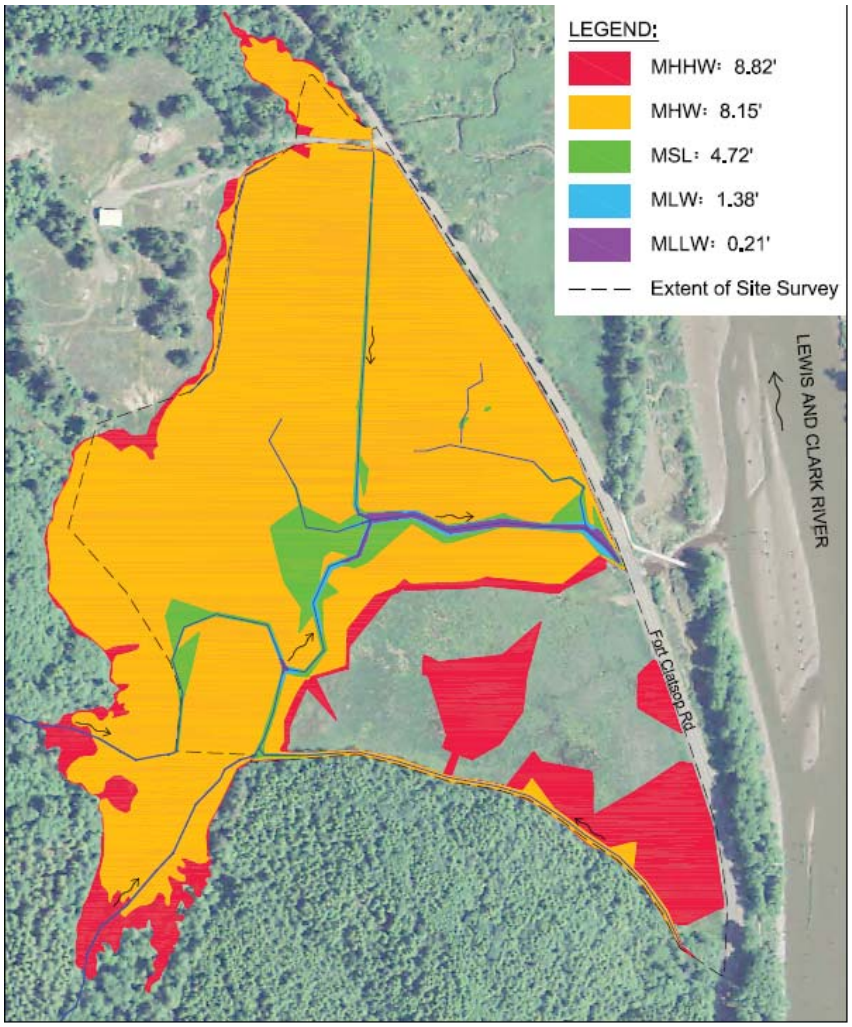

Figure 1-3. Current Tidal Inundation Areas of the Colewort Creek

NPS Guidance

NPS laws, policies and public planning documents provide guidance for this project. The NPS Organic Act of 1916 states that the fundamental purpose of the National Park System "is to conserve the scenery and the natural and historic objects and the wildlife therein." The 1978 Amendments to the Organic Act known as the "Redwoods Act" states "... the protection, management and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established..."

Section 4.4.1 of the NPS Management Policies, the agency's interpretation of the Organic Act, further addresses the biological resources within park boundaries, stating that the Service will

"successfully maintain native plants and animals by preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and communities and ecosystems in which they occur."

Often, as is the case at Lewis and Clark NHP, the NPS inherits lands that support the Park's purpose, but that may lack many of the ecological characteristics they historically encompassed. In these cases, section 4.1.5 of the NPS Management Policies directs the Service to:

"...reestablish natural functions and processes in parks unless otherwise directed by Congress. Impacts on natural systems resulting from human disturbances include the... disruption of natural processes. The Service will seek to return such disturbed areas to the natural conditions and processes characteristic of the ecological zone in which the damaged resources are situated."

The Park's 1995 General Management/ EIS recommends the acquisition and restoration of the lands that are the subject of this EA (NPS 1995: 12, 46- 47).

NPS concluded that there is clear guidance in law, policy, and planning documents to consider the restoration activities proposed in this environmental assessment.

Project Background

Project Area

Lewis and Clark National Historical Park is comprised of seven sites along 40 miles of the Pacific Coast in Oregon and Washington. The Colewort Creek wetland is located within the Fort Clatsop site adjacent to the Lewis and Clark River, approximately 1.5 miles upstream from Youngs Bay.

This site was added to the National Park System in 2006, under the authority of the 2002 Fort Clatsop Memorial Expansion Act. The purpose of this acquisition was to implement the Park's 1995 General Management Plan/EIS.

The Historic Scene

Fort Clatsop National Memorial, the precursor to today's Lewis and Clark National Historical Park was originally created by congress to "commemorate the culmination, and the winter encampment of the Lewis and Clark expedition" (Deur 2008:1)

The journals of the Lewis and Clark Expedition refer to "extensive marshes" at the location where they chose to build Fort Clatsop, encompassing a high point that projected into the estuary. Clark noted that the Fort was built on:

> "the first point of high land on the West side...this situation is on a rise about 30 feet higher than the high tides...this is certainly the most eligible Situation for our purposes of any in its neighborhood" (Clark in Moulton 1990: 114).

Maps in the journals clearly show the fort on a point protruding into the Lewis and Clark River between two broad wetland areas sitting just north and south of the point, sited adjacent to the small spring-fed stream emptying between what is now known as Otter Point and the fort site. Visiting the site a few years after Lewis and Clark's departure, Astorian Robert Stuart complained that Fort Clatsop was "very disagreeably situated, being surrounded with swamps and quagmires" (Spaulding 1953: 28). The prevalence of shallow salt marshes immediately to the north and south of Fort Clatsop contributed to that site being rejected in favor of the modern-day site of Astoria by Stuart and his fellow fur traders, who envisioned a day when big ships would regularly visit their tradition post (Deur 2008:3).

The site originally chosen for the construction of Fort Clatsop, can then be thought of as a promontory – almost a peninsula – that juts out into tidal wetlands extending north and south, with open water to its east. For the Lewis and Clark Expedition, this point would have been defensible, accessible by water, and characterized by commanding views of waterborne traffic along Lewis and Clark River, as well as of landmarks like Saddle Mountain. Available U.S. Coast Survey maps from the 1870s suggest that this marsh was probably almost impassable by foot, being dissected by meandering, dendritic tidal channel networks, with expanses of mud flats and patchy, salt-tolerant scrub-shrub margins (U.S. Coast Survey 1876). During extreme high water events, the visual appearance of this point as a "peninsula" jutting out into the tidelands would have been especially pronounced. The sharp upland-wetland interface would have been a clearly discernible shoreline during high tide events, and opened to a salt marsh meadow during moderate to low tides (Deur 2008:3).

The fort's location was chosen for a variety of reasons that are fundamental to aspects of the Lewis and Clark story that are interpreted to the public today, such as its

defensibility and its access to water. Yet, the look of the cultural landscape has been largely lost due to the diking of the marshes and ditching and draining of historic wetlands to make them adequate for agricultural uses. Presently, the shoreline appears relatively straight and uniform, rather than being a deeply indented series of points and tidal marshes. Moreover, the distinct natural shoreline, along the upland-wetland interface, has been dramatically impacted by the historical construction of the county road along the tidewater edge. The landscape reveals little to park visitors as to the historical condition of the shoreline, or of the attributes of the site that made it appealing to the Lewis and Clark Expedition (Deur 2008:3).

A review of relevant planning documents at the park demonstrates consistent attention to the restoration of historic vegetation and scenic conditions. The look of the landscape is key, and "viewsheds" from visitor facilities are identified as some of the "primary features contributing to the cultural landscape" (NPS 1995: 75). For these reasons, wetland restoration and floodplain reconnection projects have been supported by the NPS. "Water and wetland resources are a significant part of the historic scene at the encampment site" (NPS 1995: 75). Park planners have thus recommended protecting or enhancing wetlands in the park, as much to maintain the "historic scene," as to meet the Park's other compliance mandates. Planners have consistently noted that most of the wetlands in Fort Clatsop have been altered by diking or draining, meaning wetland restoration in the park would often require more than simple hydrological fixes – and instead, restoration would require the reconstruction of entire wetland landscapes, perhaps to their early 19th century conditions (Deur 2008: 3).

Salmon and Salmon Habitat

The historic scene noted by Lewis and Clark included tidal wetlands significant to the survival of young salmon in the Columbia River system. In the 20th century, the federal government built several hydroelectric dams on the Columbia River. Soon after completion of the dams, it was clear that the dams, and other changes in the watershed, were harmful to several species of anadromous fish. Recent legal proceedings have directed the federal government to undertake restoration of part of the Columbia River system, including the estuary, where this project is located.

2008 Biological Opinion

In 2008, The Bonneville Power Administration (BPA) was required by law to enter into an agreement with the United States Army Corps of Engineers, Department of the Interior, several tribes, and other government agencies to implement projects that would benefit the Columbia River Basin salmon over a ten year period. The 2008 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 2008 Bi-Op to improve rearing habitat is to restore degraded areas with high intrinsic potential for high-quality habitat. The 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 Fisheries 2008: 13-3).

Fort Clatsop Road Bridge Replacement

In 2007, a restoration project was completed to reestablish tidal connection and fish passage to the 44-acres of wetland located just west of Fort Clatsop Road. This restoration project, named the South Clatsop Slough Restoration, in recognition of the Clatsop people, involved replacing a 60- inch culvert and tide gate with a 46-foot bridge to allow for juvenile salmonid fish access to preferred off-channel foraging and rearing habitat, and to reconnect the wetland to tidal inundation from the Lewis and Clark River.

Though managers knew that the reconnected wetland site might require additional work, they decided to allow the tidal process to carry out passive restoration at the site and monitor its effects before taking further action.

Five years of monitoring data and site observations have demonstrated that the South Clatsop Slough Restoration was successful in reopening access for juvenile salmonids and reconnecting the Lewis and Clark River with its floodplain. The year immediately following the bridge installation, fish surveys found a ten-fold increase in the amount of juvenile salmon utilizing the wetland habitat. Consecutive years of fish presence monitoring have continued to demonstrate that an abundance of salmonids inhabit the wetland.

After five years, it is clear that passive restoration has reached the maximum extent of benefit possible at this site. Although the changes that have occurred at the Colewort Creek wetland have been significant, it is clear that there is still potential for improvement, both in terms of habitat, and in terms of historic viewshed.

Area North of Tidal Channel

Throughout the 29-acre area to the north of the main tidal channel, there has been a dramatic shift in vegetation communities from pasture grasses to native wetland plants, which indicates that the project has been successful. Despite this success, there is an opportunity to take restoration of this northern area further. Tidewater flows have not changed or enhanced a network of drainage ditches on the site. Instead of meandering, these ditches quickly shunt water from the site, perhaps downcutting into the marsh. Their “straightline” geometry offers little habitat complexity. Modifying the channels to make them more sinuous, and installing logs and woody debris, will greatly increase habitat area, as well as the amount of cover, and diversity of depths.

Area South of Tidal Channel

Since 2007, relatively little has changed in the 15-acre area immediately to the south of the main tidal channel. This area is approximately 3 feet higher than the wetland area to the north of the channel, due to dredge spoils placed on the site in the first half of the 20th century. At its current elevation, it is above the tidal prism and only experiences tidal inundation in isolated areas during the most extreme high tides. As a result, this southern portion of the wetland has not experienced the benefit of passive restoration that has occurred on the northern portion of the wetland.

This document evaluates additional active restoration activities within both the northern and southern areas of the wetland.

Figure 1-4. Map of Northern and Southern Project Areas

Related Restoration Work in the Youngs River Watershed and the Columbia River Estuary

This project is part of a regional effort to restore the Columbia River estuary. As noted above, the Lewis and Clark River basin is part of the Youngs Bay watershed, which is, in turn, part of the Columbia River estuary. Over the past ten years, several restoration projects have been completed in the area.

Lewis and Clark River Basin

In 2006, further upstream on the Lewis and Clark River, the City of Seaside breached two dikes on City- owned property, effectively reconnecting 25 acres of wetland with the mainstem of the Lewis and Clark River. In 2012, the NPS and its partners will complete the Otter Point Restoration by removing portions of a levee to reconnect over 33 acres of historically estuarine wetlands with the Lewis and Clark River.

Youngs Bay Watershed

The Columbia Land Trust (CLT) restored 4,800 feet of stream on the Walluski River in 2006, by placing 295 pieces of large woody debris within the river for in-stream habitat complexity. During the 2008- 2009 planting seasons, the Youngs Bay Watershed Council utilized grant funding to replant over 6 acres of riparian area on the North Fork Klaskanine River. In 2010, CLT breached a remnant levee on Haven Island to restore 80 acres of intertidal scrub-shrub and emergent wetland habitat.

Columbia River Estuary

Examples of recently implemented projects in the Columbia River estuary include a 2010 project on the Washington side of the Columbia River mainstem in which the Columbia River Estuary Study Taskforce (CREST) replaced a 24-inch culvert under Highway 101 with a 12-foot cement box culvert, reconnecting a 90-acre wetland with the tidal flows of the Columbia River and reopening access to off-channel habitat for anadromous fish. In 2002, CREST and partners completed a project on Blind Slough which reopened fish passage by replacing two undersized culverts with five 60- inch culverts. Another project on Alderbrook Slough, just off the mainstem of the Columbia, removed invasive plants and revegetated the slough with native wetland plants.

Figure 1-5. Restoration Projects on the Lewis and Clark River

Issues and Impact Topics Included for Analysis

The park's physical resources are key components of its environment, and are essential to the health of the Colewort Creek wetland system. Alterations to the physical environment could potentially affect biological and physical components of the wetland, and the organisms that inhabit the site. Cultural resources, available recreational opportunities and land uses, as well as human safety were also important factors considered in this analysis.
The impact topics that have been included in this assessment are:

Hydrology— The natural hydraulic and hydrologic patterns of the Colewort Creek wetland have been altered through diking, ditching, and construction of the county road. The analysis described in this assessment will consider how the various alternatives will impact the hydrology of the wetland area.

Geology and Soils— The NPS seeks to maintain the park's natural soil resources and geologic characteristics by preventing unnatural erosion, physical removal, or contamination. This assessment will consider the potential impacts to the geology and native soils present within the wetland.

Water Quality— Impacts to water quality are of concern whenever there is a potential for introduction of additional sedimentation into water ways due to ground disturbance from construction related activities. The potential for the various

alternatives to affect the water quality of the wetland area, or the greater Lewis and Clark River system are assessed in this document.

Air Quality— Section 118 of the Clean Air Act requires all National Park Service units to meet federal, state, and local air pollution standards. This document will assess the potential impact to air quality from increased emissions and dust by the proposed alternatives.

Vegetation— The vegetative community is a key component of overall ecosystem function and health. The NPS aims to preserve all components and processes of natural park unit ecosystems, including the abundance, diversity, and ecological integrity of native plant communities. The alternatives and restoration methods analyzed in this document will have varying degrees of effect on the vegetation at the site, and the relative abundance of native versus non-native species present.

Threatened or Endangered (T&E) Species (Including coho salmon, Chinook salmon, chum salmon, and steelhead trout)— The NPS Management Policies require that potential effects of agency actions on federal, state, or locally listed species be considered. NPS is required to control access to important habitat for such species, and to perpetuate the natural distribution and abundance of these species and the ecosystems upon which they depend. The analysis described in this assessment considers the impacts of each of the alternatives on T&E habitat and species within the Lewis and Clark National Historical Park.

Fish and Wildlife (Non-T&E) — Native wildlife species are an integral part of the park's environment. It is the Park's mission to protect these resources, and therefore it is important to identify and analyze any potential impacts (adverse or beneficial) that could affect these resources. The alternatives and restoration methods analyzed in this environmental assessment may affect the biological and natural resources of the wetland system. The analysis described in this assessment considers the impacts of each of the alternatives on fish and wildlife species found within the Lewis and Clark National Historical Park.

Historical and Cultural Resources— Restoration of the historic landscape is one of the purposes of this project. The NPS is charged with the protection and management of historical and cultural resources found under its care. Impacts to these resources are identified and analyzed in this document.

Visitor Use and Experience— The NPS Organic Act directs NPS to "... provide for the enjoyment..." of National Park units. NPS Management Policies state that the "enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks" (NPS 2006). Aesthetics is considered part of the visitor experience, and maintaining scenery of great natural beauty is a key component in enhancing visitor experience. In addition, the heavy equipment to implement the

alternatives will be loud and generate unnatural sound. Analysis of all potential impacts to recreation and visitor experience, including soundscape and viewscape, is provided in this document.

Human Health and Safety— The health and safety of visitors, staff and contractors is of utmost importance to the NPS. Therefore, impacts to human health and safety are addressed in this analysis.

Land Use— The NPS DO-12 Handbook requires an analysis of impacts due to land use conflicts between the proposed action and land use plans in the affected area. The project area is entirely within the boundaries of the Lewis and Clark National Historical Park; however, it does have the potential to impact non-NPS lands. Though there is only a slight possibility that the proposed action could create a land use conflict, land use impacts were included in this analysis.

Issues Eliminated from Further Analysis

Regulations developed by NEPA and the Center for Environmental Quality direct agencies to "avoid useless bulk and concentrate effort and attention on important issues" (40 CFR 1502.15). Resource issues judged irrelevant to the proposed actions or the alternatives considered in this environmental assessment are listed below along with the reasons they were eliminated.

Socioeconomics— NEPA requires an analysis of impacts to the "human environment," which includes economic, social, and demographic elements in the affected area; but because many Clatsop County residents use the park for recreational purposes, they would directly benefit from the restoration of park habitats to their historic natural condition. The cost of the restoration actions would not be enough to create a significant number of jobs for Clatsop County residents. The alternatives would not significantly impact fishing practices on the Lewis and Clark River. Furthermore, the proposed restoration activities would not affect socially or economically disadvantaged populations. As a result, this issue is not included for further analysis in this environmental assessment.

Environmental Justice— Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, requires all federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Wetland restoration projects at the Lewis and Clark National Historical Park are expected to have no direct or indirect impacts on minority or low-income populations or communities. Environmental justice considerations, therefore, were not included for further analysis in this environmental assessment.

Scoping

Internal and external scoping occurred prior to preparation of this environmental assessment. Internal scoping involved an interdisciplinary process that identified issues, alternatives, and data needs. The project planning team held several internal scoping meetings at the park during 2010 and 2011.

Scoping letters were sent to local, state, and federal regulatory and resource agencies along with the Clatsop-Nehalem Confederated Tribes, Confederated Tribes of Siletz Indians, Confederated Tribes of Grand Ronde and the Chinook Indian Nation. A press release was issued in November 2011 that described the project and announced a public meeting that was held on December 1, 2011. The Daily Astorian ran an article on November 29th, announcing the December 1st, public meeting.

The public scoping meeting was attended by seven representatives of state and local government and three private citizens. Those in attendance were supportive of the project. Comments addressed during the meeting included:

- Recommending the reed canary grass scalping be hauled to a location where it would not grow
- Presence of Virginia Rails on the northern portion of the site
- Benefit of reconnecting the tidal influence to the western ditch to reduce the reproduction of invasive bullfrogs in the ditch
- Permits required from county and state
- Techniques for excavating within a wetland
- Fish presence at the creek since the 2007 bridge installation

Planning Issues and Concerns

Additional issues related to land use planning drainage and flooding were considered throughout the design phase of this project. Management actions taken by NPS are expected to be conducted in such a manner that will not create any negative impact on the land use and value of adjacent properties. These issues were analyzed in this assessment and were incorporated within the selection of the preferred alternative.

Chapter 2: Alternatives

Descriptions of Reasonable Alternatives

Reasonable alternatives, including the No Action alternative, were evaluated during the NEPA process. Possible alternatives include restoration of only the 15-acre filled area south of the main tidal channel (Alternative 2); restoration and enhancement of areas north and south of the main tidal channel (Alternative 3); and a No Action alternative as required under NEPA (Alternative 1).

In 2011, the NPS and its partners engaged the services of an engineering firm to complete ground surveys, soil surveys, hydraulic and hydrologic analysis, and an engineering feasibility study to develop a range of possible restoration actions (Vigil-Agrimis 2011:4).

The NPS then assembled an interdisciplinary team (IDT) comprised of staff from NPS and other public agencies to review the possible range of actions and refine them into the distinct alternatives cited above, which were reviewed and approved by the park superintendent.

The NPS 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 NPS restoration goals. Evaluation criteria also included public health and safety criteria, ensuring that the alternative poses no threat to the health or safety of the public or agency staff, and is in compliance with applicable health or safety requirements and guidelines.

Furthermore, each alternative was screened to certify that it complies with the policies and procedures of the NPS, and to confirm that the action can be implemented in a manner which is consistent with established policies and procedures applicable to the Park. Finally, the alternative was screened to affirm that the proposed restoration action complies with all applicable federal, state, and county laws and regulations.

Alternative 1: No Action

Under this alternative, the NPS would continue managing the site through existing methods as part of the General Management Plan.

Current management actions performed at the Colewort Creek site include wildlife and vegetation monitoring. Wildlife presence is monitored through elk surveys conducted by NPS staff, and fish presence surveys conducted within the Colewort Creek main tidal channel by the CREST biological monitoring crew. For the

evaluation process, these existing management activities are considered part of the No Action alternative.

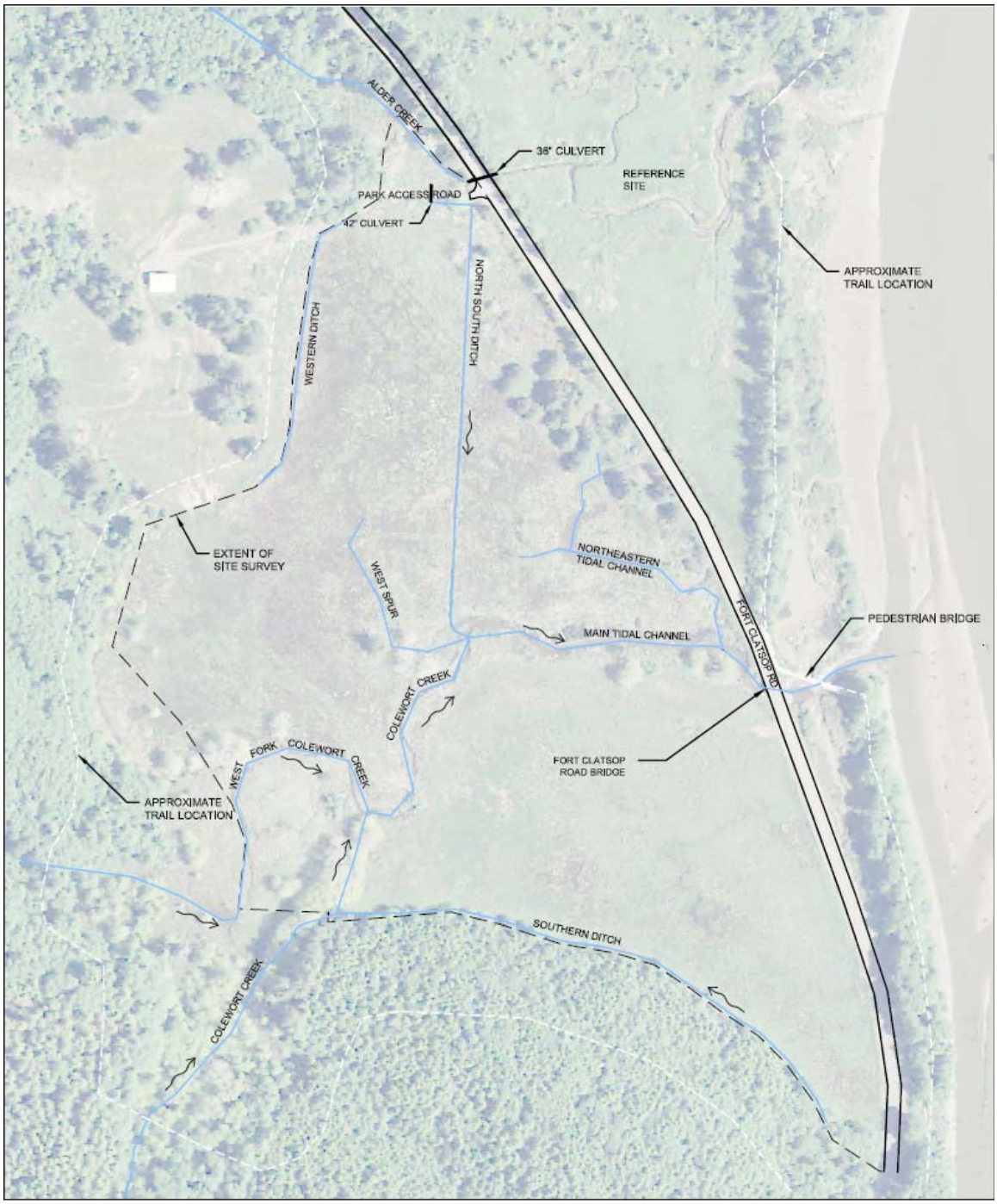

Figure 2-1. Existing Colewort Creek Conditions Map

Alternative 2: Active Restoration of the Southern Portion of the Colewort Creek Wetland

Alternative 2 proposes to restore the southern portion of the Colewort Creek Wetland.

Examination of LiDAR imaging, as well as ground surveys indicated that approximately 3 feet of fill material was placed within the southern portion of the Colewort Creek wetland. The existence of this material has raised the elevation of the southern portion of the wetland to an extent that it is above the tidal prism, and therefore, almost entirely isolated from tidal inundation. Design engineers determined that by removing the fill material and restoring the marsh plain to natural elevations matching those on the northern portion of the project site, the Park could effectively restore tidal connectivity to the southern portion of the Colewort Creek wetland (See Figure 2-2). In addition to removing fill material, a tidal channel network similar to those found in other tidal marsh environments on the Lewis and Clark River would increase the amount of available foraging and rearing habitats for juvenile salmonids.

The restored dendritic tidal channels, totaling 3,200 linear feet, will provide tidally-influenced habitat with diverse salinity profiles for salmonid refugia and rearing. Creating additional small-scale channels and alcoves will provide a diversity of refugia for juvenile salmonids. The juxtaposition of small channels and alcoves with upland and margin vegetation on portions of the site will enhance opportunities for macroinvertebrate recruitment. Their presences is an essential component of juvenile salmonid use of the historical estuarine channels that has been significantly impacted throughout large portions of the Columbia River estuary (Henderson Land Services 2010: 13).

Alternative 2 states that restoration work would be completed using a large-track excavator to lower approximately 2 acres of the marsh plain on the southern site to elevations ranging between 5 and 7 feet (NAVD88). Next, the tidal channel network would be excavated to the specifications detailed in the project designs, leaving a soil plug intact at the connection point between the new tidal channel and the mainstem of the Colewort Creek tidal channel. Once all of the interior excavation is completed and a turbidity curtain is installed, the final soil plug would be removed, reconnecting the wetland with tidal inundation and riverine flows. Sequencing restoration actions in this manner would help to minimize the potential for high turbidity levels in the waterway.

This alternative would also restore topographical diversity that is found in similar salt marshes by placing and shaping the excavated material within the ditches running along the southern and eastern borders south of the main tidal channel. Up to 100 pieces of large woody debris would be anchored along the newly excavated channels. These restored areas would add to the habitat diversity of the Colewort Creek site, providing such functions as shading and macroinvertebrate recruitment over salmonid-

bearing channels. The restored areas would also serve the additional function of providing nesting and roosting areas for passerines and waterfowl (See Figure 2-2). Slopes of these shaped upland islands are very gradual (minimum 3:1) providing for the establishment of a diversity of native plantings (Henderson Land Services 2010:16).

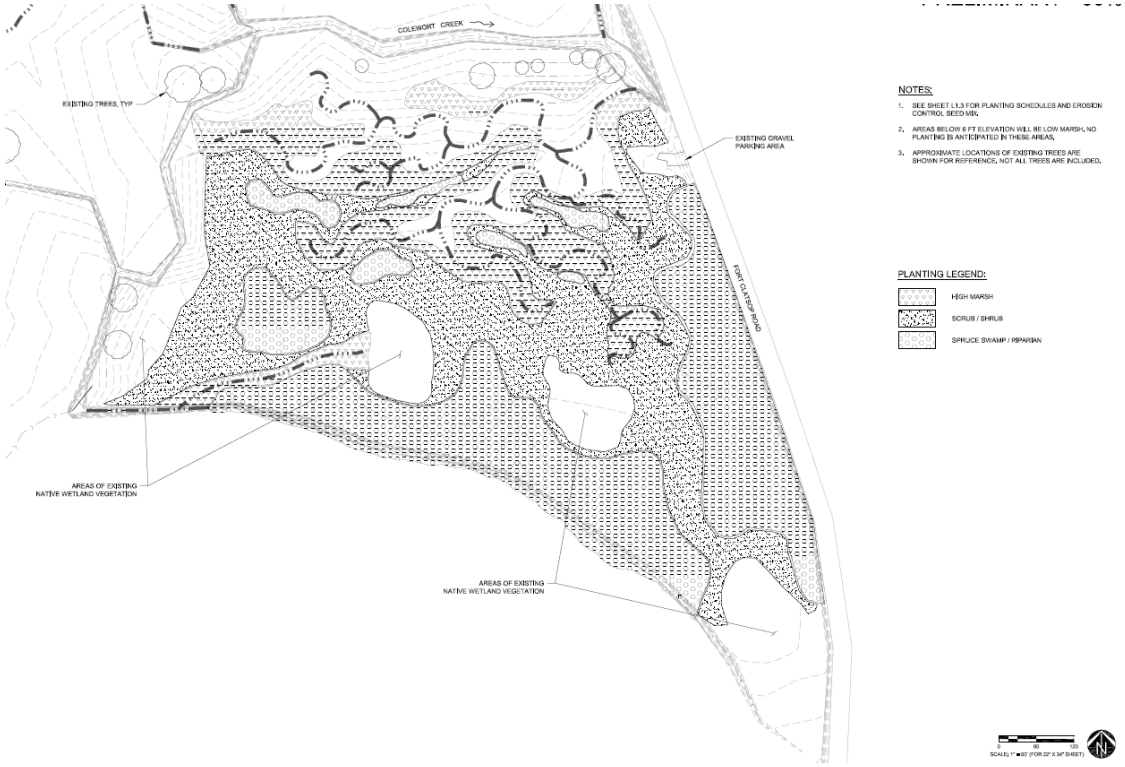

Figure 2-2. Proposed Planting Plan for the Southern Portion of the Colewort Creek Restoration Site

Following excavation, the wetland surface outside of the disturbance areas would be tilled to loosen the current soil surface, making the area more suitable for planting. The entire 15 acres of the southern portion of the Colewort Creek wetland would be replanted with native wetland, riparian, and upland vegetation at densities that would establish native plant communities that may reasonably compete with non-native invasive species and establish root networks that will help rapidly stabilize the overall project site. The planting plan will specify which plants will be installed within the various regions of the project site based on where different species would be most appropriate for the variety of elevations and inundation levels that would be achieved following project completion. Fencing or mesh cylinders may be used to protect the ative plantings from herbivory for up to five years.

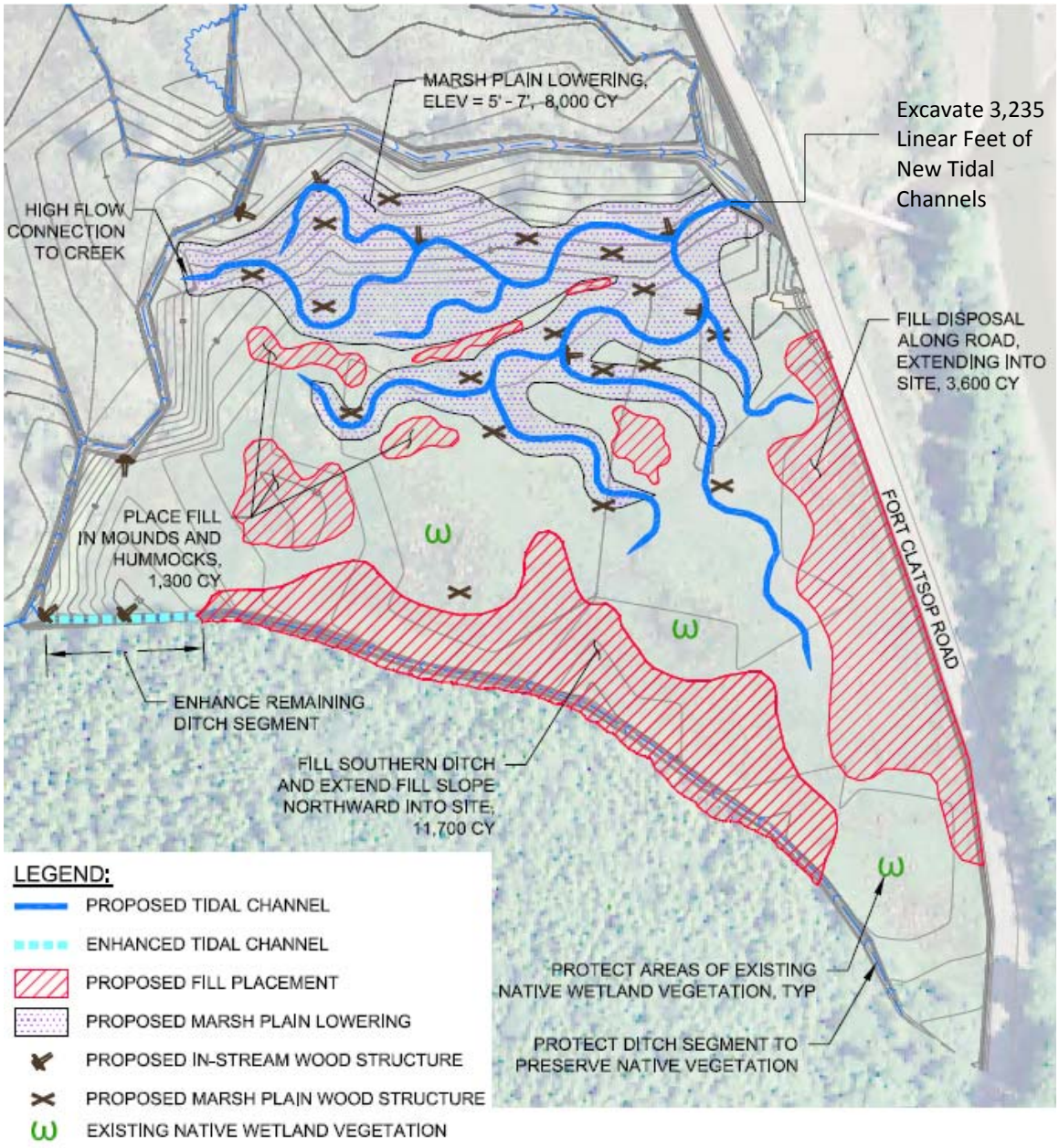

Figure 2-3. Colewort Creek Alternative 2 Conceptual Map

Alternative 3: Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Portion

Alternative 3 will include all the actions described in Alternative 2, but will also involve measures that will enhance existing habitat in the 29-acre area north of the Colewort Creek main tidal channel (See Figure 2-3). Additional enhancements would accelerate the evolution of high quality habitat features including sinuous channels and in-stream complexity in this area. Proposed activities include altering over 1,300 linear feet of remnant ditches on site to deepen the channels, create more natural sinuosity, and improve connectivity throughout the site. These alterations would involve a combination of construction methods including large equipment excavation, hand excavation, and creating small channel diversions using large wood and natural fibers. This alternative also includes installing up to fifty pieces of large woody debris and excavating the top 18 inches of soil in a 2.5-acre area in the northeast corner of the property to manage for invasive reed canary grass.

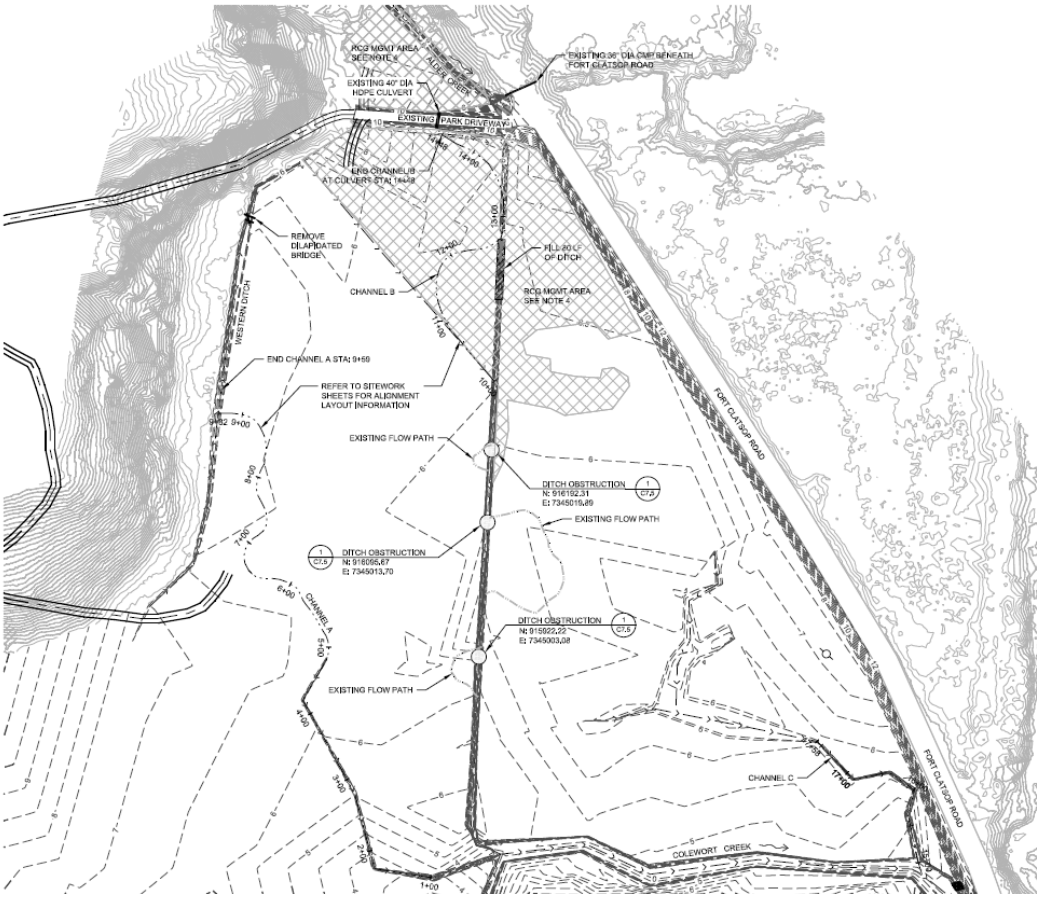

Figure 2-4. Colewort Creek Alternative 3 Northern Wetland Enhancement Conceptual Map

The northern portion of the Colewort Creek project site currently has three remnant ditches transecting the wetland. The westernmost channel, titled Channel A by project designers, is completely disconnected from the Colewort Creek main tidal channel. This segment of ditch is also shallow and often stagnant. This alternative proposes to excavate a channel that will connect the ditch to the mainstem of Colewort Creek and expand the amount of tidal channel habitat to this western segment of the wetland.

Bisecting the northern wetland area from north to south is a remnant agricultural ditch called Channel B. Although this channel is connected to the Colewort Creek tidal channel, it is extremely linear and lacks channel complexity that is necessary for high quality salmonid habitat. To improve the conditions of this ditch, Alternative 3 proposes to install three ditch obstructions. These ditch obstructions will redirect water into other flow paths adjacent to the linear ditch, encouraging additional meandering. However, it will still allow higher tidal flows to pass through the channel so as not to completely obstruct fish passage.

Finally, a small channel in the easternmost portion of the property named Channel C is connected to the main tidal channel of Colewort Creek, yet provides little habitat because it is not long and very shallow. Alternative 3 actions will involve deepening and lengthening this small channel, increasing the amount of high quality off-channel habitat. Because this area will be difficult to access with heavy equipment, these restoration actions will have to be completed by hand, through the use of shovels and pick-axes.

In addition to enhancing remnant ditches, the NPS will further improve the wetland by removing invasive reed canary grass from a 2.5-acre area in the northeastern corner of the site (See Figure 4-2). This area, along with other disturbed portions of the wetland would then be replanted with native vegetation. Although project designs indicate that restoration and diversification of Colewort Creek's native vegetation communities will be achieved, in part, through the reintroduction of site hydrology and salinity, as was experienced in the wetland north of the tidal channel following the installation of the bridge, planting of native species will significantly increase riparian and estuarine wetland habitat diversity – including critical 'edge' habitat – for native mammals and birds (Henderson Land Services 2010: 24).

Preliminary Options Considered but Dismissed: Bridge Replacement

Along with the alternatives selected for impact analysis, one alternative that was considered, but rejected, was the replacement of the current Fort Clatsop Road bridge with a larger bridge span or causeway. This alternative was rejected because hydrologic analysis showed that the current bridge is sufficiently sized to inundate the created wetland channels.

NPS Preferred Alternative

The preferred alternative was determined through evaluation by the NPS and project stakeholders based on its ability to meet restoration objectives, as well as its potential impact on the environment and surrounding properties. Alternative 3 (Active Restoration of the Southern Portion of the Wetland with Additional Enhancement in the Northern Portion) is the NPS preferred alternative based on its ability to satisfy the requirements of both the NPS General Management Plan/ EIS and the 2008 Bi-Op to the greatest extent possible.

Both Alternative 2 and Alternative 3 satisfy the Park's General Management Plan by restoring the cultural landscape of the Colewort Creek wetland back to the tidal marsh environment that existed during the 1805-1806 occupation by the Corps of Discovery led by Lewis and Clark. These designs also comply with the 2008 Bi-Op by restoring an additional 15 acres of off-channel juvenile salmonid forage and rearing habitat within the Columbia River Basin. However, Alternative 3 allows the NPS to also improve the existing landscape conditions within the entire 44-acre wetland at Colewort Creek and enhance the habitat value in areas that are already heavily influenced by tidal processes, yet still lack important characteristics of high quality salmonid habitat. Alternative 1, the No Action Alternative, would satisfy neither of the goals set by the National Park Service.

Environmentally Preferred Alternative

The CEQ Regulations implementing NEPA and the NPS NEPA guidelines require that "the alternative or alternatives which were considered to be environmentally preferable" be identified (Council on Environmental Quality Regulations, Section 1505.2). Generally this means the alternative that causes the least damage to the biological and physical environment. It also means the alternative that best protects, preserves, and enhances historic, cultural, and natural resources (CEQ, 1981).

Section 101(b) of the NEPA identifies six criteria to help determine the environmentally preferred alternative. The NEPA directs that federal plans should:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
- Achieve a balance between population and resource use that will permit high standards of living and wide sharing of life's amenities.
- Enhance the quality of renewable resources and approach the maximum attainable

recycling of depletable resources.

Among the options considered, Alternative 3 best fulfills these criteria.

Continuing current conditions under Alternative 1, the No Action alternative, the NPS would fail to enhance the quality of renewable resources. The Colewort Creek wetland system would continue to exist in its degraded condition, providing minimal habitat value to native fish and wildlife. The wetland site would also continue to exist in a condition that does not reflect the historic conditions that were experienced by Lewis and Clark's Corps of Discovery during the 1805-1806 occupation of Fort Clatsop.

Although implementing Alternative 2 would satisfy both the General Management Plan of the Park, and the 2008 Bi-Op, it would not meet NEPA's six criteria to the greatest extent possible at this time. The remnant ditches currently transecting the wetland to the north of the main tidal channel are very straight, with no in-stream complexity such as large woody debris, and no riparian shading. These missing characteristics are important not only because they are components of high-quality salmon habitat, but also because they are naturally occurring characteristics that would have been present during the Lewis and Clark expedition.

Of the approaches evaluated in this document, Alternative 3 best fulfills all of the environmentally preferred alternative requirements. Implementing both restoration and enhancement activities will create a more ecologically productive wetland that supports diverse native plant and animal species. It will also enhance the quality of renewable resources by improving wetland functions, and will recreate conditions that are culturally representative of the landscape experienced during the Corps of Discovery.

Table 2-1. Summary of Alternatives Considered

Alternative	Result/ Considerations
Alternative 1: No Action	• Wildlife and endangered species would not benefit from restored off-channel salmonid habitat and diversified estuarine wetland habitat. • Action would not meet Park management goals to restore former pasturelands to estuarine wetlands, and to recreate the historic riverine setting of Fort Clatsop.
Alternative 2: Active Restoration Approach	• Restoration actions have the potential to improve current wetland conditions by restoring tidal flow and flood plain connectivity. • Alternative provides potential for off-channel habitat for endangered species of

	salmonids as well as a more diverse wetland ecosystem. • Action is consistent with Park management goals to restore former pastureland and recreate historic setting. • Provided that all regulatory standards are met, action will not adversely affect adjacent land uses.
Alternative 3: Active Restoration and Enhancement Approach	• Restoration and enhancement actions will have the most improvement on current wetland conditions by restoring tidal flow and flood plain connectivity. • Alternative provides potential for additional off-channel habitat for endangered species of salmon, as well as additional in-stream complexity and higher quality habitat within the wetland ecosystem. • Action is consistent with Park management goals to restore former pastureland and recreate historic settings to the greatest degree possible. • Provided that all regulatory standards are met, actions will not adversely affect adjacent land uses.

Mitigation

The action alternatives 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, mitigation measures will be used to minimize negative impacts. Mitigation measures include best management practices (BMPs) and minimization measures 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 (HIP II). BMPs proposed include, but are not limited to the following:

- Clearing/grading will be limited to minimum practicable extent.
- There will be no tree cutting or vegetation removal outside of the project area.
- Sediment fencing will 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 will be covered with mulch or fiber matting and re-vegetated.
- Work will be done during the summer and fall to limit erosion and sedimentation
- Staging areas will use, to the extent possible, previously graveled areas within the project area. Any newly created staging areas will be restored after construction.

- During work on the western ditch, the lower South Slough Trail may be periodically closed to visitor access for safety. The upper South Slough Trail would remain open.
- During excavation of new tidal channels, the area closest to the existing creek will be excavated last. Once all the interior excavation is completed and a turbidity curtain is installed, the final soil plug will be removed.
- Construction work will be seen and heard by users of the Netul Trail and the South Slough Trail. The Park will educate visitors on the purpose of the project, salmon recovery, and wetland restoration.
- All disturbed areas of the project will be seeded after construction is complete to prevent erosion and sedimentation out to the Lewis and Clark River.
- The NPS will implement the recommended guidance of the State and Tribal Historical Preservation Offices for archeological monitoring during ground disturbing activities.

Long-Term Monitoring

Long-term monitoring would be a collaborative effort between the NPS, CREST and Astoria High School students. This includes a continuation of the fish presence surveys, plant community surveys, water quality analysis, elk pellet surveys, and topographic surveys to track channel morphology, with additional areas added following the completion of project construction. Post-project monitoring data will be compared to data recorded prior to the completion of this phase of active restoration to determine long-term impacts at the site.

Chapter 3: Affected Environment

This section describes the environment expected to be affected by the Colewort Creek restoration alternatives proposed in this assessment. The environments and issues discussed include the physical environment, the biological and natural resources, critical habitat, historical and cultural resources, recreation and visitor experience, human health and safety, aesthetics, and Park operations.

Due to the distinct differences in the characteristics between the northern and southern Colewort Creek wetland areas, these two environments will be described individually in this chapter.

Youngs Bay Watsershed

The Colewort Creek restoration site is located in the Youngs Bay Watershed near the mouth of the Columbia River in Northwest Oregon. The Youngs Bay Watershed is the largest watershed in the Columbia River estuary. Research shows that the Youngs Bay estuary is one of the Lower Columbia's most bio-diverse areas.

Despite its diversity, the lower Youngs Bay Watershed, including the Lewis & Clark River has undergone considerable modification from its former forested, wetland, and estuarine habitats. The lower Lewis & Clark River once contained significant Sitka spruce swamp habitat, as well as extensive 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 River and its adjacent lands. It is estimated that 95% of all the bottomlands within the 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 (Youngs Bay Watershed Assessment, 2001).

Hydrology

Two freshwater streams drain into the Colewort Creek project site. To the north, Alder Creek enters the site along Fort Clatsop Road, widening into a small wetland area north of the access road. This wetland is hydraulically connected to the northern Colewort Creek wetland area by a 42-inch diameter culvert beneath the Park's access road. Its primary flow path drains through a 36-inch diameter culvert beneath Fort Clatsop Road which flows to the Lewis and Clark River. In the southwestern corner of the Colewort Creek wetland, two branches of Colewort Creek enter and converge into one channel. The two branches combine and flow northward to the main tidal channel, which runs west- east through the center of the project site (Vigil-Agrimis, 2011: 3).

The project area is tidally affected, with 29-acres to the north of the main tidal channel, as well as the Colewort Creek channels to the south, connected to tidewater. The northern portion of the wetland complex is almost completely inundated during high tides. Several remnant ditches transect this site providing in-stream habitat for salmonids. During low tides, inundation is limited to the ditch networks.

The southern 15-acre portion of the project site is largely disconnected from tidal and riverine influence. Water sources for this site are primarily seeps and springs, and in isolated areas, extreme high tides.

Geology and Soils

During the winter of 1805-1806, the presidentially appointed Corps of Discovery, led by Lewis and Clark constructed Fort Clatsop about 30 feet above tide on top of the Upper Eocene mudstones and siltstones of the Smuggler Cove Formation. Now exposed at the surface, these sediments were originally deposited in deep marine environments. The Tertiary exposures are overlain by a variety of Quaternary deposits including shoreline sediments, fluvial, terrace, and estuarine deposits, and landslide material.

Colewort Creek's landscape has been altered from tidally-influenced wetland and estuarine habitat into agricultural pastureland. Protective levees, and later Fort Clatsop Road, were constructed along the Lewis and Clark riverfront, reducing tidal influence from Youngs Bay, as well as Lewis & Clark River flows. Materials dredged from the bed of Youngs Bay and its tributaries were placed within the Colewort Creek wetland site as fill to improve shipping access and commerce.

Natural soils (as compared to dredge spoils) within the Colewort Creek wetland are comprised of Coquille-Clatsop complex, having 0 to 1 percent slopes. This soil type is found in tidally- influenced flood plains, and is described as being very poorly drained with very dark gray silt loam, and very dark grayish brown muck (United States Department of Agriculture 1984: 144-145).

Soil surveys of the Colewort Creek site have found large amounts of fill material throughout the southern portion of the wetland. Dredge material on the site ranges from sand to silt and is 35 to 60 inches deep.

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. NOAA-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 historic tidal floodplains and wetland complexes have been altered.

Currently, the project area receives water from Colewort and Alder Creeks and from seeps and springs that dot the hillside above the marsh. However, the flow of freshwater from these upstream sources is significantly smaller than the water provided by daily tides. The tides carry saltwater from the ocean, Columbia River estuary, and the Lewis and Clark River to the site. The Lewis & Clark River is listed for fecal coliform on the State of Oregon's 303(d) inventory of impaired water bodies (Youngs Bay Watershed Assessment, 2001).

For salmonids and other fish species, no single environmental factor affects their development and growth rate more than water temperature (Bjornn and Reiser 1991:84). Annual temperature changes impact many biological processes for juvenile and adult salmonids, including, but not limited to, feeding potential, growth rates, spawning, smoltification, hatching, out migration timing and success.

The installation of a bridge on Fort Clatsop Road in 2007 allowed for larger hydraulic capacity, restoring tidal processes to the wetland north of the main tidal channel. Water quality data collected on-site since 2007 indicates that post restoration temperature maximums were consistently lower than 2007 temperatures within the Colewort Creek main tidal channel (CREST 2011: 30).

The optimal dissolved oxygen (DO) level for salmonids is 9mg/l. A level of 7 mg/l -8 mg/l is generally considered acceptable, while 3.5 mg/l- 6 mg/l is considered poor. Levels below 3.5 mg/l are likely fatal to salmon, and a level below 3 mg/l is stressful to most vertebrates and other forms of aquatic life (Bjornn and Reiser 1991:85). Dissolved oxygen levels at Colewort Creek remain within acceptable levels averaging 8.23 mg/l (CREST 2011:27).

Due to its higher elevation, the wetland area south of the Colewort Creek main tidal channel is completely disconnected from tidal inundation during all but the highest of tides. When the mean higher high tide reaches a level of 8.82 feet NAVD88 and above, isolated areas of the southern wetland will become inundated through the existing ditch system along the southern border of the wetland, but because water is relatively absent from the southern wetland site at this time, no water quality data is available for that portion of the project site.

Air Quality

The Lewis and Clark National Historical Park is designated a Class II Airshed. This designation was established by Congress to facilitate the implementation of air quality provisions of the Clear Air Act, and allows for a moderate increase in certain air pollutants. The Clean Air Act requires that the NPS comply with all federal, state, and local air pollution control laws. The state agency that regulates air quality related concerns is the Oregon Department of Environmental Quality (DEQ).

Air quality monitoring at the park is not conducted by DEQ because coastal winds generally maintain clean air conditions in the area. Under certain conditions, smoke will enter the project site from nearby forest slash and burning and from living history fires within the Fort Clatsop replica (NPS 2011: 61).

Vegetation

Vegetation on the Colewort Creek site has been influenced by the historic disturbances mentioned elsewhere in this document. Fill material placed within the southern portion of the wetland largely prevents tidal waters or river flows from impacting this portion of the site. As a result, the plant communities within this portion of the wetland have remained unchanged following the 2007 bridge installation. The plant community found in the area south of the main tidal channel is dominated by 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.

The vegetation within the wetland to the north of the main tidal channel has changed dramatically since being reconnected with the tidal flows of the Lewis and Clark River. This section of the wetland complex is being colonized by desirable natives such as slough sedge (*Carex obnupta*) and bulrushes (*Schoenoplectus spp.*). However, a small area in the northeastern corner of the property is dominated by reed canary grass (*Phalaris arundinacea).* This restoration project proposes to treat this area by removing the reed canary grass and replanting the area with native wetland plant species.

Reed Canary Grass (*Phalaris arundinacea*)

Reed canary grass is a rhizomatous perennial grass that can grow up to 6 feet in height. Reed canary grass prefers wetland environments in soils that are saturated or nearly saturated most of the growing season, but does not have standing water that persists for extended periods. Due to its highly productive nature, this grass species poses a major threat to many wetland ecosystems. Reed canary grass grows so vigorously that it is able to inhibit and eliminate native wetland species that compete for sunlight and nutrients. Unlike native wetland vegetation, dense stands of reed canary grass have little value for wildlife. Few species eat the grass, and the stems grow too densely to provide adequate cover for small mammals and waterfowl. The species is considered a problem weed along irrigation banks and ditches because infestations can increase siltation. When flowering, the species produces abundant pollen and chaff, which aggravate hay fever and allergies (Pojar, MacKinnon 2004: 370).

Threatened and Endangered Species

The ESA directs federal and state agencies to protect and conserve listed T&E animals and plants. The habitat of T&E species takes on special importance because of these laws, and conservation of these species requires careful management. Federally listed

T&E species that may be present at the Colewort Creek site, or could be potentially affected by the proposed action are described below.

Coho Salmon (*Oncorhychus kisutch*)
- Lower Columbia River ESU Coho salmon (Endangered)
- Oregon Coast 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 within the park, including the main tidal channel at Colewort Creek.

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 have been documented in streams within the park, including the Colewort Creek main tidal channel.

Chum Salmon (*Oncorhynchus keta*)
- Columbia River ESU Chum salmon (Endangered)

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 have been documented within the park in the Colewort Creek main tidal channel (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 Willamette River ESU, winter run Steelhead (Threatened)
- Oregon Coast ESU, winter run Steelhead (Species of Concern)
- 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 1992:65).

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 Colewort Creek main tidal channel 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 are not known to be present in the Lewis and Clark River, and are not present within Colewort Creek.

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. Long-term fish monitoring data indicates that Pacific Eulachon are not currently present within the Lewis and Clark River system or at the proposed project site.

Columbian white-tailed deer (*Odocileus verginianus leucurus*) (Endangered)
The Columbian white-tailed deer is the western-most subspecies of white-tailed deer. 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).

Long-term wildlife monitoring conducted by NPS staff has not produced any evidence that Columbian white-tailed deer have inhabited the Colewort Creek wetland at any time. Currently, the population of Columbian white-tailed deer that can be found in Clatsop County is small and isolated to riparian and island habitats directly on the Columbia River mainstem. There is no evidence available at this time that suggests that Columbian white-tailed deer are migrating to inhabit the riparian areas of tributaries to the Columbia River, such as the Lewis and Clark River.

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 Oregon coast by upwards of 80 percent. It is estimated to take 100 to 250 years to grow marbled murrelet nesting habitat (USFWS 1996)

The Colewort Creek project site and the Fort Clatsop unit of the park do not contain any marbled murrelet nests. Landscape alterations during the past century have prohibited the growth of dense forest stands. Conifer trees approximately 45 years old 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.

Western snowy (coastal) plover (*Charadrius alexandrinus nivosus*) (Threatened)
The Western snowy plover is a small shorebird that inhabits beaches along the Pacific coastline ranging from southern Washington to the Baja Peninsula in Mexico. Loss and degradation of habitat poses the primary threat to the Western snowy plover, and has been attributed to the significant decline in the plover population in recent decades. Plovers lay their eggs in shallow depressions in loose sand or soil with sparse vegetative cover. The introduction of European beachgrass has resulted in a decline of available plover habitat by reducing open areas. Human development has also reduced available plover habitat and increased the disturbance of nesting plovers (USFWS 2005).

Snowy plover habitat consists of relatively flat beach habitat with sparse vegetative cover. The Colewort Creek wetland does not contain such habitat. The entire site is

heavily vegetated with grasses, rushes and shrubs, and soils consist primarily of sandy silt loams. Wildlife monitoring has not shown any evidence of snowy plover presence at the site and the closest listed critical habitat is over 10 miles away. Therefore, the western snowy plover and its critical habitat will not be affected by the actions proposed for the Colewort Creek restoration project.

Short-tailed albatross (*Phoebastria albatrus*) (Endangered)
Short-tailed albatross are large pelagic birds with long life spans. The current population of short-tailed albatross existing throughout the world is estimated to be 1,200 individual birds. At one time, however, the short-tailed albatross ranged throughout most of the north Pacific Ocean and Bering Sea. These sea birds do not have a specifically identified critical habitat, though they are known to nest in on several Japanese and Taiwanese islands (USFWS 2000).

The short-tailed albatross is in danger of extinction due to its small population size, and limited number of breeding colonies. Natural environmental threats, longline fishing, and plastics pollution are also considered threats to the species' population recovery. (USFWS 2000). The Colewort Creek wetland does not exhibit characteristics of short-tailed albatross nesting habitat. Also, the project site is further inland than most short-tailed albatross are recorded as inhabiting. There have not been any sightings of short-tailed albatross at the project site to date.

Northern spotted owl (*Strix occidentalis caurina*) (Threatened)
Research indicates that historically, this owl species inhabited most of the forest areas throughout the entire western coast of the United States and British Columbia. However, loss and alteration of preferred nesting, roosting, and foraging habitat due to timber harvesting, land conversion, and increased competition with barred owls has drastically reduced northern spotted owl numbers and fragmented its historic range. Today, the majority of the remaining spotted owl population is isolated to the Olympic peninsula (USFWS 1992).

The preferred habitat of the northern spotted owl is a late seral forest stand with multi-layered canopies comprised of a variety of tree species of varying size and age that also contains both standing and fallen dead trees and open space among lower branches to allow flight under the canopy to aid hunting (USFWS 1992).The closest late seral forest stands are over 15 miles from the Colewort Creek project site. Wildlife surveys have not documented the presence of northern spotted owls within the Colewort Creek wetland or the Lewis and Clark National Historical Park.

Oregon silverspot butterfly (*Speyeria zerene hippolyta*) (Threatened)
Oregon silverspot butterflies are medium-sized orange and brown butterflies distinguished from other silverspot butterfly subspecies by their morphological

adaptations for survival in a persistently windy and foggy environment. The historic range of this silverspot subspecies extended from the coastline of southwestern Washington to northern California (USFWS 2001).

The primary limiting factor threatening this butterfly species is a limitation of suitable habitat. The specialized habitat was never widespread within the Oregon silverspot's geographical range. More recently however, preferred butterfly habitat has been utilized for residential and commercial development. Furthermore, introduction of non-native plants into the butterfly habitats also reduce habitat availability by out competing the low-lying early blue violet plants that are essential to the Oregon silverspot's survival (USFWS 2001). The Colewort Creek wetland does not contain the habitat characteristics needed by the Oregon silverspot butterfly. The site is densely vegetated with grasses, rushes and scrub shrub plants such as willows and alders. These plant species would out-compete the low-lying early blue violet needed for the butterfly's survival. Furthermore, wildlife and vegetation surveys of the Colewort Creek wetland have not recorded evidence of either the Oregon silverspot butterfly or the early blue violet.

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 Colewort Creek wetland include pasture grasses and rushes on the southern portion of the wetland, and vegetation native to tidal marsh on the northern portion of the property. Long-term vegetation monitoring conducted throughout the Colewort Creek wetland has not recorded the presence of Nelson's checker-mallow within the project site. Also, vegetation surveys conducted throughout the Lewis and Clark National Historical Park has not yielded evidence that this plant is present within park 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 Lewis and Clark National Historical Park, including the Colewort Creek main tidal channel.

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 will 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 Fort Clatsop unit, and are not anticipated to be found within the Colewort Creek wetland.

Several other species of concern were also evaluated for potential impacts resulting from project alternatives. Species of concern considered in this assessment include green sturgeon and Northern red-legged frog. Although these species may be present within the Colewort Creek wetland, the potential impacts to these species would be minor, and short-term. These species would also experience long-term benefits from restoration of the wetland habitat at Colewort Creek.

Fish and Wildlife (Non- T&E)

In its current state, the Colewort Creek wetland provides marginal habitat for wildlife including Roosevelt elk, amphibians, and a variety of bird species in the area south of the main tidal channel. The northern portion of the wetland complex provides moderate habitat for a variety of fish and water fowl.

Despite its altered state, the Colewort Creek wetland provides habitat for a variety of wildlife species. Inventories and on-site observations have documented a diverse array of mammals, birds, amphibians, reptiles and fish.

Mammals
The Roosevelt elk were an important source of food for the Lewis and Clark Expedition at Fort Clatsop. Elk populations in western Oregon were severely depleted by 1900, when the state began implementing active restoration and protection programs, and closed hunting seasons. Populations in western Oregon increased and hunting was reestablished in 1938. Oregon Department of Fish and Wildlife (ODFW) data indicate that elk populations in Clatsop County are stable in number. Elk pellet surveys and driving surveys have confirmed that elk returned to the 15 acres of former livestock pasture on the southern portion of the site after livestock were removed in 2006. Wetland areas also provide important elk habitat (NPS 2011:55). Other

mammals that may inhabit this wetland include raccoons, coyotes, weasels, black-tailed deer, beaver, river otters, mink, skunks, rabbits, muskrats, and bats.

Birds

A large number of birds and water fowl have been observed within the Colewort Creek wetland. Birds commonly observed at the Colewort Creek site include Virginia Rails, marsh wrens, kinglets, red wing black birds, bufflehead, mallards and kingfishers. Eagles and several species of hawks are also commonly observed along the Lewis and Clark River. A nesting pair of bald eagles is located across the Lewis and Clark River from the project, approximately 0.5 miles east of the project area.

Fish

Fish surveys conducted within the Colewort Creek main tidal channel have recorded multiple fish species inhabiting the site, especially following the 2007 restoration project. Fish species including starry flounder, large-mouth bass, banded killifish, three-spined stickleback, peamouth chub, Pacific staghorn sculpin, largescale sucker, northern pike minnow, American shad, black crappie, pumpkinseed sunfish, shiner perch, estuarine smelt, cottid, and several species of anadromous fish that are listed as threatened or endangered, have all been identified during fish presence surveys conducted at the project site.

Amphibians and Reptiles

Surveys conducted in 2002 and 2005 documented the presence of several species of amphibians and reptiles within the park. Amphibian species known to inhabit the Colewort Creek wetland include Northern red-legged frog, Pacific chorus frog, rough-skinned newt, Northwestern salamander, Dunn's salamander, Western red-backed salamander, and Ensatina. Invasive bullfrogs have also been identified within the Colewort Creek wetland. Reptiles that are known to inhabit the Fort Clatsop Unit include the Northern alligator lizard, Northwestern garter snake, and common garter snake (NPS 2011: 57).

Historic and Cultural Resources

The 125 acres surrounding the Fort replica is maintained as a cultural landscape by the NPS. The project site is located immediately to the southwest of the Fort replica. As a historic site, the primary cultural landscape resource is the reconstructed physical setting which provides an overall interpretive environment for the site. Primary features contributing to the cultural landscape include the clearing immediately around the fort, the spring site, Canoe Landing, view sheds from the fort site and the Canoe Landing, the trails linking these resources, and the forest defining/surrounding the development. All of these areas have been physically impacted and highly modified since the historic period. To address these impacts, NPS Management Policies call for the management of the landscape to reflect the scene that prevailed during the historic period. Park managers are thus compelled to recreate, to the extent possible, landscape

features, and plant and animal communities comparable to those found there in 1805-1806 as major restoration projects are completed, such as the proposed project at Colewort Creek (Deur 2008: 2). The Colewort Creek property was not part of the original Fort Clatsop Monument, but was acquired through a land purchase in 2006. As with all boundary modifications undertaken during and after the General Management Plan process, Colewort Creek was obtained to protect and enhance the natural and cultural resources at the site, and to present visitors with scenery comparable to that encountered by the Corps of Discovery.

Salmon and their coastal habitat were features described in the journals from the expedition. For example, described and eaten by members of the Lewis and Clark expedition, the Chinook salmon is spiritually and culturally prized among certain Native American tribes. Many tribes celebrate the first spring Chinook caught each year with "First Salmon Ceremonies". While salmon fishing is still important economically for many tribal communities, the Chinook harvest is typically the most valuable (National Research Council 1996).

Visitor Use and Experience

Lands and waters within the Fort Clatsop Unit of the Lewis and Clark National Historical Park are utilized mainly for preservation, recreation, education and scientific research. Fort Clatsop is open to the public year-round. Due to the nature of the park and its resources, visitors can experience the park by land or by water. Common activities available within the park include walking, biking, historical reenactments and exhibits, kayaking, and canoeing.

In 2011, construction of a trail (the lower South Slough Trail) was completed to the west of the project area. This trail affords visitors close-up views of the Colewort Creek wetland restoration site, and includes a boardwalk crossing the main channel of Colewort Creek approximately ½ mile upstream from the project area.

Immediately upstream from the Colewort Creek wetland on the Lewis and Clark River, the Netul Landing serves as a launch for non-motorized boats. The launch is part of the Lewis and Clark Columbia River Water Trail, a 146 mile stretch of water that follows the route taken by the Corps of Discovery on the lower Columbia River. Guided kayak and canoe tours are also available through the park.

The visitor center at Fort Clatsop marks the trailhead for the park's primary trail system, which includes the Fort to Sea Trail, (a 6.5 mile trail that runs from the park to Sunset Beach and Seaside), the South Slough Trail mentioned above, the Kwis Kwis Trail (a two mile loop constructed in 2011) and the Netul River Trail (a one mile trail along the river). These trails travel along the coastal streams, lakes, forests, wetlands, and dunes that were once traversed by Lewis and Clark.

The soundscape at the project site is impacted by the road traffic along Fort Clatsop Road and the nearby Astoria Regional Airport.

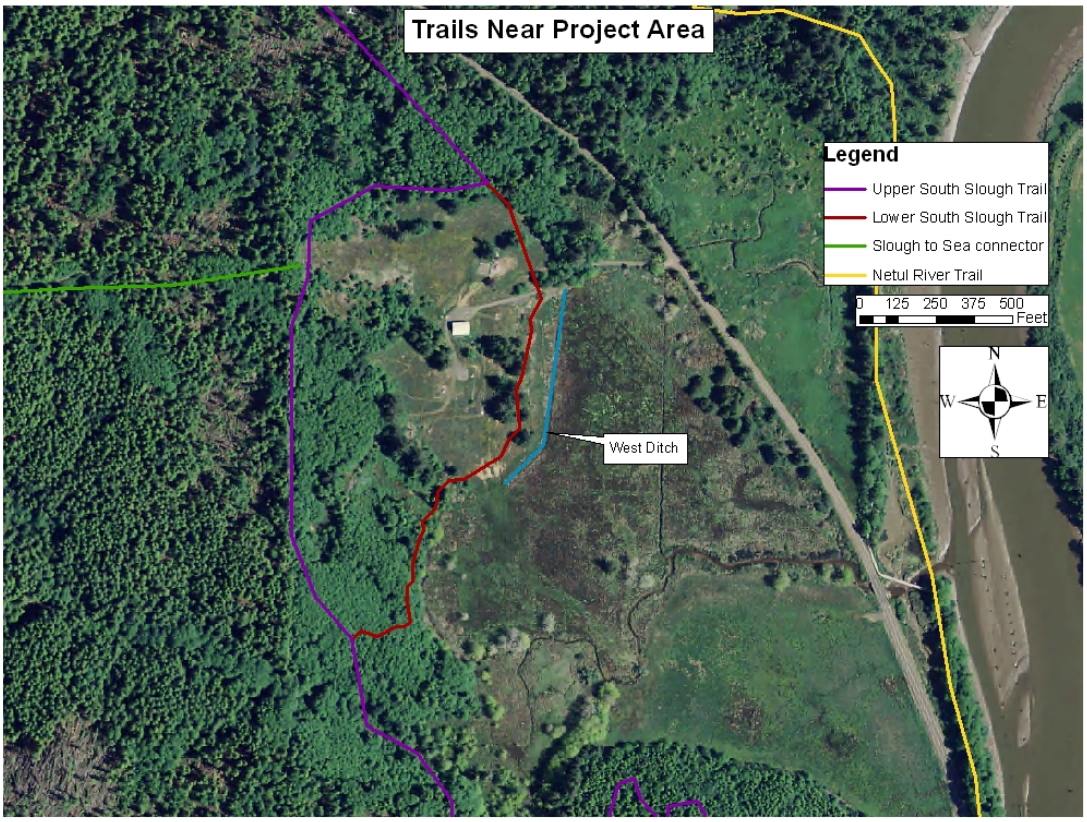

Figure 3-1. Park Trails Near the Colewort Creek Wetland Restoration Site

Human Health and Safety

The NPS is committed to providing appropriate, high quality opportunities for visitors to enjoy the park, while at the same time providing a safe and healthful environment for visitors and employees. The proposed alternatives could result in impacts to public and employee safety during construction and implementation.

While construction activities are occurring, heavy equipment may be on site along with other construction-related equipment. Because areas of the proposed construction site overlap recreational areas such as the lower South Slough Trail, extra precautions will have to be taken to ensure human health and safety are protected. Precautionary measures may include closing portions of the adjacent trails, and educating park visitors about the construction so that they are aware of potential safety hazards.

Land Use

Past land use practices have determined the patterns of development and landscape at the Lewis and Clark National Historical Park. The project site is located in unincorporated Clatsop County and surrounded by lands zoned as agricultural, forest, or low-density residential.

The Colewort Creek wetland has undergone significant modification since its historic tidal marsh condition due to a variety of land uses. Past land uses have included logging, grazing, and agricultural production. Early logging cleared the area now encompassed by first growth forests within the park, and opened up fields for agriculture. For much of the recent past, the predominant land use in the Fort Clatsop area was agriculture. The land was cleared and used for pastures and the cultivation of crops such as potatoes. Most of the original park lands reverted to forests following a brief agricultural period. The general pattern of development has resulted in second and third growth forests mixed with marginal wetlands (Henderson Land Services 2010: 1).

Today, land use within the park has transitioned from active agriculture and logging to recreational and educational activities. The entire project area being considered for this project lies within the NPS boundaries. Furthermore, all areas adjacent to the project site are also part of the park. A small portion of the Colewort Creek watershed is within industrial timber property. However, the actions being considered for this project will not impact this property at the stream headwaters.

Chapter 4: Environmental Consequences

This section describes the impacts that the proposed restoration alternatives are expected to have on the affected resources at the Colewort Creek site. Three alternatives were evaluated, the No Action alternative (Alternative 1), the Active Restoration approach (Alternative 2) and the Active Restoration and Enhancement approach (Alternative 3). 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 injury 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 3-Affected Environment, were evaluated for potential effects:

1. Hydrology
2. Geology and Soils
3. Water Quality
4. Air Quality
5. Vegetation
6. Threatened and Endangered Species
7. Fish and Wildlife (Non- T&E)
8. Historic and Cultural Resources
9. Visitor Use and Experience
10. Human Health and Safety
11. Land Use

Analysis Approach

The potential direct, indirect, and cumulative impacts of each alternative was analyzed for the restoration methods proposed. The resources expected to be affected by the proposed restoration alternatives are described in Chapter 3. Restoration actions and methods discussed in this environmental assessment are those currently approved and utilized by the Lewis and Clark National Historical Park.

Approach for Evaluating Alternatives

The impact analysis involved the following steps:

- Identifying the resource that could be affected.
- Identifying the cumulative effect, 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 mitigation measures that may be employed to offset or minimize potential adverse impacts.

The impact analyses were based on professional judgment using information provided by project designs, NPS 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 (40 CFR
1508.8). 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 Colewort Creek 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.

Cumulative Impacts: The CEQ regulations to implement NEPA require an assessment of cumulative 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 Fort Clatsop Unit of the Lewis and Clark National Historical Park, and the contribution of those actions on cumulative effects to the resource.

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.

Regulations and Policies—The Organic Act of 1916, NPS Management Policies (NPS 2006b), and NPS Reference Manual 77: National Resource Management Guidelines (NPS 1991) direct NPS managers to provide for the protection of park resources. These regulations and policies require NPS to protect and preserve geologic resources and processes.

Hydrology

Methodology

Two-dimensional modeling was utilized to compute water surface elevations and horizontal velocity components for free-flows from both within the Colewort Creek project area and the downstream tidal and upstream flow boundary locations.

Thresholds for Intensity, Duration and Type of Effect:

- **Negligible—** Very slight changes in surface hydrology. Impacts are barely detectable.

- **Minor—** Changes in surface water hydrology would be measurable, although the changes would likely be small and the effects would be localized. No mitigation measures would be necessary.

- **Moderate—** Changes in surface hydrology would be measurable and potentially long-term but would be relatively local. Mitigation measures would be necessary and would be effective.

- **Major—** Changes in surface hydrology would be measurable, long-term, and broad-scale. Mitigation measures would be necessary and their success would not be guaranteed.

Duration:

- **Short-Term—** Recovery in less than a year.

- **Long-Term—** Permanent post-construction impact.

Alternative 1- 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 Colewort Creek wetland. The southern portion of the wetland complex would continue to be isolated from the Lewis and Clark River, and would therefore not provide additional water storage capacity or pollutant filtration. The channel networks in the wetland area to the north of the main tidal channel would remain disconnected and linear, providing a diminished quality habitat for salmonids.

Cumulative Impacts: The No Action alternative would not create conditions that would alter the current hydraulic and hydrologic conditions at Colewort Creek.

Conclusion: This alternative would have no effect on hydrology because it would not change the existing surface water hydrology or water storage capacity.

Alternative 2- Active Restoration of the Southern Portion of the Wetland

Impact Analysis: The effects of this alternative would not only impact the site itself, but also the Lewis and Clark River system. Alternative 2 would restore hydrologic connectivity between the southern portion of the Colewort Creek wetland and the Lewis and Clark River. Reestablishing surface connectivity with upstream seeps and springs would recreate the ecological complexity of the historic tidal wetland. This alternative would also increase water storage capacity of the Lewis and Clark River floodplain, and rehabilitate the wetland filtration functions of Colewort Creek for the larger watershed system.

Cumulative Impacts: Implementation of Alternative 2, in conjunction with other restoration projects within the Lewis and Clark River basin, would provide minor, long- term positive effects for the River. It would also have a major, long-term positive effect on the site itself from hydrologic reconnection and rehabilitation of the historic wetland functions.

Conclusion: When compared with current condition, Alternative 2 would have minor long-term positive effects to surface hydrology of the Lewis and Clark River, and major long-term positive effects on the hydrology of the project site.

Alternative 3- Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Wetland

Impact Analysis: Like Alternative 2, this alternative will restore hydrologic connectivity between the southern portion of the Colewort Creek wetland and the tidal flows of the Lewis and Clark River, in addition to enhancing the connectivity and wetland functions of the northern wetland area. Completing additional enhancement work will further expand the water storage capacity of the floodplain, and provide greater improvement of wetland filtration functions.

Cumulative Impacts: Alternative 3 will provide minor, long-term positive effects on the hydrology of the Lewis and Clark River through greater storage capacity, and improved wetland filtration functions. It will also create a major, long-term positive impact within the wetland resulting from improved hydrologic connection and tidal inundation throughout the entire project site.

Conclusion: Implementation of Alternative 3 will provide major long-term hydrologic improvements to the Colewort Creek wetland. This alternative will also have minor long-term benefits to the hydrology of the larger Lewis and Clark River system.

Geology and Soils

Methodology

Recent field surveys conducted by the hired project engineer, and 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.

Thresholds for Intensity, Duration, and Type of Effect:

- **Negligible—** Geologic and soil resources would not be affected or effects would be below or at the lower levels of detection. Any effects to the geology, geomorphology or soil characteristics of the site would be slight and no long-term effects would occur.

- **Minor—** The effects to geologic and soil resources would be detectable. Effects to grade, soil erosion potential, or productivity would be small, as would be the area affected (< 1 acre). If mitigation were needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.

- **Moderate—** The effect on landscape morphology, and soil erosion potential or productivity would be readily apparent and likely long-term. The resulting change to the geology and soil character 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—** The effect on landscape morphology and soil productivity would be readily apparent, long-term, and substantially change the character of the wetland 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—** Lasting only during the construction period or no longer than the first growing season thereafter.

- **Long-Term—** A permanent post-construction impact.

Alternative 1- No Action

Impact Analysis: The No Action alternative does not entail any changes to the current natural functions, marsh plain elevation, or channel grades of the Colewort Creek wetland. This alternative would not affect the existing geology or soils at the

site. The southern portion of the Colewort Creek wetland 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. However, the No Action alternative would perpetuate the artificial geology of both the southern wetland area, and the northern ditch network, and therefore would not meet the NPS cultural and natural resources restoration goals.

Cumulative Impacts: The No Action alternative would continue to allow downcutting from the linear irrigation channels.

Conclusion: With the No Action alternative there would be negligible negative long-term effects on geology and soils due to erosion and downcutting from the linear irrigation channels.

Alternative 2- Active Restoration of the Southern Portion of the Wetland without Additional Enhancement

Impact Analysis: This alternative involves excavating 3,500 linear feet of tidal channels and removing historic fill from approximately 3 acres south of the main tidal channel to restore the historic marsh plain elevation. Excavation would reconnect this portion of the Colewort Creek site to riverine and tidal flows, creating the potential for dynamic alteration of design 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 affects during construction would be minor or negligible, and would be mitigated by installing erosion control methods, excavating the tidal channels during the dry season, and at low tide, and by reseeding and planting disturbed areas of the project site following construction activities.

Cumulative Impacts: Alternative 2 would expose the southern portion of the Colewort Creek site to tidal inundation, which would result in major, long-term beneficial alterations of the site's current landscape morphology by reestablishing historic conditions that were found on site prior to the placement of fill material. Soil productivity would also be improved through enhanced nutrient exchange.

Conclusion: Alternative 2 would have major, long-term positive effects on geology, landscape morphology and soil productivity. Potential long-term adverse effects would be mitigated by placement of large wood and bank revegetation. Short-term adverse affects during construction would be minor or negligible and would be mitigated through erosion control methods.

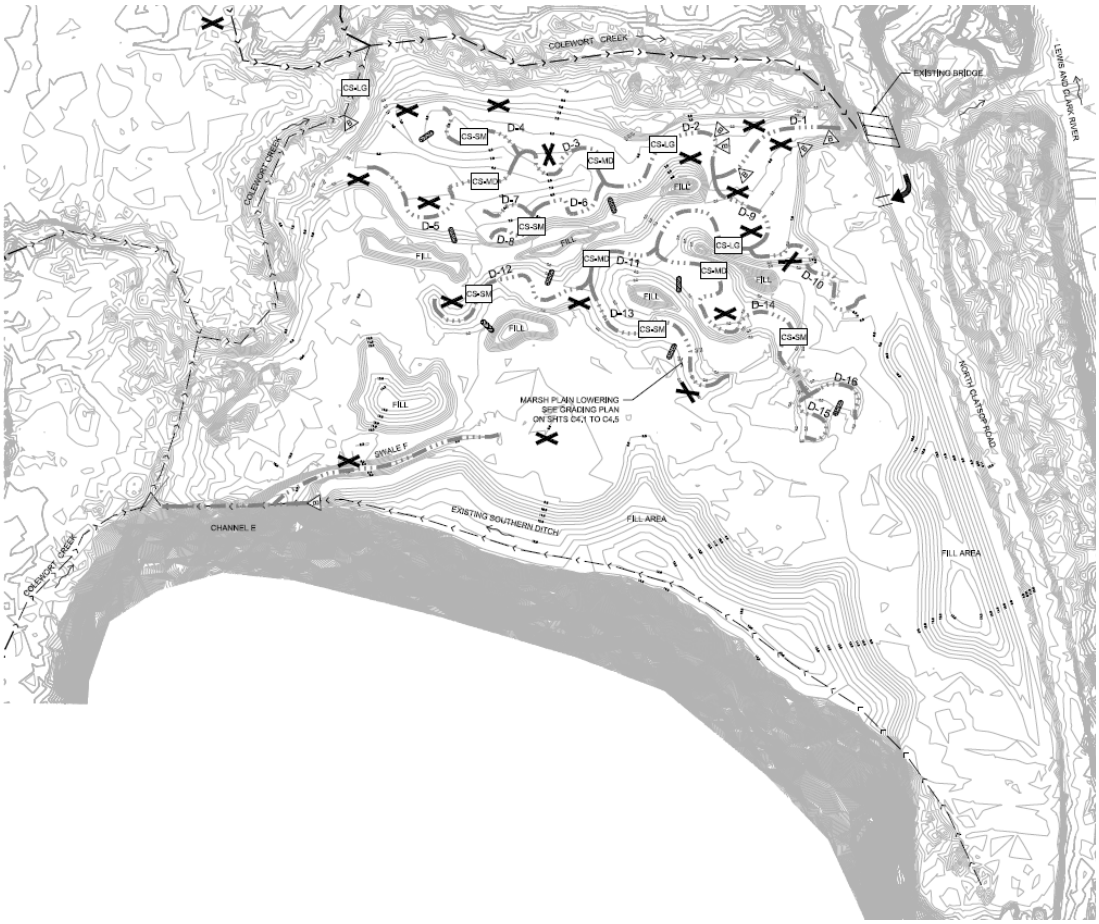

Figure 4-1. Project Design for Excavated Channels and Creation of Topographic Diversity in the Southern Portion of the Colewort Creek Restoration Site

Alternative 3- Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Wetland

Impact Analysis: Alternative 3 will also involve excavation to reconnect the southern wetland area and create more in-stream habitat, in addition to conducting excavation work and invasive plant removal within the northern portion of the wetland to enhance habitat conditions where tidal connection has already been restored. Enhancing this northern wetland area will create more natural channel characteristics, further improve tidal connection, and increase nutrient exchange throughout the entire 44-acre wetland. It will also increase the habitat value by removing invasive plant species and installing large wood for in-stream complexity. Like Alternative 2, this alternative has the potential to create grading changes throughout the project site. Again, the potential for adverse landscape morphology effects and soil erosion will be reduced through methods to stabilize the excavated channels such as strategically placing large woody debris in areas with increased tidal action, and vegetating stream banks to stabilize the soils. Short-term adverse affects to geology and soils during construction will be minor or negligible and will be mitigated by installing erosion control methods, and excavating the tidal channels at low tide, during the dry season.

Cumulative Impacts: Cumulative impacts from Alternative 3 will result in major, long-term positive effects to geology and soil productivity throughout the entire Colewort Creek wetland from increased tidal connection and nutrient exchange.

Conclusion: This alternative will result in major long-term positive effects on geology and soil conditions by reestablishing more natural landscape morphology and increasing nutrient exchange. Potential moderate adverse effects can be mitigated through the implementation of erosion control methods and BMPs.

Water Quality

Methodology

Site visits and water quality monitoring data collected at the site since 2007 were utilized to estimate the effects of the proposed alternatives on surface water quality.

Thresholds for Intensity, Duration, and Type of Effect:

- **Negligible—** Very slight changes in surface water quality. Impacts barely detectable.

- **Minor—** Changes in surface water quality would be measurable, although the changes would likely be small and the effects would be localized. No mitigation measures would be necessary.

- **Moderate—** Changes in surface water quality would be measurable and potentially long-term but would be relatively local. Mitigation measures would be necessary and would be effective.

- **Major—** Changes in surface water quality would be measurable, long-term, and broad-scale. Mitigation measures would be necessary and their success would not be guaranteed.

Duration:

- **Short-Term—** Recovery in less than a year.

- **Long-Term—** Permanent post-construction impact.

Alternative 1- 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 discharged from Colewort Creek. Surface runoff would continue to flow through the remnant ditch systems transecting the Colewort Creek wetland to the main tidal channel, and out to the Lewis and Clark River.

Cumulative Impacts: The No Action alternative would not create conditions that will alter the current water quality at Colewort Creek.

Conclusion: This alternative would have no effect on the water quality of the Colewort Creek wetland and the adjacent Lewis and Clark River because drainage patterns and tidal influx would not be changed.

Alternative 2- Active Restoration of the Southern Portion of the Wetland without Additional Enhancement

Impact Analysis: Alternative 2 project designs recommend utilizing fill material excavated from the wetland to fill the existing ditches along the southern and eastern perimeters of the wetland. By doing this, it would both create topographic diversity, and prevent any possibility for fish stranding in the shallow, turbid ditches that border the southern property. Also, floodplain wetlands provide water quality benefits by reducing sediment, and potentially harmful nutrients and pesticides from stormwater runoff. Therefore, restoring the wetland functions at Colewort Creek does have the potential to have long-term positive impacts on water quality by increasing the pollutant filtration component of the floodplain. 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.

Cumulative Impacts: The substantial mitigative measures associated with this alternative would provide minor long-term benefits from increased filtering capabilities within the Lewis and Clark River floodplain.

Conclusion: When compared with current conditions, this alternative, with the recommended mitigation measures, would have minor long-term positive effects to surface water quality.

Alternative 3- Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Wetland

Impact Analysis: Since Alternative 3 incorporates the activities of Alternative 2, the same benefits and potential impacts will apply to this alternative as well. However, enhancing the habitat on the northern portion of the wetland increases the potential benefits of this project by increasing the hydrologic connection of the northern site. Also, removal of invasive plants and replacing them with native wetland vegetation will enhance the filtration potential within the wetland, thereby providing additional reduction in potentially harmful pollutants entering the Lewis and Clark River system through stormwater runoff.

Cumulative Impacts: Improvements to wetland function that will result from the implementation of Alternative 3 will provide minor long-term benefits to the Lewis and Clark River system from increased filtering capabilities throughout the entire wetland area and invasive species removal.

Conclusion: Implementation of Alternative 3 will have minor long-term positive effects on water quality in the Lewis and Clark River system.

Air Quality

Methodology

Familiarity of air quality classification at the park, as well as past experience with similar restoration projects within the park boundaries were used to determine potential effects of proposed alternatives on air quality at the Colewort Creek site, and the surrounding area.

Thresholds for Intensity, Duration and Type of Effect:

- **Negligible –** There is no perceptible impact to air quality.

- **Minor –** Exhaust from excavators and other heavy equipment, and additional dust in the air is perceptible for brief periods during project construction. Mitigation is able to alleviate impacts.

- **Moderate –** Exhaust from excavators and other heavy equipment, and additional dust is perceptible for extended periods during project construction. Mitigation is able to alleviate impacts.

- **Major –** Exhaust from excavators and other heavy equipment, and additional dust is easily detectible for extended periods during project construction, and possibly after construction is complete. Mitigation is unable to alleviate the impacts.

Duration:

- **Short-term –** The air quality impacts from the proposed actions are corrected immediately following the cessation of construction activities utilizing large equipment.

- **Long-term –** The air quality impacts from the proposed actions remain detectible for more than one month following the cessation of construction activities utilizing large equipment.

Alternative 1- No Action

Impact Analysis: This alternative would not involve utilizing heavy equipment to implement restoration work at the Colewort Creek wetland. There would be no negative impacts to existing air quality from the No Action alternative.

Cumulative Impacts: Implementation of Alternative 1 would not result in perceptible cumulative impacts to air quality at the project site, or surrounding areas.

Conclusion: Alternative 1 would not have effects on air quality.

Alternative 2- Active Restoration of the Southern Portion of the Wetland without Additional Enhancement

Impact Analysis: Implementation of Alternative 2 would involve actions that may impact local air quality. Heavy equipment such as dump trucks and excavators used during the implementation of restoration actions would likely produce additional exhaust that could result in reduced air quality at the project site and possibly areas immediately surrounding the wetland area. Construction activities involving excavation and other "earthwork" may generate additional dust particulates into the air. These impacts would be minor and would last only a short duration when the machines are running.

Cumulative Impacts: Impacts to air quality resulting from Alternative 2 restoration activities would be short-term and minor, and not likely contribute to cumulative impacts on air quality.

Conclusion: Restoration actions associated with Alternative 2 could result in minor adverse impacts to air quality through the generation of dust and additional exhaust. These impacts would generally be confined to the project site, or possibly the areas immediately adjacent to the project site through the use of BMPs, and would only be short-term.

Alternative 3- Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Wetland

Impact Analysis: Similar to Alternative 2, restoration actions associated with Alternative 3 will involve the use of heavy equipment for implementation. Localized impacts to air quality could occur from heavy equipment use and additional dust in the air during construction of Alternative 3 restoration actions. Impacts to air quality will be minor and only occur during the active construction period.

Cumulative Impacts: It is unlikely that Alternative 3 will result in cumulative adverse impacts to local air quality.

Conclusion: Alternative 3 restoration actions could result in short-term, minor impacts to air quality resulting from additional exhaust from heavy equipment. Any potential impairment will likely be confined to the project site.

Vegetation

Methodology

Multiple site visits, vegetation community maps and the professional knowledge of the NPS staff were used to determine potential effects of proposed alternatives at the Colewort Creek site.

Thresholds for Intensity, Duration and Type of Effect:

- **Negligible –** Direct or indirect impacts would have perceptible, but small changes in the size, integrity, or continuity of vegetation at the site.

- **Minor –** Disturbance of vegetation would be measurable or perceptible but limited in size to less than 1 acre. The overall viability of plant communities would not be affected and would recover. Introduction of exotic plants would be limited to those species already established at the site.

- **Moderate –** Disturbance of 1 to 5 acres of vegetation would occur. Impacts would cause a change in the plant communities (e.g. abundance, distribution, quantity, or quality), but would remain localized. This may result in the introduction of non-aggressive exotic plant species not previously established in the park.

- **Major –** Disturbance of more than 5 acres of vegetation or any disturbance to federally listed plant species would occur. This alternative could also result in the introduction of aggressive exotic plant species not already established in the park.

Duration:

- **Short-term –** The physical impact from the proposed actions would require less than one growing season for the full recovery of plant communities.

- **Long-term –** The physical impact from the proposed actions would require more than one growing season for the full recovery of plant communities

Alternative 1- No Action

Impact Analysis: Immediate removal of invasive species would not be conducted under this alternative. There would be negligible negative impacts to existing vegetation, and no change in extent or competition at this time.

Cumulative Impacts: This alternative would result in moderate short-term negative impacts by allowing invasive vegetation to continue to thrive within the Colewort Creek wetland.

Conclusion: Under Alternative 1, invasive reed canary would continue to expand without treatment, leading to minor short-term negative impacts on existing vegetation from the increase in the extent of reed canary.

Alternative 2- Active Restoration of the Southern Portion of the Wetland without Additional Enhancement

Impact Analysis: The Alternative 2 project design would significantly improve existing vegetation conditions within the southern portion of the Colewort Creek site. Reconnecting the wetland area with tidal inundation would recreate conditions conducive for the cultivation of emergent native wetland plants. To better ensure that the disturbed areas of the project site are revegetated with beneficial plant species, the entire 15 acre area will be replanted with native wetland, riparian and upland vegetation.

Cumulative Impacts: This alternative would result in major long-term benefits to vegetation within the southern portion of the Colewort Creek wetland by restoring conditions that promote tidal wetland vegetation, and replanting the site with native plant species. Actions completed under this alternative would not improve vegetation conditions within the northern portion of Colewort Creek, including the presence of invasive reed canary grass.

Conclusion: Alternative 2 would have major long-term positive effects on the vegetative communities of the Colewort Creek site south of the main tidal channel. Vegetation conditions in the northern wetland area would remain unchanged.

Alternative 3- Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Wetland

Impact Analysis: Similar to Alternative 2, this alternative will allow for considerable improvements to the vegetative communities of the Colewort Creek wetland. In addition to reconnecting the southern portion of the wetland to tidal flows, Alternative 3 will create more connection in the northern portion of the wetland, and will remove invasive reed canary grass from the wetland complex. Enhanced species diversity will be encouraged by hydrologic reconnection and planting of native species on a total of 19 acres throughout the restored areas of the wetland.

Cumulative Impacts: Alternative 3 will result in major long-term benefits to vegetation within the Colewort Creek wetland by restoring conditions that promote tidal wetland vegetation, removing invasive plant species, and revegetating the site with native varieties of plants.

Conclusion: This alternative will have major long-term positive effects on vegetation throughout the entire Colewort Creek wetland complex.

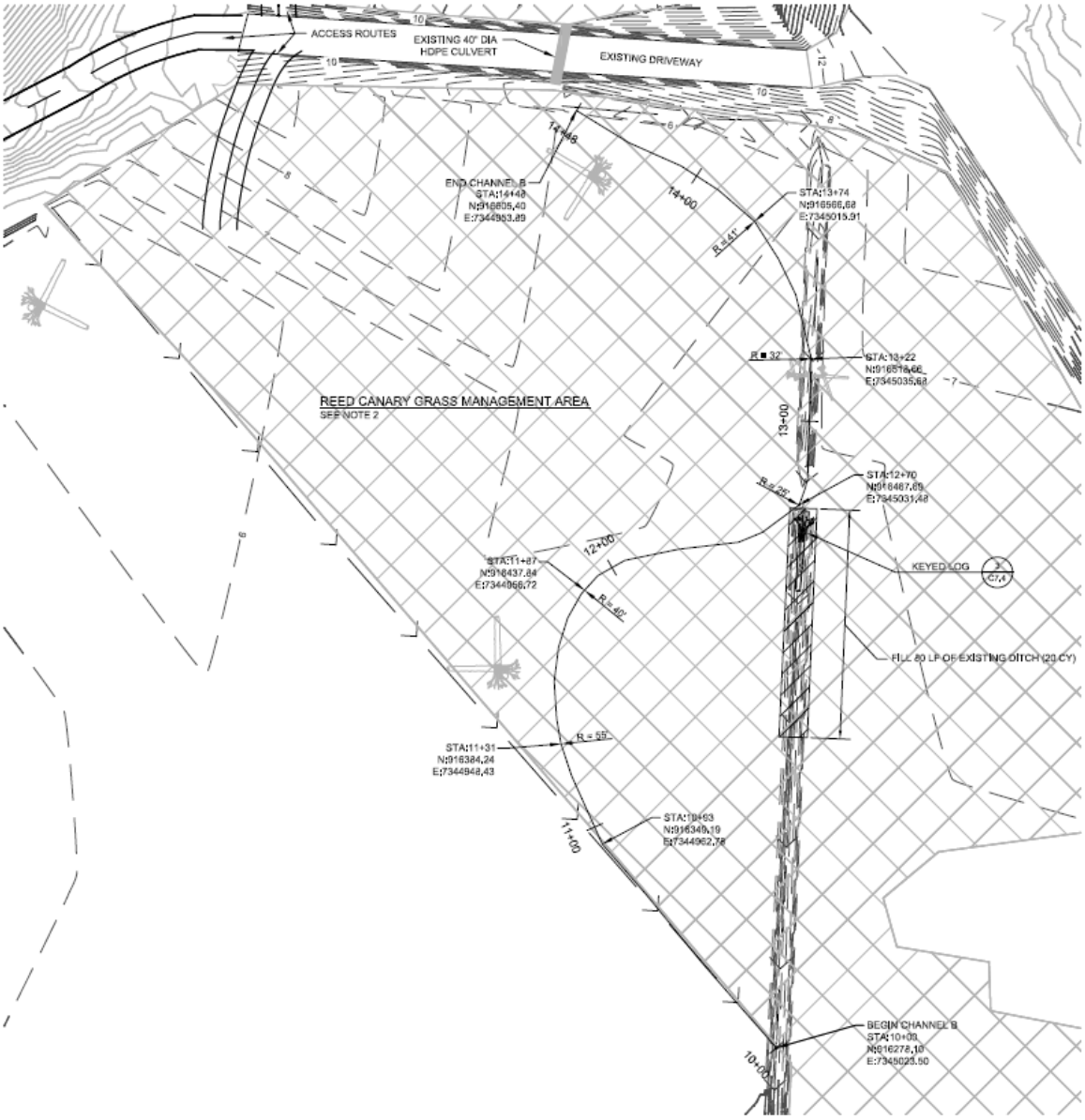

Figure 4-2. Project Design for Management of Reed Canary Grass Area

Threatened and Endangered Species

Methodology

On-site fish presence data collected between 2007 and 2011 within the Colewort Creek main tidal channel, as well as fish presence monitoring data from proximate tidal wetlands, the mainstem of the Lewis and Clark River, and available research on the Columbia River estuary were used to estimate the effects of the proposed actions on threatened and endangered species. Fish presence surveys from the South Clatsop Slough Restoration site indicated a dramatic increase in the number of juvenile salmonids utilizing the habitat after the bridge installation was completed. Not only did the monitoring data reveal a ten-fold increase in the number of individual salmonids surveyed, salmonid species diversity also increased from two species to five species present. Even greater salmonid usage of the Colewort Creek site is expected following the completion of this restoration project.

Thresholds for Intensity, Duration, and Type of Impact:

- **Negligible—** Threatened and endangered species would not be affected or the effects would be at or below the level of detection, would be short-term, and changes would be so slight that they would not be of any measurable or perceptible consequence to the wildlife species' population.

- **Minor—** Disturbance of native terrestrial and/or aquatic habitat for threatened and endangered species would be limited to 1 acre or less for terrestrial communities and to highly localized areas along length of Colewort Creek.

- **Moderate—** Disturbance of regionally typical native terrestrial and/or aquatic habitat for threatened and endangered species would occur. The area of disturbance would be from over 1 acre to 5 acres of terrestrial habitat and the localized areas within the wetland complex or along the length of Colewort Creek.

- **Major—** Disturbance of more than 5 acres of regionally typical terrestrial habitat for threatened and endangered species would occur. Disturbance would occur within the Colewort Creek wetland and a measurable portion of the Colewort Creek system, and possibly localized areas of the Lewis and Clark River.

Duration:

- **Short-Term—** Complete disturbance recovery in less than 5 years.

- **Long-Term—** Disturbance recovery requiring more than 5 years to return to pre-disturbance levels.

Alternative 1- No Action

Impact Analysis: Under the No Action alternative, conditions of the existing wetland would remain unchanged. No increase of off-channel salmonid refugia would be reestablished, and therefore the requirements of the 2008 Bi-Op would not be met.

Cumulative Impacts: This alternative would not contribute to other efforts to recover threatened and endangered salmonid populations in the lower Columbia River basin.

Conclusion: The No Action alternative would result in no effect to threatened and endangered species populations in the lower Columbia River basin because there would be no increase in off-channel salmonid refugia.

Alternative 2- Active Restoration of the Southern Portion of the Wetland without Additional Enhancement

Impact Analysis: Activities associated with Alternative 2 would involve restoring approximately 15 acres of off-channel juvenile salmonids habitat in the lower Columbia River estuary. Off-channel habitat would be enhanced by installation of large woody debris to provide in-stream complexity and cover from predation. Wetland and riparian plantings would provide shade cover and potential for inputs of macrodetritus. Minor short- term adverse impacts during construction would be mitigated using soil plugs, erosion control methods and revegetating disturbed areas of the site.

Cumulative Impacts: Alternative 2 would result in major long- term beneficial impacts to threatened and endangered species as a result of increased off-channel habitat for salmonids. However, limiting factors for salmon such as lack of channel complexity would not be addressed in the wetland north of the main tidal channel. Potential minor, short-term adverse effects would be mitigated by adhering to recommendations provided by the ODFW and other regulatory agencies.

Conclusion: Alternative 2 would result in major long- term positive effects for threatened and endangered species. Minor short-term negative effects would be mitigated to minimize stress to threatened and endangered species.

Alternative 3- Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Wetland

Impact Analysis: Like Alternative 2, this potential alternative will restore tidal connection to the southern portion of Colewort Creek and create additional in-stream habitat for threatened and endangered species of salmon. However, Alternative 3 will have the greatest benefit to T&E species by also improving the existing habitat north

of the Colewort Creek main tidal channel. Increasing channel complexity and providing protective cover for salmon in addition to creating off-channel habitat will provide the greatest long-term, positive impact to threatened and endangered salmon. This alternative is also the most consistent with the requirements of the 2008 Bi-Op.

Cumulative Impacts: Implementation of Alternative 3 will have major long-term positive effects on several T&E species of salmon. Together, the methods proposed with this alternative will address several key limiting factors to salmonids such as lack of off-channel habitat, lack of in-stream complexity, elevated water temperature and degraded riparian habitat. Potential minor short-term adverse effects will be mitigated through adherence to in-water work recommendations provided by regulatory agencies.

Conclusion: Alternative 3 will result in major long-term positive effects for T&E species. This alternative will create the most beneficial impacts to salmon by addressing the most limiting factors possible with the resources available at this time. Minor short-term adverse impacts can be mitigated to minimize stress to T&E species, and all wildlife inhabiting the Colewort Creek wetland.

Fish and Wildlife (Non- T&E)

Methodology

On-site visits, on-going research, and knowledge and technical expertise by Park staff were used to estimate the effects of the proposed actions in the various alternatives.

Thresholds for Intensity, Duration, and Type of Impact:

- **Negligible—** Wildlife would not be affected, or the effects would be at or below the level of detection, would be short-term, and the changes would be so slight that they would not be of any measurable or perceptible consequence to the wildlife species' population.

- **Minor—** Disturbance of native terrestrial and/or aquatic wildlife habitat would be limited to 1 acre or less for terrestrial communities and to highly localized areas along the length of Colewort Creek.

- **Moderate—** Disturbance of regionally typical native terrestrial and/or aquatic wildlife habitat would occur. The area of disturbance would be from over 1 acre to 5 acres of terrestrial habitat and the localized areas within the Colewort Creek wetland.

- **Major—** Disturbance of more than 5 acres of regionally typical terrestrial wildlife habitat. Disturbance will encompass both the Colewort Creek wetland and a measurable portion of Colewort Creek itself.

Duration:

- **Short-Term—** Complete disturbance recovery in less than 5 years.

- **Long-Term**— Disturbance recovery requiring more than five years to return to pre-disturbance levels.

Alternative Action 1- No Action

Impact Analysis: The No Action alternative leaves the existing wetland unchanged. Limited habitat value of the isolated wetland area south of the main tidal channel would persist. The northern wetland's tidal network would not benefit from enhanced habitat features such as large woody debris and sinuous tidal channel networks.

Cumulative Impacts: This alternative would not change the habitat available to fish and wildlife.

Conclusion: Alternative 1 would have no effects on fish and wildlife. While the northern section would continue to recover from its use as pasture, increases in the extent of reed canary grass would decrease the habit quality of the site.

Alternative 2- Active Restoration of the Southern Portion of the Wetland without Additional Enhancement

Impact Analysis: Activities associated with Alternative 2 entail actively restoring 15 acres of estuarine wetland habitat. 3,500 feet of tidal channels would be recreated for habitat, and 3 acres of the existing wetland surface would be regraded to mimic historic marsh plain elevations. Excavated material 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 Roosevelt elk use this wetland area. It is likely that conversion of the southern pasture into 3 acres of tidally influenced wetlands will result in reduced use of the new marsh plain by elk in the long term. This will be balanced by improved native vegetation for future browsing on the restored upland and hummock areas. Impacts to elk will also be moderated by the fact that the project area was not historically elk habitat due to the presence of grazing livestock; only after livestock were removed in 2006 have elk used the site. Minor short-term effects may occur due to displacement of wildlife species such as mammals, birds, and amphibians during the period of construction and revegetation.

Cumulative Impacts: The cumulative effect of this alternative would result in major long-term habitat benefits for a variety of terrestrial and aquatic species at Colewort Creek. It may also result in minor short-term adverse effects due to wildlife displacement during construction.

Conclusion: This active restoration alternative would have major, long-term positive impacts for wetland dependant wildlife at Colewort Creek, and minor, short-term negative effects on terrestrial during construction.

Alternative 3- Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Wetland

Impact Analysis: Alternative 3 will include the restoration activities, and therefore the benefits involved with Alternative 2, and will also entail expanding the existing tidal network north of the main tidal channel by over one thousand linear feet. The northern tidal channel network would be further improved by creating sinuous branches and installing large wood for protective cover. The potential for short-term wildlife displacement would be greater with this alternative, but can be mitigated by performing the surface construction during the late summer when birds have completed their nesting cycles. Precautionary measures such as completing in-water work during the period recommended by the ODFW will further ensure that the least amount of aquatic wildlife will be displaced. Sweeps of the wetland to clear out amphibians and other terrestrial fauna will also help lessen the potential for adverse impacts.

Cumulative Impacts: The cumulative impact of implementing Alternative 3 will result in a higher quality wetland habitat that will have major long-term benefits for aquatic and terrestrial wildlife throughout the entire Colewort Creek wetland. Disturbances to the wildlife during construction will be mitigated, but will still result in short-term displacement.

Conclusion: Alternative 3 will have major long-term benefits for wetland dependant fish and wildlife at Colewort Creek, and the adjacent areas of the Lewis and Clark River. Minor short-term negative effects may also occur during the construction period.

Historic and Cultural Resources

Methodology

As required under Section 106 of the National Historic Preservation Act (NHPA) process, the NPS conducted an archeological study of the Area of Potential Effects (APE) of the Colewort Creek wetland in May 2012 (O'Rourke and Stokeld 2012). The survey included a surface examination and 39 shovel probes measuring 40 cm in diameter and at a minimum depth of 50cm. One wire nail and one horseshoe were observed but were not judged to be historical. An archeological survey for the lower South Slough Trail, to the west side of the project area, was conducted in 2011, which included a surface examination and six shovel probes measuring 40cm in diameter and at a minimum depth of 50cm (O'Rourke 2011). One wire nail and one wire nail/ wire fragment were observed within two of the shovel probes, but were not judged to be historical because the nails are still being manufactured and their age could not be determined. No known structures exist in the project area, although a barn and a former house site are just outside of the project area. Based on preliminary research of aerial photos from the 1960s and historic topographic maps, the NPS does not anticipate having adverse effects to cultural resources.

Thresholds for Intensity, Duration, and Type of Impact:

- **Negligible —** Impact is at the lowest levels of detection, barely perceptible, and not measurable.

- **Minor - Adverse**: Disturbance of archeological site(s) and/or alteration of a pattern(s) or feature(s) of the landscape results in little, if any, loss of integrity. The determination of archeological site(s) would result from project implementation. For cultural landscapes, landscape patterns and features preserved in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes. The determination of effect for Section 106 would be *no adverse effect*.

- **Moderate - Adverse**: Disturbance of archeological sites(s) and/or alteration of a pattern(s) or feature(s) of the landscape would result in an overall loss of integrity. The determination for Section 106 would be adverse effect. A memorandum of agreement (MOA) is executed among the NPS and applicable state or tribal historic preservation officer and, if necessary, the Advisory Council on Historic Preservation, in accordance with 36CFR 800.6(b). Measures identified in the MOA to minimize or mitigate adverse impacts reduce the intensity of impact under NEPA from major to moderate.

Beneficial: Stabilization of a site and/or rehabilitation of a landscape or its patterns and features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. The determination of effect for Section 106 would be *no adverse effect*.

- **Major - Adverse**: Disturbance of archeological site(s) and/or alteration of a pattern(s) or feature(s) of the landscape would result in an overall loss of integrity. The determination of effect for Section 106 would be *adverse effect*. Measures to minimize or mitigate adverse impacts cannot be agreed upon and the NPS and applicable state or tribal historic preservation officer, and/or Advisory council, are unable to negotiate and execute a memorandum of agreement in accordance with 36CFR800.6(b).

Beneficial: Active intervention to preserve a site and/or restore a landscape or its patterns and features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. The determination of effect for Section 106 would be *no adverse effect*.

Duration:

- **Short-Term —** Disturbance only during construction activities.

- **Long-Term —** Disturbance lasting longer than construction activities.

Alternative 1- No Action

Impact Analysis: Under this alternative, activities that are currently taking place at the Colewort Creek site would continue into the future. Although these actions would not adversely affect the historic and cultural resources at Colewort Creek, they also would not satisfy the goals set in the Park's General Management Plan to recreate the historic estuarine setting of Fort Clatsop.

Cumulative Impacts: The No Action alternative would not impact the historic and cultural resources at Colewort Creek. There would be no disturbance of archeological sites or alterations to landscape features. There would also be no rehabilitation of the landscape features, as is recommended in the Park's General Management Plan.

Conclusions: By maintaining the current landscape, this alternative would have no impacts on historic and cultural resources. The site would continue in a landscape different from the scene present at the time of the Corps of Discovery.

Alternative 2- Active Restoration of the Southern Portion of the Wetland without Additional Enhancement

Impact Analysis: No known historical properties, cultural features, artifacts, or modern refuse exist on the project site. Archival research conducted in the past has not identified any historical structures within the Colewort Creek project area (Horton 2010, O'Rourke 2011, O'Rourke and Stokeld 2012). The NPS will implement the recommended guidance of the State and Tribal Historical Preservation Offices (SHPO) for archeological monitoring during ground disturbing activities. Excavations on the southern portion of the site will occur predominately in the former fill spoils.

Cumulative Impacts: The cumulative effect of this alternative would create moderate long-term beneficial impacts at the proposed site due to rehabilitation of natural features in the southern portion of the Colewort Creek wetland. Measures would be in place to avoid impairments that might occur due to discovery of anthropogenic materials during the implementation of Alternative 2.

Conclusions: This alternative would have moderate long-term positive impacts on the historic and cultural resources in the Colewort Creek wetland south of the main tidal channel.

Alternative 3- Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Wetland

Impact Analysis: No known historical properties, cultural features, artifacts, or modern refuse exist on the project site. Archival research conducted in the past has not located any historic structures within the Colewort Creek project area (Horton 2012, O'Rourke 2011, O'Rourke and Stokeld 2012). As with Alternative 2, implementation of Alternative 3 will implement the recommended guidance of the SHPO for archeological monitoring during ground disturbing activities such as excavation and clearing. Completing the additional enhancement activities in the wetland north of the main tidal channel does not pose any increased threat to cultural features or artifacts. It will however, help to recreate the historic landscape features by providing a more natural channel network, and removing invasive plant species that would not have been present in the wetland area during the expedition of Lewis and Clark.

Cumulative Impacts: Alternative 3 will not adversely impact the historic and cultural features of this property. Standard operating procedures will also be followed during implementation to address any unexpected archeological findings. This alternative is consistent with the recommendations of the General Management Plan to restore and rehabilitate historic features within the park.

Conclusions: This alternative will have moderate long-term beneficial impacts to the Colewort Creek wetland. Alternative 3 is the most consistent with the recommendations of the General Management Plan, by both restoring the southern wetland area to natural tidal conditions, and by enhancing the channel networks in the northern wetland area to achieve more natural channel conditions.

Visitor Use and Experience

Methodology

Personal observation of what is available to visitors under current management, combined with information obtained from the NPS personnel on visitation patterns, and applicable research were used to estimate the effects of the actions in the various alternatives.

Thresholds for Intensity, Duration, and Type of Effect:

- **Negligible—** Visitors would not likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources.

- **Minor—** Visitors would likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources; however the changes in visitor use and experience would be slight, and likely short term. Other areas in the park would remain available for similar visitor experience.

- **Moderate—** Visitors would be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor use and experience would be readily apparent, and likely long term. Some visitors who desire to continue their chosen activity would be required to pursue their choice in other available local or regional areas.

- **Major—** Visitors would be highly aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor use and experience would be readily apparent and long term. The change in visitor use and experience proposed in the alternative would preclude future generations of visitors from enjoying park resources and values. Some visitors who desire to continue their chosen activity would be required to pursue other available local or regional areas.

Duration:

- **Short-Term —** Disturbance lasting only during construction.

- **Long-Term** — Disturbance lasting past construction, up to 10 years into future.

Alternative 1- No Action

Analysis: No changes to the existing site would occur under this alternative. The current experience for hikers, bird watches, cyclists and other park visitors would remain the same.

Cumulative Impacts: There would be no cumulative impacts to visitor use and experience as a result of this alternative.

Conclusion: Alternative 1 would result in no effect on visitor use and experience.

Alternative 2- Active Restoration of the Southern Portion of the Wetland without Additional Enhancement

Impact Analysis: Alternative 2's construction activities would not temporarily exclude park visitors from previously accessible park amenities because the location of the lower South Slough Trail is more than 500 feet from the southern portion of the project area. Construction efforts may temporarily impact the viewshed of the area, thereby creating negligible short- term adverse effects. However, this alternative would create opportunities to use the project as an educational tool, and provide a more enhanced visitor experience in the long term by restoring cultural landscapes.

Cumulative Impacts: Cumulatively, this alternative would have moderate long-term beneficial impacts.

Conclusion: Implementation of Alternative 2 would create negligible, short-term adverse impacts due to heavy equipment operating while the project is in construction, yet the long-term impacts of restoring the southern portion of the Colewort Creek wetland would be beneficial for visitor use and experience.

Alternative 3- Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Wetland

Impact Analysis: The lower South Slough Trail is located within 100 feet of the western ditch segment in the northern section of the project area. For safety, it may be intermittently or temporarily closed when construction is occurring on the western ditch, or when vehicles are using the NPS service road that bisects the trail. Visitors will still be able to use the upper South Slough Trail, so impacts will be minimized. Construction activities may have short-term minor effects due to increased noise and large equipment traffic. In contrast, the long-term benefits would include an improved natural landscape and habitat for wildlife viewing, restoration of the cultural landscape, as well as the opportunity to utilize the project site for educational outreach.

Cumulative Impacts: Alternative 3 will result in moderate, long-term positive impacts to visitor use and experience resulting from a restored estuarine marsh landscape that mimics what existed during the Lewis and Clark Expedition. Minor short-term adverse impacts may result from increased noise and traffic during construction. The NPS will educate the public and park visitors to the importance of tidal wetland restoration to mitigate negative impacts that may be encountered during construction.

Conclusion: Implementation of Alternative 3 will result in beneficial long-term effects to visitor use and experience by restoring the natural landscape of the park. Restoration actions may also result in negligible short-term adverse impacts to visitor experience due to increased noise and traffic during project construction and periodic closure of the lower South Slough Trail.

Human Health and Safety

Methodology

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

Thresholds for Intensity, Duration, and Type of Effect:

- **Negligible—** The impact to health and human safety would not be perceptible.

- **Minor—** The impact to health and human safety would be measurable or perceptible, but it would be limited to a relatively small number of visitors or employees at localized areas. Impacts would also be minimal and easily mitigated.

- **Moderate—** The impact on health and human safety would be sufficient enough to cause a change in accident rates at existing low accident locations, or in areas that currently do not exhibit noticeable accident trends. Mitigation to offset adverse impacts would be extensive, but likely successful.

- **Major—** The impact on health and human safety would be substantial. Accident rates in areas usually limited to low accident potential are expected to substantially increase for both the short and long-term. Mitigation measures would be extensive, and success could not be guaranteed.

Duration:

- **Short-Term—** A finite, definitive period of increased safety risk would occur during construction and implementation. Once tasks are completed, accident rates would return pre-existing conditions.

- **Long-Term—** The period of increased risk would last an extended period of time after project implementation. Increased accident rates would remain at the site for 1 year or more.

Alternative 1- No Action

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. Alternative 1 would not adversely or positively impact human health and safety.

Cumulative Impacts: Any potential cumulative impacts to human health and safety as a result of the No Action alternative would be negligible.

Conclusion: Alternative 1 would not impact human health and safety.

Alternative 2- Active Restoration of the Southern Portion of the Wetland without Additional Enhancement

Impact Analysis: Implementation of Alternative 2 would involve construction activities within the project area south of the Colewort Creek tidal channel, and 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 Park 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, and traffic controls when necessary. Public announcements and notices would also be posted on the Park website to inform park visitors about construction activities.

Cumulative Impacts: Negative impacts resulting from this alternative would be negligible and short-term, as the construction work would occur outside of the park trail system and main recreational areas. Potential risks to human health and safety would be mitigated through the use of safety guidelines, traffic controls and public announcements.

Conclusion: Alternative 2 would result in negligible, short-term impacts to human health and safety which would be easily mitigated through proper safety precautions.

Alternative 3- Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Wetland

Impact Analysis: Impacts to human health and safety from this alternative will be similar to those of Alternative 2, with the possible addition of hazards resulting from construction occurring immediately adjacent to the lower Sough Slough Trail. As with the previous alternative, these risks to human health and safety will be mitigated by adhering to safety guidelines, installing construction barriers and signs, posting notices and announcements, and through the temporary closure of the lower South Slough Trail during construction activities.

Cumulative Impacts: Alternative 3 will have negligible to minor short-term negative impacts to human health and safety. Adherence to strict safety guidelines will reduce the potential risk of accidents and injuries.

Conclusion: Implementation of this alternative will result in negligible, short-term impacts to health and human safety which will be easily mitigated through precautionary measures.

Land Use

Methodology

On-site observation combined with detailed engineering and hydraulic and hydrologic modeling was used to evaluate if the proposed alternatives would be compatible with the land uses of adjacent properties.

Thresholds for Intensity, Duration, and Type of Effect:

- **Negligible—** Changes to site conditions would be barely detectable and create no noticeable difference in for adjoining land uses.
- **Minor—** On-site functions would change to some extent, but would not unduly impact neighboring land uses. Changes would be unlikely to cause adverse affects to land use functions.
- **Moderate—** There would be noticeable changes in terms of land use. Measures to correct the altered functions may need to be implemented in response to such changes.
- **Major—** Changes would be substantial in all areas of land use function.

Duration:

- **Short-Term—** One-time, finite, definitive changes would occur due to construction and/or modification. Once tasks are completed, land use functions would return pre-existing conditions.
- **Long-Term—** Changes instituted, that could alter neighboring land use functions, are expected to remain in effect for 5 or more years.

Alternative 1- No Action

Impact Analysis: The Colewort Creek property is located entirely within the boundaries of the Lewis and Clark National Historical Park. Furthermore, all but the headwaters of the Colewort Creek watershed also fall within the park, and therefore, the potential to adversely affect adjacent land uses is minimal. Nonetheless, potential impacts to adjacent infrastructure were evaluated in the hydraulic and hydrologic modeling conducted to estimate the impacts of the proposed alternatives. Alternative 1 would not adversely or positively impact the surrounding land uses, or infrastructure, adjacent to the Colewort Creek wetland.

Cumulative Impacts: Any potential cumulative impacts to land use as a result of the No Action alternative would be negligible.

Conclusion: Alternative 1 would have no impact on surrounding land uses.

Alternative 2- Active Restoration of the Southern Portion of the Wetland without Additional Enhancement

Impact Analysis: The hydraulic and hydrologic analysis conducted for this project has indicated that the restoration actions associated with Alternative 2 would not significantly impact areas upstream or downstream of the Colewort Creek wetland on the Lewis and Clark River. Nor would Alternative 2 project actions pose any threat to the adjacent infrastructure located at the site.

Cumulative Impacts: This alternative would not have any foreseen impacts, either positive or negative, on the surrounding land uses or infrastructure. However, by improving wetland function, this project has the potential to reduce the risk of possible flooding of the adjacent Fort Clatsop Road during extreme storm events.

Conclusion: Alternative 2 would result in minor long- term positive effects to land use by allowing for increased water storage capacity at the project site.

Alternative 3- Active Restoration of the Southern Portion of the Wetland with Additional Enhancement of the Northern Wetland

Impact Analysis: Analysis of the potential project alternatives also determined that the restoration actions associated with Alternative 3 will not negatively impact surrounding land uses or infrastructure. The closest adjacent land use to the Colewort Creek wetland is industrial timber. The potential that the actions proposed with this restoration and enhancement project will have any impact on timber practices is negligible.

Cumulative Impacts: Alternative 3 will not have foreseen impacts on surrounding land uses or infrastructure. Like the previously discussed alternative, restoring and enhancing the Colewort Creek wetland may have minor long-term benefits to surrounding areas resulting from the increased water storage and filtration capacity of the restored project site.

Conclusion: The restoration and enhancement activities associated with Alternative 3 may result in minor long-term benefits to adjacent land use and infrastructure resulting from improved wetland functions.

Table 4-1. Summary of Alternative Impacts to the Affected Environment

	Alternative 1 No Action	Alternative 2 Active Restoration	Alternative 3, Preferred Alternative Active Restoration and Enhancement
Hydrology	**No Effect.** No action at the site would not change the existing surface water hydrology or water storage capacity of the Colewort Creek wetland.	**Minor, long-term positive effects.** Restoring hydrologic connectivity to the southern portion of the Colewort Creek would recreate the ecological complexity of the historic tidal wetland. It would also increase the water storage capacity of the floodplain, and rehabilitate the wetland filtration functions for the larger watershed system.	**Major, long-term positive impacts.** This alternative would provide the greatest storage capacity and improved wetland filtration functions. It would also create a major, long-term positive impact within the wetland resulting from improved hydrologic connection and tidal inundation throughout the entire project site.
Geology and Soils	**Negligible, long-term negative effects.** The No Action alternative would perpetuate the erosion and downcutting associated with the liner irrigation channels.	**Major, long-term positive impacts.** Actively restoring 15 acres of tidal wetland would result in benefits for flood storage and nutrient deposits within the Colewort Creek wetland.	**Major, long-term, positive effects.** Implementation of this alternative would improve flood storage and nutrient exchange for the entire 44-acre wetland.
Water Quality	**No effect.** Existing surface water hydrology or drainage patterns within the wetland system would not be altered.	**Minor, long-term positive effects.** Restoring wetland functions to the southern project area would provide water quality benefits by reducing sediments, and potentially harmful nutrients and pesticides from stormwater runoff.	**Minor, long-term positive effects.** Restoring and enhancing wetland function to the entire wetland area will provide the most water quality benefits through stormwater pollution reduction.
Air Quality	**Negligible, long-term positive effects.** The No Action alternative would not involve construction	**Minor, short-term negative impacts.** Construction activities associated with this alternative may slightly decrease local air quality through the production of additional exhaust from	**Minor, short-term negative effects.** Similar to Alternative 2, this alternative may decrease local air quality by adding exhaust and dust into the air. Because the

	activities, and there would be no increase in exhaust or dust.	heavy machinery. Air quality may also be reduced during the construction period through the introduction of dust into the air by earthwork.	construction activities for this alternative are more extensive, so too is the potential for negative air quality effects.
Vegetation	**Minor, long-term negative impacts.** Under this alternative, invasive and non-native plants would expand at this site.	**Major, long-term positive effects.** Restoring the southern project site would promote tidal wetland vegetation. Native plant species would provide better wetland filtration functions and improved wildlife habitat.	**Major, long-term positive effects.** This alternative would provide the greatest improvement to vegetation at the site through removal of invasive reed canary grass in the area to the north of the tidal channel, as well as increased planting of native vegetation throughout the entire project site.
Threatened and Endangered Species	**No effect.** The No Action alternative would continue site isolation from tidal and riverine flows, and exclusion of juvenile salmonids from off-channel habitat in the area to the south of the Colewort Creek main tidal channel.	**Major, long-term positive impacts.** This alternative would increase off-channel salmonid refugia and provide additional rearing habitat for juvenile salmon.	**Major, long-term beneficial impacts**. Alternative 3 would increase off-channel rearing habitat, as well as address key limiting factors to T&E salmon species in the northern portion of the property such as lack of in-stream complexity and degraded riparian habitat. This alternative will allow for the greatest extent of habitat improvements possible at this time.
Fish and Wildlife (Non-T&E)	**No effect.** The northern section would continue to recover from its use as pasture, but invasive and non-native plants would expand at this site, decreasing habit availability.	**Major, long-term positive effects.** Alternative 2 would increase overall habitat quality to the area south of the Colewort Creek tidal channel. However, there is a potential for minor short-term adverse effects to wildlife due to displacement during construction.	**Major, long-term positive effects.** This alternative would increase in-stream habitat availability and vegetative diversity, as well as improve existing wetland habitat through large wood placement and invasive plant removal. Overall, Alternative 3 will have the largest long-term, positive impact on fish and wildlife. It also has a greater potential for short-term adverse effects to wildlife due to displacement during

			construction.
Historical and Cultural Resources	**No effect.** This alternative would leave the Colewort Creek wetland in its altered condition. It would not help meet Park goals to recreate the historic setting of Fort Clatsop.	**Moderate, long-term positive effects.** Implementation of this alternative would help meet the goals set in the Park's General Management Plan to restore pasturelands to recreate the historic setting of Fort Clatsop.	**Moderate, long-term positive impacts.** Alternative 3 also follows the recommendations of the Park's General Management Plan to the greatest extent possible by restoring the southern project area, and altering the man-made ditch networks in the area north of the main tidal channel, to achieve a more natural tidal channel network.
Visitor Use and Experience	**No effect.** Current site conditions and recreational use would remain the same.	**Moderate, long-term positive effects.** Alternative 2 would create the opportunity to use the restored wetland as an educational tool, as well as provide an improved viewshed to park visitors.	**Moderate, long-term positive effects.** Implementation of this third alternative would restore the historic landscape, and improve of habitat for wildlife viewing to the greatest extent possible.
Human Health and Safety	**Negligible, long-term positive effects.** 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.	**Negligible, short-term negative impacts.** Implementation of Alternative 2 would involve construction activities within the project area south of the Colewort Creek tidal channel that 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 Park staff or members of the public.	**Negligible to moderate, short-term negative impacts.** Concerns for increased safety risks during the construction period would be similar to those of Alternative 2, with the possible addition of hazards resulting from construction occurring immediately adjacent to the lower Sough Slough Trail. Safety risks would be mitigated through the use of safety precautions such as trail closures.
Land Use	**No effect.** Alternative 1 would not affect adjacent land uses or infrastructure. However, leaving	**Minor, long-term positive effects.** This alternative would not directly affect surrounding land uses. However, the increased water storage capacity of the	**Minor, long-term positive effects.** Activities associated with Alternative 3 will not affect the adjacent land uses or infrastructure. Yet, similar

	the Colewort Creek in its current condition would not improve the flood storage capacity of the wetland.	restored wetland may provide minor long-term positive impacts to the surrounding infrastructure by reducing the risk of flooding during extreme storm events.	to Alternative 2, this alternative may provide minor long-term benefits to the area surrounding the Colewort Creek wetland resulting from enhanced wetland function and decreased risk of flooding.

Chapter 5: Consultation and Coordination

The Scoping Process

The NPS interdisciplinary team conducted multiple internal scoping meetings throughout the proposed project's inception from 2010 to 2012 at the Fort Clatsop Unit of the Lewis and Clark National Historical Park. 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.

In November 2011, the NPS notified local, state, and federal agencies, Clatsop-Nehalem Confederated Tribes, Confederated Tribes of the Siletz Indians, Confederated Tribes of the Grande Ronde, and the Chinook Nation, other interested organizations, and the general public of the proposed actions at Colewort Creek through a public scoping letter and a news release that announced the public and agency scoping meetings on Thursday December 1st, 2011. This release was posted on the National Park Service's website. A November 29th, newspaper article in the Daily Astorian also announced the scoping meeting.

Bonneville Power Administration

This project was brought to the attention of BPA's Expert Regional Technical Group (ERTG) by our partners at CREST. According to their rating system based on Salmon Benefit Units (SBUs), the project scored high enough to be approved for BPA funding.

Youngs Bay Watershed Council

The Youngs Bay Watershed Council has been involved with the Colewort Creek Wetland Restoration Project since its inception.

State and Tribal Consultation and Coordination

The NPS initiated the Section 106 consultation on April 6th, 2012, when the Park sent a letter and proposed archeological survey scope of work for the Colewort Creek wetland to the Oregon SHPO, Clatsop- Nehalem Confederated Tribes, Confederated Tribes of the Siletz Indians, Confederated Tribes of the Grande Ronde, and the Chinook Indian Nation.

The NPS will continue to consult with the tribes and Oregon SHPO, as well as other interested parties during the course of the project planning and implementation as part of its compliance with the Section 106 consultation. The archeological survey will incorporate SHPO's comment to conduct the shovel probes in 10cm levels. No comments were received from tribal offices.

U.S. Fish and Wildlife Service and NOAA Fisheries

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 (HIP II). The consultation analyzed a suite of actions that BPA 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.

U.S. Army Corps of Engineers

A joint permit application for the Colewort Creek Wetland Restoration Project was submitted in order to obtain a Nationwide Permit.

Oregon Department of State Lands

A joint permit application for fill and removal activities was also submitted to Oregon Department of State Lands (DSL) to gain consent to work within the submersed and submersible lands of the State of Oregon.

Clatsop County

Clatsop County issued a Notice of Intent to issue a conditional use permit for the restoration project on May 14, 2012. A permit will be issued contingent on satisfactory compliance with all applicable federal, state, and county laws.

Supporting Compliance

In addition to the compliance actions previously listed in this chapter, the NPS will also need to obtain permits to conduct restoration actions through the Oregon DSL, U.S. Army Corps of Engineers and Clatsop County.

Individuals conducting work that involves removal or filling in waters of the State of Oregon are required to complete a Joint Permit Application. This application activates the permitting process for a removal/ fill permit from the Oregon DSL and several federal regulatory programs through the U.S. Army Corps of Engineers. Federal laws that are included within the Army Corps permit are Section 10 of the Rivers and Harbors Act, and Section 404 of the Clean Water Act.

Grading of lands located outside of city limits or urban growth boundaries in Clatsop County, Oregon will require a county development permit. This permit verifies that the proposed work is a permitted use in the zone.

Distribution List

To inform the public of the availability of the environmental assessment, the NPS distributed a letter to various agencies, tribes, and organizations, and published a press release in the local newspaper. Below is a list of agencies and organizations who received a letter announcing the availability of the environmental assessment. Copies of the environmental assessment are provided to interested individuals, upon request. The document is also available for review at the Astoria Public Library, the Warrenton Community Library, the Lewis and Clark National Historical Park visitor center and on the internet at http://parkplanning.nps.gov/lewi.

The environmental assessment is subject to a thirty day public comment period. During this time, the public is encouraged to submit their written comments to the National Park Service. The address to send comments is provided at the beginning of this document.

U.S. Army Corps of Engineers
Oregon Department of State Lands
U.S. Fish and Wildlife Service
Oregon Department of Fish and Wildlife
Oregon State Parks
Oregon Department of Forestry
Oregon State Historic Preservation Office
Clatsop-Nehalem Confederated Tribes
Confederated Tribes of Siletz Indians
Confederated Tribes of the Grand Ronde
Chinook Indian Nation
Clatsop County
City of Astoria, Oregon
City of Warrenton, Oregon
Youngs Bay Watershed Association

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