U.S. Army Corps
of Engineers
Seattle District

Centralia Flood Damage Reduction Project
Chehalis River, Washington

FINAL ENVIRONMENTAL IMPACT STATEMENT

Appendix C:
Wetland and Riparian Survey

June 2003

WETLAND AND IMPACT ASSESSMENT REPORT

Centralia Flood Hazard Reduction Study

Lewis County, WA

Prepared by Seattle District, U.S. Army Corps of Engineers

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2. SUMMARY

The U.S. Army Corps of Engineers, in partnership with Lewis County, is investigating flood hazard reduction measures for the Centralia and Chehalis areas of Lewis County Washington. Various alternative proposals and designs are being investigated, all of which will have impacts to wetland and aquatic resources in the project area. This report details the location and magnitude of the potential impacts to wetland and aquatic resources.

The project area is located within the floodplains of the Chehalis River and the Skookumchuck River . Sensitive wetland and aquatic habitat occurs throughout the area. The degree of potential impact to aquatic habitats depends heavily on the design and location of the different alternatives.

3. INTRODUCTION

Purpose

This Wetland and Impact Assessment Report has been prepared to meet requirements of the National Environmental Policy Act and Section 404 of the Clean Water Act. This report identifies the existing aquatic (including wetland) resources in the project area and the potential biological and environmental impacts that may occur as a result of project construction.

4. AFFECTED ENVIRONMENT

This section describes the existing environment in the project area. It includes information on the area setting, its recent disturbance history and inventoried wetland and riparian **[keep or remove]** areas.

Project Area

Chehalis River. The Chehalis River Valley is in the southern end of the Puget Trough physiographic province and is characterized by a broad well developed flood plain and low terraces surrounded by highly dissected uplands of low to moderate relief. Valley bottoms are at an elevation of about 150 feet and the uplands areas average about 300 to 600 feet. The highest hills are between 1,000 to 2,000 feet in elevation.

From its headwaters in the Willapa Hills of western Lewis County, the Chehalis River flows generally east and northeast to its confluence with Newaukum River near the City of Chehalis. From Chehalis the river flows north to the City of Centralia, then northwest into Thurston County, and ultimately enters Grays Harbor, near the City of Aberdeen, about 45 miles west-northwest of Centralia. The Chehalis River's major tributaries are the South Fork of the Chehalis, Newaukum, Skookumchuck, and Black Rivers. Other significant tributaries include Lincoln, Scatter, and Hanaford Creeks.

In the northwest part of Lewis County, the drainage pattern is controlled to a large degree by the geologic structure. Two sets of faults and folds, trending generally east-west and north-south, have resulted in a rectangular drainage pattern (Weigle and Foxworthy 1962). This pattern is evident in the trends of the small streams in the foothills areas, but it is also apparent from the course of the Chehalis River upstream from the Town of Adna.

In its course from Adna to the Thurston County line, the Chehalis River has an average gradient of only 1.8 feet per mile – the gentlest stream gradient within the County (Weigle and Foxworthy 1962). This reach of the river is also associated with the widest floodplain and has a well-developed meandering channel pattern within the area. Upstream from this area, the gradient of the Chehalis River ranges from about 5 to 10 feet per mile (Weigle and Foxworthy 1962).

The project area is located within the reach between Adna to the Thurston County line within a broad lowland. The topography of the lowland is mainly one of terraces and floodplains. The terraces were formed by a sequence of events that began in the early part of the Pleistocene epoch. During that time, the basin was partially filled with deposits of silt, sand and gravel. Streams, at times fed by glaciers, subsequently discharged across the fill, eroding broad valleys and formed terraces of alluvium and glacial-outwash materials. The oldest and most extensive terraces lie at the highest levels, which the progressively younger terraces are at successively lower levels.

The younger and lower terraces are relatively flat. The older terraces have gone extensive erosion by stream action and are characterized by a rolling surface. The lowest lying areas are the active floodplains of the current drainage systems of the Chehalis River and its tributaries.

Skookumchuck River.

The Skookumchuck River occupies one of the intermediate terraces between the uplands and the Chehalis River floodplain. It originates in the Snoqualmie National Forest northeast of Centralia and meets the Chehalis River in Centralia. Elevations within the basin range from 150 at the mouth to over 3,000 feet at its headwaters. The slope of the river from its source is steep, falling an average of 19 feet per mile. Below the town of Bucoda, the slope flattens and is about 5 feet per mile near Centralia. Except for the uppermost portion, the Skookumchuck River flows as a meandering channel in a flood plain, varying in width from a few hundred feet to ½ mile.

History

Chehalis River. Exploring parties first came to the area in the 1820's from Fort Vancouver on the Columbia River (Washington State Historical Society 1940 *from soil survey). French Canadians settled on the Cowlitz Prairie near the present site of Toledo and in 1838 Simon Plamondon founded the Cowlitz Farm there. The Hudson's Bay Company brought immigrants to the farm and it became the Puget Sound Agricultural Company in 1843. In 1845, John R. Jackson settled 9 miles southeast of Chehalis, on the prairie that now bears his name. In the same year, Lewis County was established as a part of the Oregon Territory. It was the first county organized in what became the State of Washington.

The lower parts of Cowlitz and Chehalis Valleys were soon settled and farming and logging began. Chehalis, originally known as Saundersville, was settled in the early 1850s. Centralia, the largest town in the area, was organized in 1875.

Logging and farming have been the major industries since settlement. Interstate 5, built in 19??, SR6 (19??) and SR 12 (19??) are major transportation corridors that bisect the region both north and south (SR 6 and 12) and east-west (I-5) FIX THIS.

Skookumchuck River. There is not much specific information available for the historic settlement of the Skookumchuck Valley, but it was likely settled and developed along the same time of the Chehalis River valley. Logging and farming have also been the major industries since settlement.

Land Use

Chehalis River. The project area is largely in private land ownership. The Washington State Department of Transportation controls the major public lands, which are associated with the transportation corridor. Current land uses within and close to the project area include residential and commercial development associated with the Cities of Centralia and Chehalis and agricultural development within the major portions of the floodplain. There area also substantial areas of commercial development associated with the I-5 transportation corridor.

Skookumchuck River. The City of Centralia (private and public property) occupies several square miles at the lower end of the River basin and the upper areas are within the boundaries of the Snoqualmie National Forest, under Federal government management. Private timber companies and the Washington State Department of Natural Resources also own portions of the upper watershed. Skookumchuck Dam, which is about 20 miles upstream from Centralia, is owned and operated by Puget Sound Power to supply cooling water to the coal-fired Centralia steam electric power plant. The dam was completed in 1970. The reaches below the dam are mainly in private ownership and in agricultural use with some residential development, mostly around Centralia.

Ecology

Chehalis River. The climate, which largely drives the ecologic characteristics of the area, is temperate due to the maritime influence of the Pacific Ocean. Summers are fairly warm, but hot days are rare. Winters are cool, but snow and freezing temperatures are also rare. Precipitation averages between 46 and 50 inches per year, mostly as rainfall between the months of October and April. The months of May through September experiences significantly less rainfall, which is typical of the Pacific Northwest.

Undeveloped and undisturbed areas in the project area support several different habitats, from evergreen forests to forested and emergent wetlands. The variety of habitat in the project area supports numerous types of wildlife. The riparian corridors adjacent to the river are especially important to birds and small mammals. Passerine birds and waterfowl also rely on the riparian corridors for food and rest. Pooled water on the broad agricultural flood plains also provide important waterfowl habitat during the winter and spring months. The river system itself supports numerous species of salmonids, including spring and fall Chinook, coho, and chum salmon, as well as steelhead, rainbow, and both sea-run and resident cutthroat trout (WDF 1975). The Chehalis River also supports several other species of native and exotic resident fishes.

Aquatic areas found in the project area include the Chehalis River and floodplain, including areas of wetlands and riparian areas. The Washington State Department of Ecology has designated this reach of the Chehalis as Class A waters for water quality, but with a special condition that allows dissolved oxygen levels to fall as low at 5 mg/l during the summer months. The normal Class A standard requires a minimum dissolved oxygen concentration of 8 mg/l. This special condition was issued because oxygen levels in the designated reach of the Chehalis River commonly violate Class A standards between June and September. This reach is also listed on the State 303(d) list of impaired waters in several locations for fecal coliform and temperature violations. Lewis County Conservation District also noted several occasions of high concentrations of nitrogen and phosphorus, indicating water quality was generally worse than the Class A standards (Lewis County 1994).

The observed nutrient and fecal contamination is likely attributed to runoff from farms, dairies and ranches (Ecology 1990 – From Lewis county 1994). Urban runoff from Chehalis and Centralia may also be partially responsible. The elevated water temperatures may by attributed to lack of riparian shade and/or irrigation or drainage ditch flow (Lewis County 1994). The low dissolved oxygen concentrations during the summer months probably reflect the combined effects of high water temperatures and organic enrichment.

Wetlands found in the project area are forested, scrub-shrub and/or emergent systems and, like the other aquatic systems, are driven by the seasonal hydrologic cycle. The wetlands help moderate flood flows by storing water that, later in the summer, supports base flows in streams and rivers. The wetlands in the project area provide support functions for wildlife (feeding and migration), fishery support (organic detritus, habitat for aquatic and terrestrial insects, woody debris, shade), passerine and migratory bird support (nesting, feeding, resting). The wetlands also provide aesthetic values, especially those adjacent to the river.

Skookumchuck River. The climate of the Skookumchuck River basin is the same as for the Chehalis, except for higher winter precipitation (rain and snow) in the upper reaches of the watershed.

Aquatic resources within the project area include wetlands and riparian areas, but these are not as extensive as those found in the Chehalis River floodplain. This is mainly because the Skookumchuck River has a substantially smaller flood plain than the Chehalis.

The Skookumchuck River provides spawing and rearing habitat for spring and fall Chinook and coho salmon as well as winter steelhead and resident cutthroat trout. Prior to construction of the dam, coho and steelhead used the Skookumchuck River up to an impassible falls near RM 28.9. The dam now blocks all fish passage.

The Washington State Department of Ecology has designated the lower reach (project area) of the Skookumchuck as Class A waters for water quality. This reach is also listed on the State 303(d) list of impaired waters in two locations for fecal coliform and for pH violoations either in or near Centralia.

Wetlands found in the project area include emergent, shrub-scrub, and forested systems. Most of these wetlands are directly adjacent to the Skookumchuck. Functions would include wildlife support (feeding, migration corridor), fishery support (source of organic detritus, habitat for terrestrial and aquatic insects, shade, woody debris), and passerine and migratory bird habitat. The dam has likely changed the significance of any flood storage and groundwater discharge/recharge functions, although the existing wetlands likely continue to provide some support.

5. METHODS

This section describes the methodology used for preparing this Wetland and Impact Assessment Report, including the review of existing information and field investigation procedures.

Environmental Baseline

A variety of reports detailing the geological setting and historical setting of the project area were reviewed to provide a summary of the existing environmental setting. To the extent that they affect the location and function of the aquatic resources, past alterations of the wetland and aquatic resources in the project area have been identified.

Wetlands

Identification and Classification

For the purposes of this report, wetlands were identified from new aerial photography and past National Wetland Inventory maps to update the existing National Wetland Inventory for the project area. The Lewis County soil survey also provided information on the extent and location of hydric soils in the project area. Detailed wetland delineations have not yet been done, pending evaluation of the possible alternative alignments and designs that would accomplish the project purpose. Wetlands have been classified according to the U.S. Fish and Wildlife Service (USFWS) classification system (Cowardin et al 1979).

Functional Assessment

Wetlands perform a variety of biological, physical (hydrologic), and chemical (water quality) functions. For this project, wetland functions were assessed and evaluated partially based on the hydrogeomorphic approach as adapted by the Washington State Department of Ecology (FILL IN). This methodology does not assign quantitative values to a particular function, but identifies functional strengths and weaknesses to help guide management decisions and aid in mitigation choices. Wetland functions are divided into the following 14 categories: flood flow alteration, sediment removal, nutrient and toxicant removal, erosion control and shoreline stabilization, production of organic matter and its export, general habitat suitability, habitat for aquatic invertebrates, habitat for amphibians, habitat for wetland-associated mammals, habitat for wetland-associated birds, general fish habitat, native plant richness, educational or scientific value, and uniqueness and heritage.

The following data sources were reviewed for information on vegetation patterns, topography, drainage, and potential or known wetlands or wildlife habitats in the project vicinity:

- National Wetland Inventory (NWI) maps
- U.S. Geologic Survey (USGS) 7.5 minute topographic maps
- Natural Resources Conservation Service (NRCS) soils surveys and county hydric soils lists;
- Lewis County Comprehensive Food Hazard Management Plan
- aerial photographs; and
- various existing reports

Impacts

Potential impacts to wetland habitats were assessed using a geographic information system to overlay the various alternatives onto a map of wetlands within the project corridor. Impact acreage was then calculated and tabulated by wetland classification and location.

6. WETLANDS

Chehalis River

Existing Conditions

An extensive wetland complex of emergent, scrub-shrub and forested make up the floodplain of the Chehalis River, as well as large area of agricultural wetlands that are actively cultivated during the spring and summer months. Much of the agricultural area of the flood plain has been tiled with subsurface tiles to facilitate drainage and a large number of ditches were also constructed for the same purpose. Some of the ditches and drains were very successful in converting wetland areas into uplands whereas others systems have failed, resulting in maintenance of wetland hydrology. The extent of either situation is difficult to determine without supporting field observations although the Soil

Survey for Lewis County has mapped large units of hydric soils throughout the project area, including the areas currently under pasture use or cultivation. This indicates that the soil forming processes are those associated with wetlands. Whether the conditions are remnant of past hydrologic conditions or reflective of current conditions will need to be field verified when the project footprint is finalized.

Wetlands make up approximately 5% of the landscape in western Washington and typically occur as small features, which usually means that they are too small to be inventoried as areas of hydric soils (the typical mapped ‘polygon’ is greater than 6 acres). What is unique in the Chehalis River portion of the project area is that there are large, extensive areas of mapped hydric soils. This indicates that wetlands either currently occupy or historically occupied a significant percentage of the project area.

Interspersed with the wetland complexes are equally large areas of well-drained soils. This complex variety of soils is a result of the glacial-fluvial history of the area, which was historically part of a broad glacial outwash plain and currently part of an active floodplain.

The Chehalis River wetlands are supported by a combination of high seasonal water tables, periodic flooding, and seasonal ponding. Those areas directly adjacent to the river probably experience both high water tables and seasonal flooding. The areas away from the river likely are a result of high seasonal water tables and ponding.

Agriculture, logging, development and road construction have affected conditions in this reach of the Chehalis. I-5 cuts transversely through the area and interrupts the hydrologic and ecological connectivity of the system. Extensive agricultural development has changed the complexity and extent of wetlands as well as adjacent riparian forests. Urban development has resulted in direct losses of wetlands and well as indirect impacts to remaining wetlands. Lastly, past logging practices apparently changed the hydrologic dynamics of the Chehalis, which reduced the effect of seasonal flooding.

Using a hydrogeomorphic classification, the Chehalis River wetlands are a mix of riverine and depressional wetland areas forming a complex matrix. Functions likely provided by these wetlands include sediment and nutrient removal, peak flow reduction, base flow support, shoreline stabilization, primary production and organic export, fish and wildlife habitat, and native plant richness.

Impacts

Impacts to the Chehalis River wetlands are identified in Table XX.

Impact Assessment. Chehalis River wetlands are a remnant of a once extensive system of braided channels, wetlands, and riparian areas across a broad floodplain. It was an extremely dynamic system that carried a high load of organic materials (wood and other debris) with shifting channels. The wetland and riparian plant communities probably supported many of the same species found in the remnant system today; shrub-shrub and emergent systems with evergreen and deciduous trees along the higher flood terraces. This community would be typical of a braided river system with frequently shifting stream channels. Functions associated with the historic wetlands would be habitat for aquatic invertebrates, anadromous and resident fish habitat, wildlife habitat, export of organic matter, and biodiversity. Of great import would be the ability of this system to produce and export organic matter. Because of the dynamic nature of the riverbed (rapid erosion and sedimentation), plants adapted to this environment were likely to be highly adaptable and highly productive as primary producers. This would result in a rich food web supporting invertebrates and vertebrates. Of equal importance would be the use of this system as a migration corridor for wildlife. The Chehalis River system was likely a rich source of food for a vast variety of both fish and wildlife species. The richness of cultural resource sites around the project area indicates that this was also an important source of food and materials for Native Americans.

European-American settlement brought dramatic changes to the system. Agricultural development resulted in the clearing and draining (or attempted draining) of all but the most difficult to access wetland systems. Vast areas of riparian forests were also cleared. Woody debris jams historically were historically principal mechanism that controlled river habitat diversity through the formation of scour pools, bars, in-channel islands, and riparian forests (Abbey 2000). This appeared to be true also for the historic Chehalis River; The Secretary of War (1890) described the navigability of the Chehalis River from Claquato (upstream of Centralia at RM 82) to its mouth. The main stem is described as a river that became progressively shallower and increasingly blocked by snags and fallen trees in the upstream direction. From Elma to Claquato, "the river is practically blockaded during the summer and fall by snags, shoals, and a general lack of water; at this time the river is a succession of shoals and pools" many of which were recorded as shallow as 6 to 12 inches in depth (Secretary of War 1890). A Government Land Office Survey Plat records provide additional accounts of numerous side channels, sloughs, and ponds hydrologically connected to the Chehalis main stem, the Newaukum and Skookumchuck rivers (GLO 1833-1860).

The Federal government's 1890 plan of navigation improvement included the removal of snags, overhanging trees, log jams, drift heaps, shoals, and other obstructions to navigability. In 1 year (1887), 293 large snags were removed from the main channel, beginning at Claquato and ending near Oakville (approximately 16 miles), and masses of log drifts and log jams were loosened or burned (Secretary of War 1887). The practice of removing woody obstructions continued for decades through this reach for purposes of floating logs resulting from timber operations (Secretary of War 1892, Wendler and Deschamps 1955).

According to the Secretary of War (1875), the largest obstructions to navigability occurred at the Chehalis Indian Reservation (near Oakville), consisting of two log rafts totaling about 2 miles in length from the upper to the lower one. The lower raft was described as the greater of the two, measuring 600 feet in length and 400 feet in width, and was "formed by drifting logs being lodged at the head of the Sand Island and by fallen trees from the adjoining banks". Sand Island is further described as having trees as large as 6 feet in diameter growing on its surface, indicating that this island was geomorphically stable due to the influence of LWD, much like those described by Abbe (2000). The second raft was reported to be smaller, being 100 feet in length and width. The rafts were composed of LWD that consisted of fir, cedar, hemlock, cottonwood, and maple ranging from 1 to 6 feet in diameter; the majority of the raft structures were underwater (Secretary of War 1875).

The Corps (2001) completed a habitat evaluation by analyzing two sets of aerial photographs (1938 and 1999) that examined the spatial and temporal changes in riparian habitat and meander characteristics along the main stem. In many areas of the main stem, the Corps observed very little lateral migration and formation of islands and side channels. The same analysts observed that, over time, the channel became more disconnected from side channels and floodplain features. The Corps (2001) observed that in-channel islands and side channels in the 1938 photo set became single-channel systems. This occurred at the main-stem confluence with Lincoln Creek and at the Chehalis River at Fords Prairie. Prior to the current study, extensive bank protection measures have been attempted over time (fill, car bodies, cement rubble, riprap, etc) between the airport and the Skookumchuck confluence. The main-stem channel also appears to be entrenched.

The historic records support that LWD strongly influenced the hydrologic characteristics of the Chehalis floodplain areas of the basin. The removal of wood and the clearing of riparian vegetation has very likely changed the channel dynamics in this system. The main stem appears to be undergoing a long-term trend of channel entrenchment since pre-settlement conditions, which likely began with the regular removal of woody debris. The shallow depths recorded in the main stem support that the main stem was a shallow, wide river with numerous side channels, ponds, and shoals. Woody debris removal resulted in concentrating river flow into one main channel. River transport of logs (from logging operations) also created conditions that further favored processes of entrenchment. Lastly, bank protection measures prevented (and continues to prevent) the main stem from adjusting to flow events though channel widening.

Overall, historic actions changed the Chehalis River wetland characteristics by decreasing the ability of the system to store water (flood retention, ground water discharge) by draining wetlands and channelizing the river system thereby decreasing the ability of the system to augment low flow conditions and to decrease the peak of flooding events. The Chehalis System also lost biodiversity due to the loss and/or degradation of habitat and the loss and/or degradation of connectivity between habitats.

The impacts of the historic actions include loss of population and population isolation of many species (both plant and animal); loss of primary and secondary productivity; loss and/or degradation of fisheries habitat; loss flood storage and low flow augmentation and loss of biodiversity. The current Chehalis River ecosystem now plays an important role because it continues to be support remnant riparian and wetland ecosystems as well as providing support to the fisheries and wildlife. Any additional loss and/or adverse impacts may have profound effects on the remaining fish and wildlife populations. Loss or adverse impacts to the remaining wetlands and riparian areas would have a high likelihood of the following:

- Loss and/or degradation of plant and animal populations
- Loss of biodiversity
- Loss of productivity and organic export
- Loss and/or degradation of fisheries habitat
- Loss of flood storage and low flow augmentation

Loss of wetlands and riparian areas at this location should be avoided to the maximum extent practicable. However, if there is unavoidable loss of wetland and/or riparian areas, suitable mitigation should include the following:

- Increased connectivity between the flood plain and river system
- Restoration of historic riparian vegetation
- Restoration of the historic flood plain (removal of restrictions) to increased biodiversity and primary production opportunities
- No overall net loss of area or function

Skookumchuck River

Existing Conditions. The floodplain of the Skookumchuck River in the project is not a large or a diverse as that of the Chehalis River flood plain. The floodplain is narrow and somewhat incised until it reaches the vicinity of Bucoda, where the floodplain becomes somewhat wider. The widest area of flood plain occurs at the confluence with Hanaford and the City of Centralia. Most of the project area is in agricultural production, with the exception of Centralia. Wetlands associated with this system are directly adjacent to the river or in the floodplain. Much of the agricultural area of the flood plain has subsurface tiles to facilitate drainage and a large number of ditches were also constructed for the same purpose. This area does not contain extensive areas of hydric soils, which suggests that there may not have been extensive wetlands prior to settlement associated with the river above the confluence with Hanaford Creek. Hanaford Creek, in contrast, supports extensive emergent wetlands and the soil survey also maps extensive hydric soils (SCS [NRCS] 1987).

The Skookumchuck River wetlands are supported by a combination of high seasonal water tables, periodic flooding, and seasonal ponding. Those areas directly adjacent to the river probably experience both high water tables and seasonal flooding. The areas away from the river likely are a result of high seasonal water tables and ponding.

Agriculture, logging, urban development and the construction of Skookumchuck Dam have affected conditions in this reach of the Skookumchuck. Agricultural development has changed the complexity and extent of wetlands as well as adjacent riparian forests. Urban development has resulted in direct losses of wetlands and well as indirect impacts to remaining wetlands. Past logging and the construction of Skookumchuck Dam had the most changed on the hydrologic dynamics of the Skookumchuch River.

Using a hydrogeomorphic classification, the Skookumchuck River wetlands are a mix of riverine and depressional wetland areas. Functions likely provided by these wetlands include sediment and nutrient removal, peak flow reduction, base flow support, shoreline stabilization, primary production and organic export, fish and wildlife habitat, and native plant richness.

Impacts

Impacts to the Skookumchuck River wetlands are identified in Table XX.

Impact Analysis. The historic impacts to the Skookumchuck are less well documented (prior to Dam construction) than the Chehalis River. However, the position of the Skookumchuck in the landscape (located on an intermediate terrace) and the soil surveys (including information on soil forming processes) indicate that the Skookumchuck River wetlands were not as extensive as those associated with the floodplain of the Chehalis within the project area. The confluence with Chehalis likely supported the largest area of wetlands and riparian habitat along the historic Skookumchuck, where the flood plain is the widest. The current river meanders in this area of the floodplain suggests that the was an area of lower energy, which probably looked and functioned much like the historic Chenalis River in the same reach. Almost all of the lower Skookumchuck flood plain wetlands were altered or filled with the development of Centralia.

The Skookumchuck River probably also provided a source of large woody debris to the system. The construction of the dam resulting in trapping a large percentage of woody debris above the dam. Although there are no specific historic records, it is also likely that this river system contained much more structural diversity that was removed to facilitate log transfer downstream, much like the work done on the Chehalis River.

Functions associated with the historic Skookumchuck River include:

- Food chain support for invertebrates and vertebrates
- Sediment removal
- Shoreline stabilization
- High biodiversity for both plants and animals
- High organic export

The existing systems function as fish and wildlife habitat and some organic export. Loss and/or adverse impact to the remaining system would result in the following:

- Loss or adverse impact to plant and animal populations
- Loss of organic input/export to the river ecosystems
- Loss or adverse impact to fishery support functions
- Loss of biodiversity

For any unavoidable loss or adverse impact to the Skookumchuck River wetlands, mitigation should include the following to offset impacts:

- Increase the area and/or complexity of remaining systems, especially those directly adjacent to the shoreline
- No overall loss of area or function

Table 1. Wetland impacts from proposed project for Chehalis River

Wetland	Corwardin Class[1]	Impacted Hectares[2]	Impacted Acres[2]
	PEM	0.0	0.0
	PEM PSS	0.0	0.00
	PSS	0	0
	PEM PSS PFO	00	0.0
	PEM	0	0
	PFO	0	0
Totals		0.0	1.0

[1] PEM = Palustrine Emergent, PSS = Palustrine Scrub-Shrub, PFO = Palustrine Forested

[2] Wetland impact acreage was estimated by overlaying the alternative alignments onto the wetland layer of the Geographic Information System maps.

Table 2. Wetland impacts from proposed project for Skookumchuck River

Wetland	Corwardin Class[1]	Impacted Hectares[2]	Impacted Acres[2]
	PEM	0.0	0.0
	PEM PSS	0.0	0.00
	PSS	0	0
	PEM PSS PFO	00	0.0
	PEM	0	0
	PFO	0	0
Totals		0.0	1.0

[1] PEM = Palustrine Emergent, PSS = Palustrine Scrub-Shrub, PFO = Palustrine Forested

[2] Wetland impact acreage was estimated by overlaying the alternative alignments onto the wetland layer of the Geographic Information System maps.

7. PRELIMINARY COMPENSATORY MITIGATION

The above-mentioned wetland impacts are the result of minimization through design and thus are unavoidable. The project area provides a unique opportunity for compensatory mitigation because the area is relatively undeveloped and many remnant systems remain. Compensatory mitigation should focus on restoring lost functions to the project area any or all of the following:

- Connecting remnant systems
- Expanding remnant systems
- Removal of fill from historic wetland areas
- Removal of non-functional levees or setting back of existing levees
- Increasing diversity of existing vegetation
- Planting riparian vegetation
- Removal of drainage systems (tiles and/or ditches)

8. RECOMMENDATIONS

To minimize impacts to existing wetlands, vegetation, streams, and fish and wildlife habitats, the following measures will also be followed:

1. Use strict erosion control techniques during construction.
2. Leave as much native vegetation as possible in the right of way to preserve wildlife habitat and provide a buffer of vegetation.
3. Minimize clearing of trees or other native vegetation.
4. Adhere to construction windows that are most protective of sensitive species.

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