BIOLOGICAL ASSESSMENT

Skagit Environmental Bank Habitat Restoration Project Skagit County, Washington

Prepared for

Clear Valley Environmental Farm, LLC

October 2005

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Skagit Environmental Bank Habitat Restoration Project Skagit County, Washington

Prepared for

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Executive Summary

This biological assessment was prepared for Clear Valley Environmental Farm, LLC, in support of the proposed Skagit Environmental Bank habitat restoration project, which will be implemented northeast of Mount Vernon, Washington, along the lower main stem of Nookachamps Creek and the east fork of Nookachamps Creek. Nookachamps Creek is a tributary of the Skagit River, which is located approximately 1.5 miles north of the project site.

The Skagit Environmental Bank habitat restoration project will restore reaches of the main stem of Nookachamps Creek, the east fork of Nookachamps Creek, and associated palustrine and riverine wetlands. The proposed project, which will be constructed in three phases, will reestablish or rehabilitate 13,000 feet (2.5 miles) of existing riverine channel habitat, construct 9,720 feet (1.8 miles) of new high-flow channel, and reestablish or rehabilitate 340 acres of palustrine emergent, scrub-shrub, and forested wetlands (including the powerline easement area but excluding the waterline easement area).

This biological assessment has been conducted in accordance with Section 7(c) of the federal Endangered Species Act of 1973. The purpose of this assessment is to determine whether any protected species are present within the project area and whether they or their habitats will be adversely affected by the proposed Skagit Environmental Bank habitat restoration project. Based on information from the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries), the U.S. Fish and Wildlife Service, and the Washington Department of Fish and Wildlife, three threatened species could be affected by this project: the **bald eagle**, the **bull trout**, and the **chinook salmon**. Additionally, a petition to review the status of the Puget Sound **steelhead** has been accepted by NOAA Fisheries. These four species are addressed in this biological assessment.

Project construction is scheduled to occur in three phases, beginning with Phase 1 in summer 2007 and continuing with the completion of Phases 2 in 2009 and Phase 3 in 2011. The majority of in-water work will be during Phase 1 (with minor stream connection work in Phase 2) and during the period of time from June 15 through August 31 (i.e., the work window). The definitive work window for fish will be indicated in the hydraulic project approval to be issued by the Washington Department of Fish and Wildlife. Streamflow will be temporarily diverted from the stream channel during construction of the engineered logjams in the channel.

Phase 1 of the project will consist of completing all the modifications necessary to restore the wetland and floodplain hydrology. These modifications consist of filling all the ditches and constructing one engineered logjam in Nookachamps Creek and three engineered logjams in the east fork of Nookachamps Creek. From experience on other restoration projects involving the placement of engineered logjams, it is expected that their placement will increase the average stream levels and the surrounding ground water levels.

Phase 2 of the project will consist of measuring (using well data and changes in stream levels) the exact area of hydrologic change (as a result of Phase 1 construction) and the construction of high-flow channels.

Phase 3 of the project will consist of excavating (down to the appropriate hydrologic conditions) the remaining 20 percent (approximately 60 acres) of the project site that will remain nonhydric after the Phase 1 and Phase 2 modifications. The areas that likely will remain nonhydric are the graded soils or bermed areas close to the streams.

The primary objective of the environmental bank design is to restore the wetland and floodplain functions that were typical before the area was disturbed for agricultural purposes, to produce a restored system that is dynamic and self-sustaining, and to create a long-term management plan to address unforeseen changes.

The proposed project will improve water quality in the lower Skagit River watershed by increasing dissolved oxygen, reducing sediment input to streams, and reducing floodplain erosion due to runoff. Additionally, water quality improvements will occur as a result of the removal of the dairy operations that currently exist on the property.

The proposed project will improve hydrologic and floodplain processes by improving streamflow maintenance, floodplain connectivity, stormwater attenuation, and ground water recharge and by reducing the width-to-depth ratios of streams and the frequency and duration of low surface flows.

The proposed project will also improve fish and wildlife habitat, and essential fish habitat conditions by increasing the quality and diversity of aquatic and riparian habitat, by eventually lowering water temperatures in the summer, and by providing rearing, refuge, and migration habitat for fish, amphibians, reptiles, and other species that depend on aquatic habitat. The proposed restoration will provide additional winter roosting refuge habitat for many species of ducks, trumpeter swans, Wrangle Island snow geese, Canada geese, and other wildlife, and it will enhance the existing bald eagle habitat by providing increased foraging opportunities and forest cover for privacy.

To avoid or minimize potential impacts due to construction, the proposed project will include the implementation of best management practices that will comply with the Skagit County stormwater regulations or the 2005 Washington State Department of Ecology *Stormwater Management Manual for Western Washington* standards for construction sites, whichever is the more stringent regulatory requirement. These best management practices are considered part of the proposed project upon which the effect determinations in this biological assessment are based.

These best management practices will also minimize the potential adverse impacts associated with the proposed project. Adverse impacts on sensitive species in the vicinity of the proposed project are expected to be temporary, occurring only during construction. Activities such as vibratory pile driving and fish handling may result in adverse impacts on sensitive species. As a result of the restoration of wetlands and fish habitat, the project is expected to improve instream habitat complexity, wetland habitat function, and overall water quality at the project site.

The proposed project **is likely to adversely affect bald eagles** for the following reasons:

- There is a documented bald eagle nest on the project site that is within 400 meters and within line of sight of proposed construction activities. It is also within a 1-mile radius of proposed pile driving activities that may disturb bald eagles.

- In order to comply with the fish work window, it will not be possible to follow construction restrictions related to nesting bald eagles (January 1 through August 15). Construction activities will begin summer of 2007.

The proposed project **is likely to adversely affect bull trout** for the following reasons:

- **Stream diversion and fish handling.** Fish handling and dewatering activities during in-water construction work in Phase 1 may harass or harm fish that will be directly handled and become stressed during the procedure. This type of harm may induce responses ranging from behavioral changes to fatality. Dewatering has the potential to strand fish that were not captured and may cause stress or death during the construction period. Stream channel work performed during Phase 2 will not require fish handling because the channels will not be connected with the main stem and the east fork of Nookachamps Creek until the end of construction. This will eliminate the connection to the fish-bearing water during construction activity and thus eliminate the need for fish handling in Phases 2.

- **Sediment-laden runoff**. The activities associated with the construction of the engineered logjam structures, habitat improvements, stream bank stabilization, and stream diversion could increase the delivery of fine sediment to the main stem and the east fork of Nookachamps Creek. Fine sediments may influence egg survival and emergence success of the salmonid species that spawn in the project action area. Juvenile salmonids make up a portion of the prey species for bull trout; therefore, the survival of these salmonids affects the food web for bull trout. However, any sedimentation problem during project construction will be temporary. In addition, because of the best management practices that will be implemented as part of this project, no significant impacts on water quality are expected. The hydraulic project approval to be obtained for this project will specify additional measures for avoiding impacts.

- **Increased turbidity**. Increased sediment delivery to the main stem and the east fork of Nookachamps Creek would increase turbidity, potentially affecting bull trout. In conditions of increased turbidity, bull trout and other fishes may temporarily avoid areas downstream of the disturbance. However, because of the best management practices that will be implemented as part of the project, significant increases in turbidity are not expected to result from construction activities.

- **Accidental spills**. Bull trout are not expected to be adversely affected by the proposed project because best management practices will be implemented to avoid or minimize all potential impacts related to accidental spills of construction-related chemicals.

- **Vegetation removal**. Some vegetation will be removed along the stream banks within the project area, which could temporarily affect fish habitat. However, native species will be planted as part of the project to replace the affected riparian and wetland vegetation along the stream bank, enhancing the existing habitat for bull trout or other salmonid species that serve as prey for bull trout.

The proposed project **will not destroy or adversely modify proposed bull trout critical habitat.** Although proposed critical habitat for bull trout is located within the project action area, it will not be adversely altered or modified by the proposed project. If critical habitat is designated for bull trout before the proposed project is completed, a provisional effect determination is that the project **is not likely to adversely affect bull trout critical habitat**.

This project **is likely to adversely affect chinook salmon or its habitat**. This determination is based on the same rationale provided for the potential effects on bull trout.

The proposed project **will not destroy or adversely modify proposed chinook salmon critical habitat.** Although proposed critical habitat for chinook salmon is located within the project action area, it will not be adversely altered or modified by the proposed project. If critical habitat for chinook salmon is designated before the proposed project is completed, a provisional effect determination is that the project **is not likely to adversely affect chinook salmon critical habitat**.

This project **is likely to significantly impact individual steelhead, but not significantly impact the population or suitable habitat for steelhead**. This determination is based on the same rationale provided for the potential effects on bull trout.

Overall, the proposed project **will not adversely affect essential fish habitat for Pacific salmon**. The habitat restoration project is likely to improve essential fish habitat over the long term.

Introduction

This biological assessment was prepared for Clear Valley Environmental Farm, LLC, in accordance with Section 7(c) of the federal Endangered Species Act of 1973. It was prepared in support of the proposed Skagit Environmental Bank habitat restoration project, which will be implemented approximately 1.5 miles northeast of Mount Vernon, in Skagit County, Washington (Figure 1). This project will restore reaches along lower Nookachamps Creek (main stem), the east fork of Nookachamps Creek, and their associated palustrine and riverine wetlands. The development of this mitigation bank is being coordinated with the Mitigation Bank Review Team which includes members of the Washington State Department of Ecology, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, and the Washington Department of Natural Resources. The proposed project will be constructed in three phases and will reestablish or rehabilitate 13,000 feet (2.5 miles) of existing stream channel and riparian habitat, construct 9,720 feet (1.8 miles) of new high-flow channel, and reestablish or rehabilitate 340 acres of palustrine emergent, scrub-shrub, and forested wetlands (including the powerline easement but excluding the waterline easement) into a mosaic with restored upland habitat.

Although stream riparian, wetland, and floodplain functions have been severely degraded by landscape modifications and land uses, the existing project site offers excellent restoration opportunities for habitat rehabilitation through the implementation of projects that reintroduce channel complexity, riparian vegetation, and floodplain connectivity. The proposed restoration activities described in this report are based on field studies conducted in September and October 2004, and on subsequent data analyses completed for the project site.

Nookachamps Creek is a tributary of the Skagit River which is located approximately 1.5 miles north of the project site. Site conditions provide restoration opportunities to significantly improve riparian functions and the quality of habitat. As with most stream systems in the Puget Sound basin, Nookachamps Creek has been subjected to significant geomorphic and habitat changes that include deforestation of riparian forests, floodplain isolation by levee construction, and modification of water discharge (and wood and sediment supply) through changes in land use. The overall effects of these changes have resulted in a decrease in channel complexity and diversity of aquatic, riparian, floodplain, and wetland habitats.

The overall property to be acquired by the project proponent consists of 805 acres of farmland that is currently a dairy and cattle farm. Corn is planted on much of the property each year, and the rest is grazing pasture land. The current property owner is not willing to sell a portion of the property to the project proponent; he will sell the entire only. This provides the advantage of selecting the best 421 acres (340 restored acres and 81 acres of 150-foot planted buffer area) of the farm to restore and turn into a wetland mitigation bank. These 421 acres are hereafter referred to as the project site.

The plans for the remaining 384 acres of the former dairy property are currently unknown. The project proponent is actively seeking a nonprofit organization or other conservation group to assume ownership of the remaining acreage in order to restore and preserve the area. If an

appropriate owner is not found, the remaining acreage will likely be leased for continued agricultural uses, including stock grazing and row crops. In any case, a buffer with a minimum width of 150 feet will be maintained around the newly restored areas of the property. All activities on the adjacent acreage will comply with the goals and objectives of the wetland mitigation bank in addition to the applicable rules and laws affecting mitigation banks.

This biological assessment was conducted to evaluate the short- and long-term environmental effects of construction activities associated with development of the Skagit Environmental Bank in the 100-year floodplain of the main stem of Nookachamps Creek and the east fork of Nookachamps Creek. The purpose of this assessment was to determine whether any protected species are present within the project area and whether they or their food stocks or habitats will be adversely affected by the proposed habitat restoration project.

The U.S. Fish and Wildlife Service (USFWS) identified the following threatened or endangered animal and plant species as potentially occurring in Skagit County, in the area of the proposed project (see Appendix A):

- Canada lynx (*Lynx canadensis*)
- Gray wolf (*Canis lupus*)
- Grizzly bear (*Ursus arctos = U.a. horribilis*)
- Marbled murrelet (*Brachyramphus marmoratus*)
- Northern spotted owl (*Strix occidentalis caurina*)
- Marsh sandwort (*Arenaria paludicola*)
- Golden paintbrush (*Castilleja levisecta*).

The USFWS also identified two candidate species as potentially occurring in the area:

- Pacific fisher (*Martes pennanti pacifica*)
- Oregon spotted frog (*Rana pretiosa*).

Although these species are listed as potentially occurring in Skagit County, none of them is likely to be present, and no suitable habitats are available in the vicinity of the project site because of extensive urbanization and commercial development in the project area. Consequently, these species are not discussed further in this report.

The marbled murrelet is known to nest in forests located approximately six miles upstream from the site. The typically use the river valley as a flyway when traveling towards open water in the Puget Sound. The proposed project will not change the flyway or disturb any flight patterns of the murrelet; and therefore, this species is not addressed further in this report.

Two species listed by the USFWS and the Washington Department of Fish and Wildlife (WDFW) are most likely present in the project area and therefore are addressed in this report (see Appendix A; USFWS 2005; WDFW 2005):

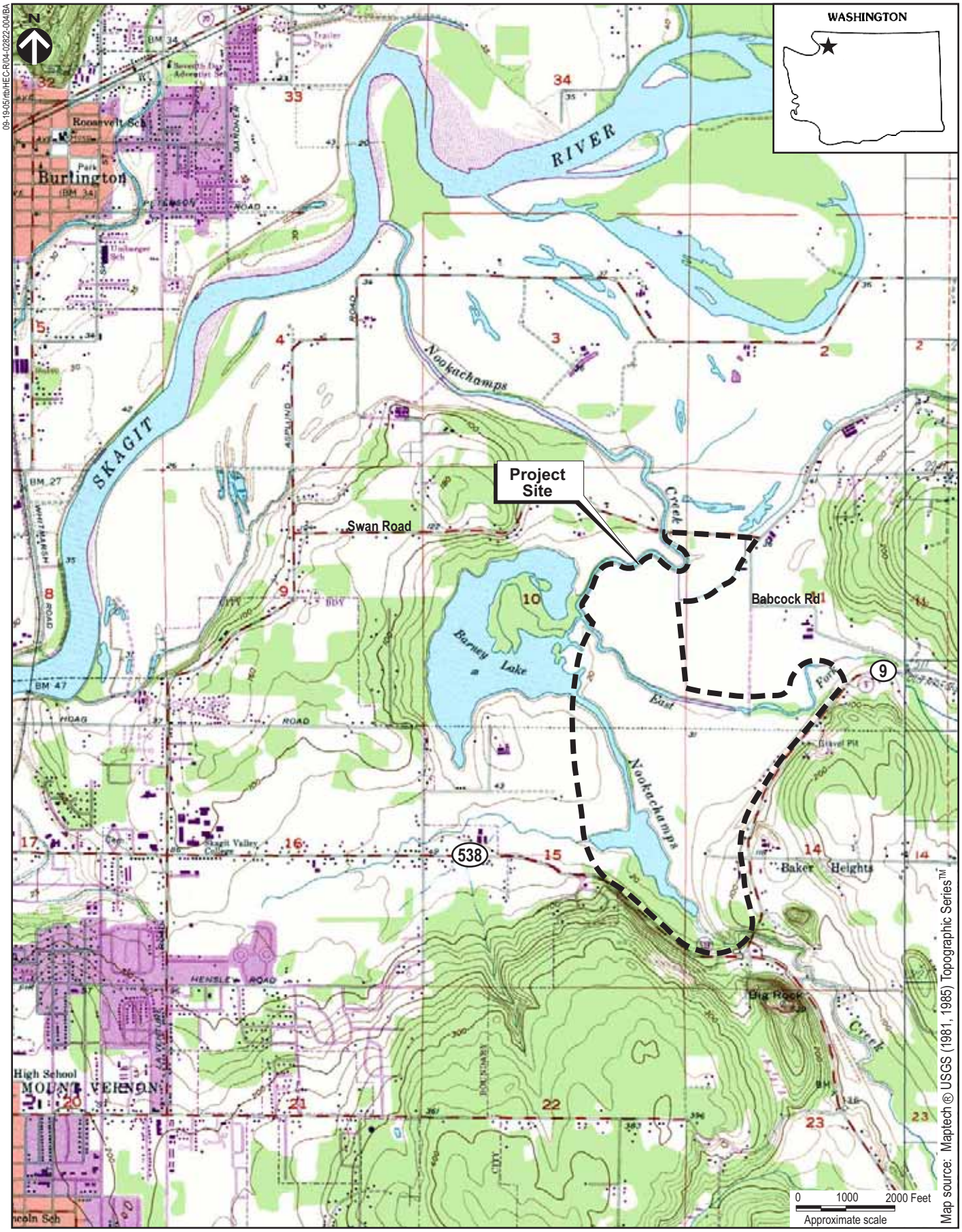

Figure 1. Vicinity map of the Skagit Environmental Bank habitat restoration project site, Skagit County, Washington.

- Bald eagle (*Haliaeetus leucocephalus*): federal threatened and state threatened species
- Bull trout (*Salvelinus confluentus*): federal threatened species and state candidate species
- Proposed critical habitat for bull trout.

Information from the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) indicates that the following species may also occur in the project area:

- Puget Sound chinook salmon (*Oncorhynchus tshawytscha*): federal threatened species and state candidate species (NOAA Fisheries 2005)
- Proposed critical habitat for Puget Sound chinook salmon.
- Puget Sound steelhead (*Oncorhynchus mykiss*): petition accepted to review the federal status (NOAA Fisheries 2005).

Project Description

Project Purpose and Need

The purpose of the Skagit Environmental Bank habitat restoration project is to create and preserve valuable habitat processes and functions in a way that contributes to achieving a significant net gain of those habitat values and strengthens the integrity of those ecosystems. The Skagit Environmental Bank sponsor and owner is Clear Valley Environmental Farm, LLC, a limited liability company. Clear Valley Environmental Farm, LLC, will buy the property and construct the Skagit Environmental Bank on a portion of the acquired property. The development of this mitigation bank is being coordinated with the Mitigation Bank Review Team (MRBT; Ecology 2005a).

The goal of the proposed restoration project is to create a general use, multi-client mitigation bank by restoring various reaches of the main stem of Nookachamps Creek, the east fork of Nookachamps Creek, and their associated floodplain wetlands. The project will restore stream hydrologic processes, stream riparian areas, high flow-channel habitat, and associated palustrine emergent, scrub-shrub, and forested wetlands.

The objectives of the proposed project are the following:

- **Improve water quality in the lower Skagit River watershed** by increasing concentrations of dissolved oxygen through a reduction in nutrients entering the stream, a reduction in sediment inputs to streams, and a reduction in floodplain erosion due to surface water runoff. Significant amounts of nitrogen and phosphorous fertilizers and fecal coliform bacteria will be eliminated by removing the dairy farm operation which will contribute to the water quality of the main stem Nookachamps Creek and east fork Nookachamps Creek.

- **Improve hydrologic and other floodplain processes** by improving streamflow maintenance, floodplain connectivity, stormwater attenuation, and ground water recharge; by reducing stream width-to-depth ratios; and by reducing the frequency and duration of low surface flows.

- **Improve fish habitat** by increasing the quality and diversity of aquatic and riparian habitat; by providing rearing, refuge, and migration habitat for fish, amphibians, reptiles, and other species that depend on aquatic habitat; by improving water quality; by reducing sediment runoff into the streams; and by reducing water temperatures in the summer over the long-term development of the site. In the short-term, some new channels will remain unshaded until the newly planted trees have matured and can shade

the water from the sun. However, these new unshaded channels will have water flow only during the winter when water temperatures are not apt to increase to levels that are unhealthy for fish.

- **Improve conditions of wildlife habitat and critical habitat for endangered species** by improving critical habitat for the bull trout, bald eagle, Puget Sound chinook salmon, and for many other unlisted fish and wildlife species; by providing additional winter roosting refuge habitat for numerous species of ducks, trumpeter swans, Wrangel Island snow geese, Canada geese, and other wildlife; and by enhancing the existing bald eagle habitat with increased foraging opportunities and forest cover protection.

- **Improve local and regional wildlife habitat connectivity** by connecting the 340 acres that constitute the project site and the 2.5 miles of stream corridor that run through the project site with nearby areas of wetlands and stream corridors, and by adding a major feeding and resting habitat for migrating fish and a stop-over area for moving/migrating birds coming from a network of nearby significant waters of the state (e.g., Skagit River, Barney Lake, and Puget Sound).

The project site was selected for the following reasons:

- The hydrologic and hydraulic conditions of the site offer significant opportunities to create a self-sustaining restoration site with numerous functions.

- The site contains large and contiguous areas of drained hydric soils that, when restored, will provide significant improvements in terms of physical and ecological functions to the lower Skagit River watershed.

- The overall results of the restoration will make a significant contribution to the achievement of the watershed planning goals.

- There is a potential for restoring high-quality salmonid habitat and numerous other wetland and floodplain functions within the restored streams and floodplains.

- The magnitude of the potential improvements in physical and ecological functions is significant; this site offers extremely high "bang-for-the-buck" or return of functional improvement for the money spent on restoration.

- The restoration bank site restoration will connect with wetlands adjacent to four sides of the property to form a total wildlife corridor of contiguous wetlands 11.1 miles long and totaling 925 acres. On a regional connectivity scale, the restoration bank site will add a major feeding and

> resting stopover opportunity for migrating fish and birds coming from a network of 10 other, nearby, significant waters of the state.

In July 2004, the Clear Valley Environmental Farm, LLC, initiated the formal process to restore 340 acres of palustrine and riverine wetlands (including the powerline easement but excluding the waterline easement) within the 100-year floodplain and along 2.5 miles of stream corridor along the main stem and the east fork of Nookachamps Creek. The restoration will include an additional 81 acres of wetland and stream buffers surrounding the restored areas.

Representatives of the Mitigation Bank Review Team have already met on three separate occasions to discuss and approve the proposed conceptual design for the Skagit Environmental Bank habitat restoration project.

Project Location

The project site is located 1.5 miles northeast of the urban center of Mount Vernon, Washington, just outside the Mount Vernon city limits (Figure 1). It is bounded by State Route (SR) 538 on the south, and SR 9 on the east, and Swan Road on the north. The main stem of Nookachamps Creek flows through the western portion of the site. The project site lies in Sections 10, 11, 15, and 14, Township 34 North, Range 4 East on the Mount Vernon 7.5-minute quadrangle map (USGS 1981).

The Nookachamps Creek watershed is located in the Lower Skagit-Samish River Water Resource Inventory Area 3 (WRIA 3). WRIA 3 drains an area of 741 square miles and is located in the Cascade and Puget Lowland ecoregions of Washington state (SCDPCD 1995). Average precipitation in WRIA 3 is 37 inches per year (SCDPCD 1995).

The main stem of Nookachamps Creek (which is designated as Stream 03-0227), originates at the outlet of Lake McMurray and drains an area of approximately 70 square miles (WDF 1975). The main stem flows for 14.3 miles to the northwest and drains into Big Lake before continuing north through the project site. Nookachamps Creek flows into the Skagit River at river mile (RM) 18.8, between the towns of Burlington and Sedro Woolley. The east fork of Nookachamps Creek is approximately 9.4 miles long and joins the main stem of Nookachamps Creek at RM 2.9, near the wetlands adjacent to Barney Lake. A major tributary of the east fork of Nookachamps Creek (Walker Creek) flows into the east fork at RM 5.1.

Project Components

The Skagit Environmental Bank habitat restoration project will restore reaches of the main stem of Nookachamps Creek, the east fork of Nookachamps Creek, and associated floodplain wetlands. The proposed restoration project will reestablish or rehabilitate 13,000 feet (2.5 miles) of existing stream channel and riparian habitat, construct 9,720 feet (1.8 miles) of new high-flow

channel, and reestablish or rehabilitate 340 acres of palustrine emergent, scrub-shrub, and forested wetland. An additional 81 acres of 150-foot buffer will be planted and preserved as part of the bank site. The total area of the proposed restoration activities is 421 acres (this is equal to 340 acres of restored wetland and 81 acres of restored buffer).

The primary design objectives for the mitigation bank are to restore the wetland and floodplain functions that were typical on the project site before the disturbance due to agricultural land use, to produce a restored system that is dynamic and self-sustaining, and to create a long-term management plan to address unforeseen changes.

The land use adjacent to the project site and beyond the buffer boundaries that will be restored is floodplain habitat, primarily forested. The project proponent is currently working with nonprofit and government organizations to share the ownership and management of the remaining property surrounding the project site, with the intent that the area be restored to forested wetland, riparian habitat, or wintering waterfowl foraging areas. If any of the property surrounding the project site is conveyed, the project proponent intends to put binding perpetual legal recorded limitations and use conditions on the conveyed property that limit its uses to those that will be consistent with the Skagit Environmental Bank restoration project plans.

Reestablishment of Former Wetlands and Rehabilitation of Existing Wetlands

Based on historical information and aerial photographs, all areas of the project site were wetlands before 1941. The proposed project includes the "reestablishment" (or restoration) of the 286 acres that are currently nonwetland (referred to throughout the rest of this report as "historical wetlands"). These historical wetlands currently exhibit nonhydric conditions that are artificially maintained by the existing drainage ditches, or they are areas that have been graded (to create filled areas) to slope toward the streams or drainage ditches. The proposed project includes the "rehabilitation" (or enhancement) of the remaining 54 acres of existing wetlands or areas that are being farmed but still exhibit some wetland characteristics.

Functional Phasing Approach

In order to avoid the potential for misinterpreting the hydrologic response to the various components of the restoration activities, a unique, three-phased approach is proposed for the restoration. This approach is called the "functional phasing" method of restoration. With the functional phasing approach, work in each of the three phases will consist of changes implemented in a logical sequence that will incrementally restore specific functions on the entire site, rather than making construction modifications to change all the functions on individual portions of the project site.

Generally, with the functional phasing approach, restoration will proceed according to the following sequence: (1) make modifications to restore the hydrology to the entire project site, (2) sow seeds to produce a cover crop of wetland vegetation and wait three years, (3) design the high-flow channels based on the new hydrologic conditions and excavate the high-flow channels

three years after the initial hydrology modifications, (4) plant vegetation in those areas with the restored hydrologic conditions using appropriate plants, (5) 2 years later, excavate the remaining "high" areas (areas that do not exhibit the required wetland hydrologic conditions), and (6) plant the excavated areas. The above sequence is described within the following three functional phases.

Functional Phase 1

During Phase 1 of the restoration, all the modifications necessary to restore the wetland and floodplain hydrology will be completed. These modifications consist of filling all the drainage ditches and constructing one engineered logjam (ELJ) in the main stem of Nookachamps Creek and three ELJs in the east fork of Nookachamps Creek (please see Figures 2 and 3).

Data from monitoring wells previously installed on the project site indicate that the ditches throughout the site are functioning to drain or lower the ground water levels in certain areas of the site. On the basis of experience with other restoration projects involving the placement of ELJs, is it expected that the placement of the ELJs will raise the average stream levels and the surrounding ground water levels.

It is expected that, as a result of these modifications, wetland hydrologic conditions (saturation within 1 foot of the surface for more than 12 days) will be restored to more than 60 percent of the wetland restoration area (204 acres). If historical agricultural practices had not resulted in the grading of the field edges to create bermed areas, it is believed that filling the ditches and placing the ELJs would restore 100 percent of the site's former hydric conditions.

A model will be run to produce a more accurate estimate of the area that will be hydrologically restored solely by completing the ELJ and ditch modifications.

At the conclusion of the Phase 1 activities, a cover crop of native herbaceous vegetation will be planted to stabilize the soils for 3 years.

Functional Phase 2

During Phase 2 of the restoration, the exact area of hydrologic change will be measured (using well data from a network of 28 wells that are currently located throughout the restoration bank site) 3 years after construction of the ELJs and the ditch filling. Based on the measured changes in stream levels and ground water hydrology, the high-flow channels will be constructed (please see Figure 4). These high-flow channels will provide valuable off-channel habitat for salmonid and waterfowl species.

After the construction of the high-flow channels, areas with appropriate hydrologic conditions in and adjacent to the channels will be planted. The choice of plants (herbaceous, shrubs, or trees) will depend on the hydrologic requirements of the plant species and the actual hydrologic conditions of the site as measured at the monitoring wells. Areas that exhibit the required hydrologic conditions and are not included in the area of excavation will also be planted appropriately with native plants.

Phase 1 and Phase 2 activities are anticipated to result in a restored area that is approximately 70 percent of the total wetland restoration area (238 acres).

Functional Phase 3

During Phase 3 of the restoration, most of the remaining areas of the site that remains nonhydric after modifications in the previous phases, will be excavated (down to the appropriate hydrologic conditions) to achieve the desired wetland conditions or planted as riparian forest. A portion of these areas will be excavated in order to achieve the desired wetland hydrology, and will subsequently be planted with wetland vegetation. We anticipate that approximately 30 percent of the restored project site will become forested upland "islands".

Historical information suggests that the removal of large woody debris from the streams and the construction of the ditches were the major influences on the existing hydric conditions. The high spots or bermed areas appear to be an attempt to move soils to create drainage across the once flat fields. They may have also been created to confine streamflow to the stream channels. Because these graded areas were sculpted to be at higher elevations than what naturally existed, they are not likely to become hydric after the modifications in Phases 1 and 2. Therefore, some areas will likely need to be excavated in Phase 3.

General Design Considerations

Wetland Design Construction and Hydrology

Stream channels on the project site now lack hydraulic complexity (see Photos 1 and 2 in Appendix C). Therefore, one of the primary restoration objectives is to direct some of the flow from the streams into newly constructed high-flow side channels. This will serve to expand the area of the floodplain and to sustain wetland habitats.

The key to the success of the proposed restoration project will be the management of the hydrologic regime. The addition of the ELJs and filling of the ditches will allow the actual change in ground water and stream elevations to be monitored.

The high-flow side-channel areas will be excavated to a depth defined by the ground water elevations and the stream fluctuation data; the high flow-channel areas will also be connected to the ground water table. During most of the dry season, the side-channels will have a low flow elevation that will provide "seasonally inundated or saturated" surface conditions. During the nongrowing rainy season, these channels will be permanently flooded and will provide fish and waterfowl habitat. The ground surface will be graded to drain toward the stream systems, which will prevent any ponding of water or stranding of fish. During all the proposed grading, the top 12 inches of soil will be stockpiled so that it can be returned to the restored areas. The high-flow channels will be designed and graded to prevent fish stranding as water levels recede.

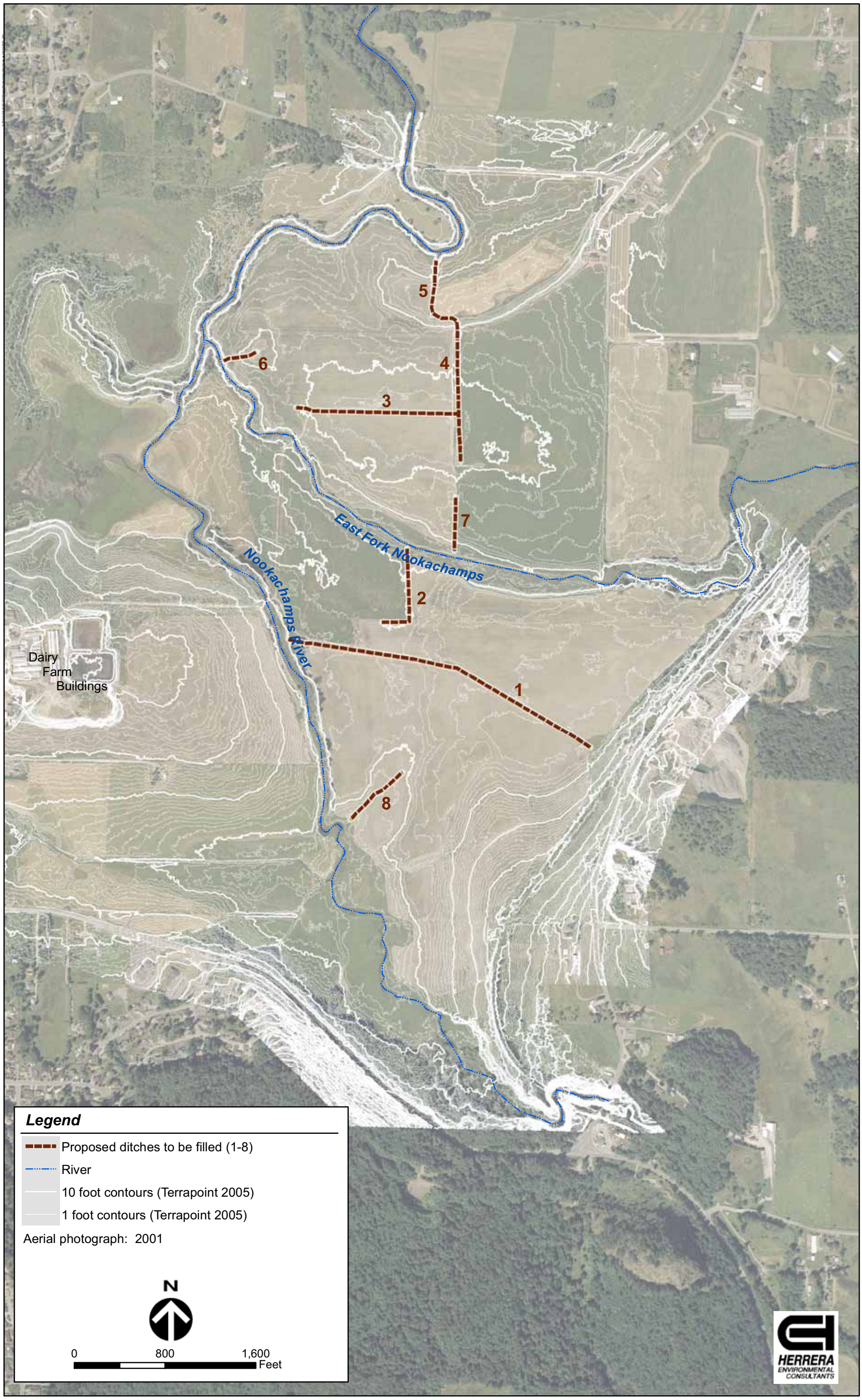

Figure 2. Ditches to be filled in Phase 1, Skagit Environmental Bank.

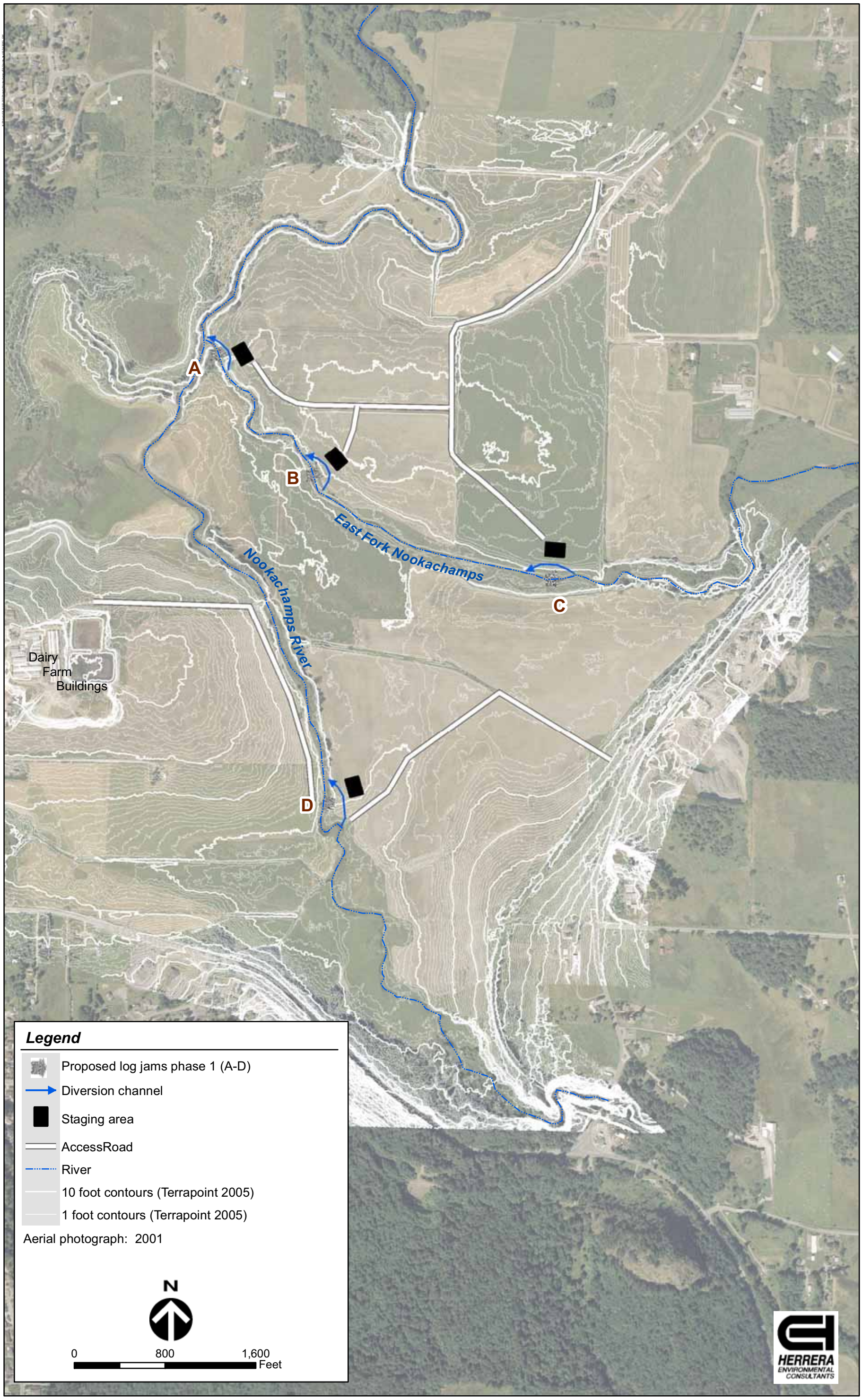

Figure 3. Proposed locations of engineered log jams, diversion channels, and staging areas to be constructed in Phase 1, Skagit Environmental Bank.

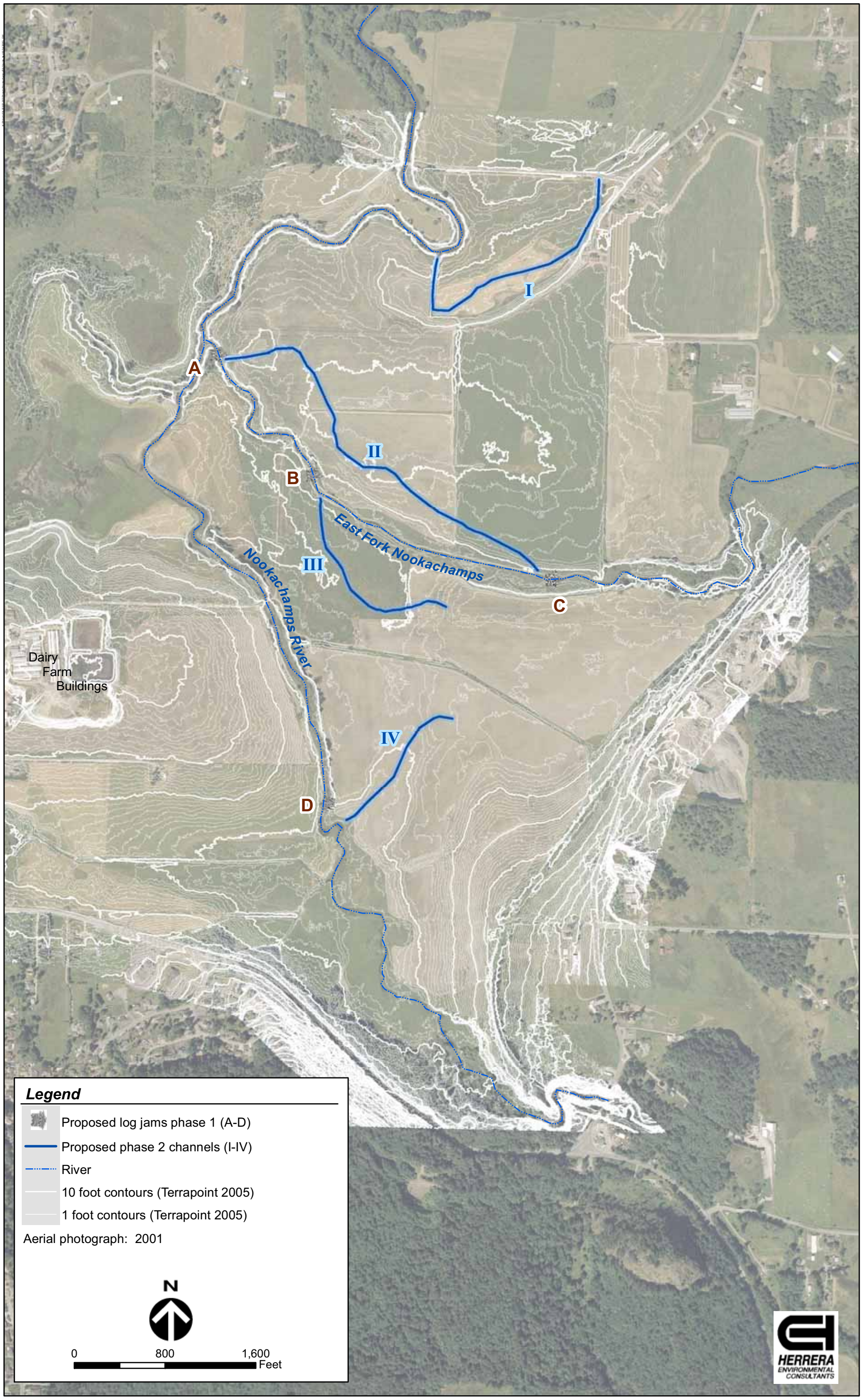

Figure 4. New channels to be constructed in Phase 2, Skagit Environmental Bank.

Ditch Treatments

Drainage ditches are designed to minimize crop damage resulting from ponded water. This type of drainage system includes land leveling and smoothing and the construction of ditches that often drain to natural waterways. Although surface drainage systems like this are designed to remove surface water, ditches that intersect with the shallow ground water table may also result in lower ground water levels.

Backfilling drainage ditches and disconnecting them from the streams is expected to raise ground water levels and restore floodplain hydrologic conditions in these areas of the project site. The effectiveness of decommissioning the drainage ditches will be assessed by comparing ground water levels, using well data, for a period of 1 year before and 1 year after the construction activities.

Proposed Plantings

Plants will be selected based on research conducted within the Skagit River watershed. The following sources will be used to develop the plant list:

- Existing and proposed restorations in the area
- Rare plant communities and wetland ecosystems (Washington Natural Heritage Program)
- Two studies that have documented the historical plant materials and communities present in the 1800s: *Historical Aquatic Habitat in River Valleys and Estuaries of the Nooksack, Skagit, Stillaguamish, and Snohomish Watersheds* (Collins and Sheikh 2003) and *Mid-19th Century Stream Channels and Wetlands Interpretation from Archival Sources for Three North Puget Sound Estuaries* (Skagit System Cooperative 2000).

Changes in Functional Values

Improvements in physical, chemical, and biological functions will result from the following project elements:

- Restoration of the stream and floodplain geomorphic processes
- Addition of off-channel rearing and refuge habitat
- Restoration of the emergent, forested, and scrub-shrub wetland habitats
- Restoration of riparian habitat throughout the project site.

Although it is believed that the removal of the dairy operation that now occupies the land on and around the project site will provide significant water quality functional improvement, this is not the focus of the creation of the mitigation bank.

A functional assessment of the existing and proposed wetlands at the site was conducted using the *Methods for Assessing Wetland Functions, Volume I: Riverine and Depressional Wetlands in the Lowlands of Western Washington* (Hruby et al. 1999) to evaluate the existing and proposed functional value of the existing and historical wetlands at the bank restoration site. A complete report of the functional analyses conducted at the site is presented in Appendix D. Four existing wetland units and three historic wetland units were identified and assessed at the site.

The four existing wetlands are riverine wetlands associated with Nookachamps Creek and east fork Nookachamps Creek and make up 83 acres. These wetlands are dominated by reed canarygrass and plowed fields. Based on the best estimates of proposed conditions, these existing wetlands will receive a significant functional improvement in all of the 15 functional value scores included within the water quality and hydrology functions, as well as the habitat suitability functions.

The three historic wetlands identified at the bank restoration site are currently plowed fields where the historic wetland conditions have been greatly altered and total approximately 259 acres. As with the existing wetlands, the best estimates of proposed conditions were used to complete the functional assessment of historic wetlands. These existing wetlands also will receive a significant functional improvement in all of the 15 functional value scores included within the water quality and hydrology functions, as well as the habitat suitability functions.

Phase 1 Construction Details

Phase 1 includes filling all of the ditches and constructing four ELJs in the main stem of Nookachamps Creek and the east fork of Nookachamps Creek in order to repair the floodplain hydrology to conditions that existed before the ditches were installed (see Figures 2 and 3).

Ditch Filling

A total of 8,550 linear feet of ditch will be filled during Phase 1 (Figure 2). When the volume of material in the berms adjacent to the ditches is insufficient to backfill the ditches, areas adjacent to the berms will be gently graded to provide backfill material. The volumes of material in the ditches and berms on the project site, in addition to the area (plan view) of the ditches, berms, and adjacent areas that will be disturbed during the ditch filling is indicated in Table 1. The estimated total area to be disturbed during the ditch filling is 1,199,100 square feet (27.5 acres), which is the sum total of the estimated area of disturbance in the ditches (361,490 square feet), the berms (175,050 square feet), and the areas adjacent to the berms (662,519 square feet). This results in approximately 19,400 cubic yards of fill that will be permanently placed in the ditches: approximately 2,800 cubic yards of berm that will be used as backfill for the ditches and approximately 16,600 cubic yards of fill material that will be obtained from areas adjacent to the berms. Disturbance of the areas adjacent to the berm, which total approximately 662,500 square feet (15.2 acres), will constitute a temporary impact. These disturbed areas will be replanted with temporary erosion control plants and later with wetland plants.

Table 1. Dimensions of ditches, berms, and adjacent areas to be disturbed during Phase 1 ditch filling.

Ditch ID	Ditch Length (feet)	Ditch Width (feet)	Ditch Depth (feet)	Ditch Volume (cubic feet)	Berm Volume (cubic feet)	Volume of Fill Needed from Adjacent Areas (cubic feet)	Disturbed Area in Plan View (square feet)			Width of Adjacent Disturbed Area (feet)
							Ditch	Berm	Adjacent Area [a,b]	
1	3,000	30.0	1.2	61,200	50,175	11,025	90,000	67,500	44,100	15
2	900	36.0	0.6	9482	6,642	2,840	32,418	20,250	11,360	13
3	1,400	18.1	0.6	7,353	6,800	553	25,354	31,500	2,210	2
4	1,300	66.0	5.4	235320	0	235,320	85,813	NB	313,760 [c]	241
5	800	54.2	7.1	153,581	0	153,581	43,320	NB	204,775 [c]	256
6	200	31.0	2.2	6,995	1,380	5,614	6,190	4,500	22,457	112
7	450	66.1	1.0	14,873	10,260	4,613	29,745	51,300	18,450	41
8	500	97.3	1.4	34,055	0	34,055	48,650	NB	45,407[c]	91
Totals	**8,550**			**522,858**	**75,257**	**447,600**	**361,490**	**175,050**	**662,519**	

NB – No Berm.
[a] When berms adjacent to ditches are absent or estimated to be of insufficient volume to backfill ditches, adjacent areas will be gently graded to obtain backfill material.
[b] Average depth of grading is assumed to be 0.25 feet unless otherwise noted.
[c] Average depth of grading is 0.75 feet.

Before ditch filling occurs, ditches and adjacent berms will be stripped of vegetation. The removed vegetative material will be composted in upland areas of the project site.

Grade Control Engineered Logjams

Four ELJs will be constructed: one in the main stem of Nookachamps Creek and three in the east fork of Nookachamps Creek (see Figure 3). ELJs are being constructed to provide grade control and to raise local water levels in order to reestablish floodplain hydrology to predrained and pregraded conditions.

The ELJs are complex structures consisting of logs (key members) with and without rootwads, timber piles, racking material, ballast material, and native backfill. The dimensions and volumes of materials to be placed in the stream channel as part of the ELJ structures are provided in Table 2.

Table 2. Components and dimensions of construction materials for grade control ELJs to be constructed during Phase 1.

ELJ Component	Dimension	Number	Volume (cubic yards)
Key logs	24- to 36-inch diameter	up to 50	NA
Racking material	3- to 12-inch diameter		50
Piles	18 to 24 inches	12	NA

NA = not applicable.

The ELJs will span the entire width of the stream channel and will be keyed into the adjacent stream banks. The ELJs will be keyed into each bank to a distance that is equivalent to approximately one-third the width of the channel that is spanned. The dimensions of the ELJs and areas that will be disturbed during ELJ construction are indicated are Table 3.

Table 3. Dimensions of grade control ELJ structures to be constructed during Phase 1.

ELJ Site ID	Channel Width (feet)	Estimated ELJ Width (feet)	ELJ Length (feet)	ELJ Footprint (square feet)	Disturbed Bank Area (square feet)
A	90	150	50	7,500	3,000
B	75	125	50	6,250	2,500
C	50	83	50	4,167	1,667
D	125	208	50	10,417	4,167

(See Figure 3 for ELJ locations.)

The ELJs will be approximately 50 feet long, as measured parallel to the channel, to allow for a gentle gradient that does not limit fish passage (see Plan Sheets in Appendix B).

All material excavated during ELJ construction will be reused.

Construction Equipment

Typical construction methods will be employed during Phase 1. Equipment used to remove vegetation and grade ditches and berms, construct ELJs, and provide general site grading will include but will not be limited to excavators, dozers loaders, articulated log loaders, log yarders, skidders, and other standard road equipment used in heavy road construction.

Equipment necessary to complete the proposed Phase 1 activities may include the following:

- Class 300 excavators with long-reach booms for structure excavation, tree/rootwad transport, and log placement
- Log skidders
- Haul trucks (dumps and low boys)
- Cable, sheaves, and winches for log procurement and placement
- Log loaders for log loading and placement
- Loaders for soil transport
- D-6 through D-8 dozers for bulk grading and excavation
- Backhoes

- Off-road 12- to 20-cubic-yard dump trucks
- Pile drivers (impact or vibratory).

Low ground-pressure equipment (less than 4.5 pounds per square inch [psi]) will be used in sensitive areas and in areas adjacent to wetlands.

Specific Construction Elements

Temporary Erosion and Sedimentation Control

Typical temporary erosion and sedimentation control (TESC) measures will be employed during construction activities. All TESC measures will be installed before project activities begin. Project engineers who are on the site during construction will monitor the TESC measures daily to ensure that they are performing as specified. TESC measures may include but are not limited to the following:

- **Placement of silt fences around all work areas.** Approved filter fabrics are Celanese fiber, polyvinyl chloride woven cloth, reinforced chlorosulfinated polyethylene cloth, chlorinated polyethylene woven cloth (e.g., Mirafi 100X, Typar 3401, Stabilenka 100, or an approved equivalent).
- **Stabilization of disturbed areas.** Soils will not be left exposed for more than 2 days from October 1 to April 30, and 7 days from May 1 to September 30. Soils will be stabilized with covering control measures (e.g., mulching, seeding, plastic covering, surface roughening, sod, or jute matting).
- **Delineation of clearing limits and boundaries of sensitive areas.** Boundaries of sensitive areas will be identified, staked, and isolated by orange plastic construction fence and silt fence as determined necessary by the project engineer.

Site Access

The project site will be accessed from the northeast via Babcock Road and/or Swan Road and from the dairy farm facility west of the project area (Figure 3). Work and staging areas will be accessed from the site access points via the existing agricultural road network.

The agricultural road network will be stabilized if it fails to perform as required; however, little maintenance is expected to be needed. If necessary, all vehicles exiting the site will have their tires cleaned before they enter the right-of-way. All washing will take place within a designated area that drains to a sediment trap.

From the agricultural road network, vehicles will use the agricultural fields to access work and staging areas. The vehicles will cross no streams.

All agricultural areas that are disturbed while they are being used for site access will be stabilized and revegetated with a temporary cover crop for erosion control purposes until they are replanted with permanent wetland vegetation during Phase 3.

After the ditches have been filled, the ditch alignments may be used for access to ELJ sites. The ditch alignments will be decompacted and revegetated once the ELJs are constructed.

Ditch Filling

Ditch filling will occur during the summer when water levels in the ditches are expected to be low. If water is present in the ditches, fish handling procedures that are consistent with NOAA Fisheries requirements will be implemented.

Fish handling for the ditch filling will include isolation of the ditch from the main stem or the east fork of Nookachamps Creek using block nets followed by seining of the ditches from upstream to downstream. Further details regarding fish handling procedures will be included in a site-specific fish handling plan that will be completed before the beginning of construction activities.

Before the ditches are cleared of vegetation or filled, and after the necessary fish handling is completed, each ditch will be isolated at the downstream end using a bulk bag dam, and a silt boom will be set up to contain any fine-grained sediment that is mobilized. A water quality monitoring station will be established downstream of the ditch outlet according to permit requirements.

Ditches, the berms adjacent to them, and any additional adjacent areas that will be graded during the ditch filling effort will be cleared of vegetative material before the ditch filling begins.

Any water that remains in the ditches will be pumped to upland areas after the fish removal and before the ditches are filled.

Water intakes for the project, including surface water pumps used to dewater construction areas, will have fish screens installed, operated, and maintained according to the NOAA Fisheries fish screen criteria (NMFS 1995), including the addendum for pump intakes (NMFS 1996a), and the Washington state screening requirements for water diversions (Revised Code of Washington, Title 77, Section 77.55.320 [RCW 77.55.320]). Additionally, all fish screens that will be used for the project will follow the draft *Fish Protection Screen Guidelines* for Washington State (WDFW 2000).

Stream Diversion

The main stem and the east fork of Nookachamps Creek will be diverted from the in-channel construction areas during the construction of ELJ grade control structures. The depth of water in the main stem and the east fork of Nookachamps Creeks may be up to 7 feet at the time of

construction. Therefore, the following steps will be implemented at each of the four ELJ construction locations:

- The upstream and downstream extent of the bypass areas will be isolated using fish block nets, and the area within the block nets will be seined to remove and relocate all fish.

- A bulk bag dam will be installed downstream of the upper fish block net with a pump inlet between the bulk bag dam and the fish block net.

- A second bulk bag dam will be installed at the downstream end of the work area, upstream of the downstream fish block dam, to isolate the ELJ construction area.

- Streamflow from upstream of the bulk bag dam will be diverted around the work area diversion channels to an energy dissipater downstream. A pump within the work area will pump turbid water to upland areas to be infiltrated.

- The diversion channels are expected to be approximately 500 long, with 30 feet of flat bottom and 3:1 side slopes. Each diversion channel will result in approximately 37,500 square feet (0.86 acres) of disturbed ground for a total of 150,000 square feet (3.44 acres).

- The diversion channels will be excavated under dry conditions, and excavated material will be temporarily stockpiled adjacent to the channels. The diversion channels will be lined with biomatting to minimize the disturbance of channel beds and side slopes.

- Water will be introduced to diversion channels slowly, and turbid water will be pumped to upland sedimentation/infliltration areas before the establishment of connectivity between the diversion channels and the main stem or the east fork of Nookachamps Creek.

- Silt booms and turbidity monitoring stations will be in place downstream of the work areas when flows are initiated through the diversion channels.

- Once the grade control structures are completed, flow will be redirected to the main stem channels, and the diversion channels will be backfilled. Similar methods of bulk bag dams and silt booms will be used to minimize any release of turbid water to the main stem or the east fork of Nookachamps Creek.

Construction of Engineered Logjams

This section includes the details necessary to construct the ELJ grade control structures, including but not limited to log procurement and decking (staging), bank excavation, log placement, backfilling of ELJ structures with native materials, and revegetation of ELJ structures.

ELJ grade control structures will be constructed along the main stem and the east fork of Nookachamps Creek. Grade control construction activities will be performed during the low-flow season and the approved fish work window.

The grade control structure will be constructed at the locations and to the dimensions and grades shown on Sheet 4 in Appendix B.

Log Procurement and Decking

Logs for the ELJ structures will be imported from offsite locations and decked on the site until construction. They will be obtained from a permitted log supply source.

Logs will be prepared for decking (staging) by cutting and trimming them to the appropriate length, in accordance with the construction specifications. Limbs will be removed from all logs except those to be used as racking material, unless limb removal is necessary for log placement or hauling.

All material that is decked for more than 3 months will be stacked on sacrificial logs to protect the material from decay.

The contractor will provide clean and unobstructed access to decked material a minimum of 3 days before their intended placement so that the material can be inspected by onsite project engineers.

Bark will not be removed from the logs. Key logs will have rootwads that are 6 to 10 feet in diameter as measured from tip to tip of the multiple branch root structure.

Excavation for Engineered Logjams

Excavated materials will be stockpiled adjacent to the work area to minimize traffic on the project site. Excavated materials that are deemed unsuitable for use as backfill for the ELJ structures by the inspecting engineer will be disposed of by the contractor at a location and in a manner approved by the project engineer. The excavation will be extended to the limits indicated in the conceptual project plans (see Appendix B).

Log Placement

Log placement for the ELJs will be performed for each layer of the ELJ (see Conceptual Plans in Appendix B) to allow clear access for the project engineer to inspect the structure before backfilling.

Inspections by the project engineer will be performed upon completion of each installed log layer as shown in the conceptual project plans. The contractor will provide a 24-hour notice before any required inspection. After the placement of each log layer, the structure will be backfilled and compacted before the placement of subsequent layers. Wooden piles will be sharpened on the tip end to allow the piles to be driven into substrate with the bucket of a backhoe or a vibratory pile driver.

Placement of log material will start at the bottom of the excavation and progress upward in accordance with the conceptual project plans (Appendix B). Material will be placed with as few voids as possible.

The rack material will be placed in a random fashion both horizontally and vertically and will be interwoven between the piles to emulate wood debris as it occurs naturally in floodplain streams similar to Nookachamps Creek. The facing of the rack material will be interwoven and randomly placed horizontally and vertically to resemble naturally occurring logjams.

The logs will not protrude more than 4 feet beyond the rootwads along the eastern half of the structure face. The logs will not protrude more than 1 foot beyond the rootwads along the western half of the structure face. The contractor will trim logs as necessary or as requested by the project engineer.

Grade Control Fill

The backfill will consist of native soil excavated from the work area and stockpiled adjacent to the locations of the grade control structures. Fill material will be placed in lifts no greater than 2-feet deep, and it will be placed after the completion of each individual log layer. Control fill will fill all the voids in the log layer to create an unyielding surface before each subsequent log layer is placed. Before subsequent log placement, the project engineer will inspect all fill layers to ensure the quality of work before additional layers of control fill preclude such inspections.

Revegetation of the Grade Control ELJ Structures

Any saplings will be salvaged from the site for replanting on the grade control structures. Live plants for salvage will be stored such that the roots are covered, the plants are in the shade, and they are kept moist, and any additional measures necessary to ensure their survival will be performed.

As the layers in the grade control structure approach the top of the existing stream bank, the contractor will use live stake poles of native red alder, black cottonwood, and willow to dress the top of the ELJ. The contractor will prepare a minimum of 30 live stake poles for each 50 feet of structure. Live stake poles will not be incorporated until the project engineer approves the poles. Live stake poles will be evenly spaced over the top of the structure where native soils occur to support plant growth.

In the final layer of the grade control structure, nurse logs will be placed randomly to emulate natural conditions. They will be buried to a depth that equals approximately one-quarter of the log diameter.

Revegetation

All areas disturbed by construction activities will be temporarily replanted with a stabilization cover crop consisting of native wetland herbaceous vegetation. Final planting of the site will occur during Phase 3 and will involve planting appropriate native herbaceous, shrub, and tree wetland plants throughout the project site, both in areas that were disturbed during the previous phases and in areas that were not previously affected during the site restoration. Initial wetland plantings will be defined using actual hydrologic data collected on the site after the Phase 1 modifications to the hydrology. A memorandum providing a breakdown of the mix of native plant seeds by species and percentage, and their availability at nurseries, will be included in the construction documents completed before the onset of Phase 1. A reed canarygrass monitoring and maintenance plan will be established throughout the life of the project and beyond for a period of time until the regulatory agencies determine that the plant community is stable and self-sustaining.

Construction Sequence and Schedule

Construction activities are planned to occur during the lowest stream-flow periods, will be coordinated with the WDFW, and will follow the construction timing restrictions of the hydraulic project approval. Phase 1 construction will occur within a 75-day construction window that will be sequenced in order to fit within the construction window for fish protection, which opens June 15 and closes August 31. This construction window may be negotiated with the WDFW Area Habitat Biologist, NOAA Fisheries, and USFWS based on site-specific observations during the construction window.

Within the project area and during construction, fish species that are protected under the Endangered Species Act are expected to potentially occur only within the east fork of Nookachamps Creek. They are not expected to be present in the main stem of Nookachamps Creek due to summer water quality conditions and limited through flow in this stream reach, factors which may limit fish passage.

A bald eagle nest on the project site typically requires that construction work be prohibited within line of sight of the nest from January 1 to August 15. It is unknown at this time whether the nest on the site has been active during the last few years. However, a bald eagle has commonly been observed perching in the immediate vicinity of the nest. Compliance with the two wildlife-protection windows (for fish and bald eagles) poses significant complications for construction phasing. Therefore, USFWS (Missildine 2005) and NOAA Fisheries (Sibley 2005) have been contacted to determine how the requirements of each window will be addressed. In order to meet the requirements of the fish work window that applies to the project site, construction of the ELJs and the ditch filling will take place during the bald eagle nesting season

(January 1 to August 15) and within line of site of bald eagle nest site. The status of the nest will be monitored before construction begins to determine if it is active during Phase 1. If the nest is active during the construction, measures will be implemented to reduce the impact on bald eagles and to document any potential take in the form of harassment (see the section "Conservation Measures").

The construction elements associated with Phase 1 and their estimated duration are presented in Table 4.

Table 4. Phase 1 construction elements and estimated durations.

Construction Element	Estimated Duration (days)
Temporary erosion and sedimentation control	5 to 10
Site access	5 to 10
Material staging	5 to 10
Water management and diversion	5 to 10
Ditch clearing and preparation	5 to 10
Grading	15 to 20
Stream diversion	5 to 10
Construction of ELJ grade control structures	25 to 30

Phase 2 Construction Details

The general construction details for Phase 2 will include much of the details provided for Phase 1. The construction of the high-flow channels will follow the same procedures as those for the construction of the diversion channels:

- Three new channels are expected to be approximately 1,400 to 3,800 feet long and approximately 75 wide. The approximate dimensions of the new channels to be constructed during Phase 2 are provided in Table 5. The actual channel dimensions will not be determined until the hydrologic conditions resulting from the modifications in Phase 1 are analyzed. Up to three additional channels may be added during Phase 3 depending on the results of the hydrologic analysis following completion of Phase 1. Construction details for high-flow channel creation will include much of the details provided from Phase 1.

- The channels will be excavated under dry conditions, with a soil plug left in place at the confluence of the new and existing channels. Excavated material will be stockpiled on the site, in a staging area below the power line alignment or at the dairy farm (see Figure 3).

- The channels may be treated with grade control structures or bio-engineered slope stabilization.

- Spawning-size gravel will be imported to treat the channel beds.

- Water will be introduced to the channels slowly, and turbid water will be pumped to upland sedimentation/infiltration areas before the establishment of connectivity between the high-flow channels and the main stem or the east fork of Nookachamps Creek.

- Silt booms and turbidity monitoring stations will be in place downstream of work areas when flows are introduced into the new channels.

- Disturbed areas will be planted where the hydrologic conditions are well understood and are not expected to change after the channel construction. Other disturbed areas will be treated with a cover crop and will receive final planting during Phase 3.

- Restoration plantings will include native trees such as big-leaf maple (*Acer macrophyllum*), Sitka spruce (*Picea sitchensis*), black cottonwood (*Populus balsamifera*), Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and western red cedar (*Thuja plicata*). Proposed native shrubs include salal (*Gaultheria shallon)*, Indian plum (*Oemleria cerasiformis*), snowberry (*Albus symphocarpus*), elderberry (*Sambucus racemosa*), twinberry (*Lonicera involucrata*), salmonberry (*Rubus spectabilis*), Nootka rose (*Rosa nutkana*), Pacific ninebark (*Physocarpus capitatus*), red-osier dogwood (*Cornus sericea*), Hooker's willow (*Salix hookeriana*), Scouler's willow (*Salix scouleriana)*, Sitka willow (*Salix sitchensis*), and Pacific willow (*Salix lucida*). Proposed emergent plants include skunk cabbage (*Lysichiton americanum*), small-fruited bulrush (*Scirpus mircrocarpus*), various rush species (*Juncus* spp.), and hard-stemmed bulrush (*Scirpus* acutus).

Table 5. Dimensions of new high-flow channels to be constructed during Phase 2.

Channel	Length (feet)	Width (feet)	Area (square feet)
I	2,500	75	187,500
II	3,800	75	285,000
III	1,800	75	135,000
IV	1,400	75	105,000
Total	**9,500**		**712,500**

Phase 3 Construction Details

Phase 3 will include final site grading that will cover up to 20 percent of the project site and final planting of all areas that are not planted during Phase 2.

- Minor grading will remove most of the dry soil areas that remain after phase 1 and 2 operations. The excavation will drop the elevation of the remaining high spots to a point where the hydrologic conditions will support wetland vegetation. Based on our interpretation of existing well data, we anticipate that average changes in ground elevation will not exceed 24 inches.

- It is estimated that approximately 30 percent of the site will remain as upland areas of forested "islands".

- The entire project site will consist of restored native revegetation at the conclusion of Phase 3.

Best Management Practices

Best management practices (BMPs) are practices that are a part of the project design and are implemented to avoid or minimize construction impacts on plant and animal species and the environment. The following sections describe general and impact-specific BMPs that will be implemented as part of the proposed project.

General Requirements

The proposed project will implement BMPs to avoid or minimize construction impacts. The contractor will design BMPs in accordance with the requirements for TESC. These BMPs will be consistent with the Washington State Department of Ecology 2005 Stormwater Manual (Ecology 2005c) and Skagit County requirements (Skagit County 2005) and will be considered part of the proposed project upon which the effect determinations made in this biological assessment are based.

Within the project area, and during construction, fish species that are protected under the Endangered Species Act are expected to potentially occur only within the east fork of Nookachamps Creek. During the summer, they are not expected to be present in the main stem of Nookachamps Creek due to poor water quality conditions and limited through flow in this stream reach, which may preclude fish passage. In-water work required for the proposed project will occur during the WDFW-suggested work windows for the protection of bull trout and salmon that may be present in the east fork of Nookachamps Creek (June 15 to August 31).

Bald eagle restrictions require that work not be conducted between January 1 and August 15 to protect nesting eagles. USFWS (Missildine 2005) and NOAA (Sibley 2005) have been contacted to determine how the requirements of each work window will be addressed. Construction of ELJs and ditch filling will take place during the bald eagle nesting season (January 1 to August 15) in order to meet the requirements of the fish work window that applies to the project site. The status of the onsite nest will be monitored before construction begins to determine if it is active during Phase 1. If the nest is active during the construction, measures will be implemented to reduce the impact on bald eagles and to document any potential take in the form of harassment. For example, construction activities will begin in areas of the project site that farthest from the nest to allow any present chick(s) to mature while construction progresses toward the nest site. Also, timing limitations will be applied if needed to restrict noisy construction activities during early morning hours.

Temporary Erosion and Sedimentation Control

Temporary erosion and sedimentation control (TESC) measures will be in place before work begins. All water and soil particles will be retained on the work site. BMPs will be implemented to prevent dust, soil, and stormwater runoff from entering the main stem and the east fork of Nookachamps Creek.

The BMPs will be monitored and maintained throughout construction. Written records of the weekly reviews of the TESC facilities will be kept on the site throughout the project. In the event that a release of turbid water occurs, the contractor will be directed to stop work and to implement additional erosion and sedimentation controls before work is allowed to proceed.

The TESC measures that will be documented in the TESC plan are the minimum requirements for the expected site conditions. During the construction period, these TESC facilities will be upgraded as necessary for unexpected storm events and changing site conditions (e.g., additional pumps or relocation of silt fences).

Filter fabric for use in the silt fencing will be purchased in a continuous 5-foot-wide roll and cut into the length of the needed barriers to avoid the use of joints. When joints are necessary, the filter fabric will be spliced together only at a support post with a minimum overlap of 6 inches. The fence posts will be spaced a minimum of 6 feet apart and securely driven 12 inches into the ground. The filter fabric will be buried in a shallow ditch upstream and adjacent to the post.

Silt fences will be removed at the direction of the project engineer but not before the upslope areas have been permanently stabilized. Silt fences will also be inspected immediately after rainfall events, and required repairs will be made immediately.

Areas that will be unworked for more than 7 days during the dry season or 2 days during the wet season will be covered with straw, wood fiber mulch, compost, plastic sheeting, or an equivalent material. If straw mulch is used, it will be applied at a minimum thickness of 2 to 3 inches. Areas that remain unworked for more than 30 days will be seeded or sodded. Upon completion

of the project, all disturbed areas will be stabilized. Sediment that has accumulated behind BMP structures will be disposed of in accordance with all local, state, and federal laws.

Stabilized construction entrances and roads will be installed at the beginning of construction and maintained for the duration of the proposed project. Additional measures, such as wash pads, may be required to ensure that all paved areas in the project vicinity remain clean for the duration of the project.

At no time will more than 6 inches of sediment be allowed to accumulate behind a silt fence or in a sediment trap. Cleaning of fencing and sediment traps will not result in the discharge of sediment-laden water into the main stem or the east fork of Nookachamps Creek.

Stormwater collected onsite will be pumped by means of a sump pump to an upslope vegetated area approved by the site engineer for filtering. As described above, temporary stream diversions will be implemented at the location of ELJ construction in order to divert streamflow around the proposed areas of in-water work.

Revegetation

The boundaries of the clearing limits, which will be shown in the construction plans, will be visibly flagged by a continuous tape or fencing before construction begins.

As described previously, the installation of wetland plants will include native tress, shrubs, and emergent vegetation.

Fueling and Lubrication

Fueling and use of lubricating oils and hydraulic fluids will be conducted offsite or at a designated staging area.

Maintenance of Best Management Practices

During construction, the TESC measures will be inspected daily by the TESC supervisor and maintained to ensure proper function. Written records of reviews of the TESC measures will be kept. Additional inspections will be scheduled during storm events, and any required repairs will be made.

Removal of Best Management Practices

After the project is complete, all BMPs will be removed according to the following procedure:

- Evaluate site to determine if the BMP is no longer needed (i.e., the area has been stabilized and the potential for sediment-laden water to exit the area has passed).

- Remove sediment buildup behind the BMP structures.
- Remove the BMP structures (recycle and/or reuse, if applicable).
- Revegetate the area that is disturbed by the BMP removal (if applicable).

Conservation Measures

Conservation measures are designed to avoid or minimize impacts and will be incorporated into the project design. To minimize the incidental take of fish and wildlife during construction, the project will implement the conservation measures discussed below:

Construction Timing

Construction activities are planned during the low-flow periods; they will be coordinated with the WDFW and conform with the construction timing restrictions indicated in the hydraulic project approval. This will help to minimize construction impacts on water quality in the streams and reduce potential impacts on aquatic species that may be present during construction.

Construction Activities Adjacent to and Within the Stream Channel

- Several temporary erosion and sedimentation control (TESC) and pollution control requirements will be included as provisions in the construction contract documents. The TESC plan will include various erosion control and sediment containment measures that will be installed to protect water quality in the main stem and the east fork of Nookachamps Creek and to minimize sediment delivery to these resources. The construction contract documents will include requirements for inspection and maintenance of the TESC measures.
- The TESC plan will be maintained onsite, updated as necessary, and available for review during the project.
- TESC measures will be in place at all times during project construction. Construction within the project vicinity will not begin until the TESC measures for site access and protection of surface water are in place.
- The contractor will develop a site-specific spill prevention, control, and countermeasures (SPCC) plan according to the requirements of the construction contract documents. The SPCC plan will address hazardous materials, fueling and maintenance of equipment, and spill containment and notification.

- The clearing limits associated with site access and construction will be clearly marked to minimize the disturbance of riparian vegetation and other sensitive areas.

Conservation Measures Specific for the Protection of Bull Trout and Chinook Salmon

- A fish handling plan will be prepared and implemented by Herrera Environmental Consultants with support from the contractor during all in-channel work throughout the duration of the project. The fish handling plan will be implemented by, or under the direct supervision of, a qualified fisheries biologist.

- The construction contractor will follow the Hydraulic Code rules that apply to the project, as described in Chapter 220-110 of the Washington Administration Code (WAC 220-118) and as required by the hydraulic project approval.

- All stream diversion channels will be operational before the construction and placement of the ELJ structures within the existing stream channels.

- Water intakes used for the project, including surface water pumps used to dewater construction areas, will have fish screens installed, operated, and maintained according to the NOAA Fisheries fish screen criteria (NMFS 199), including the addendum for pump intakes (NMFS 1996a), and the Washington state screening requirements for water diversions (RCW 77.55.320). All fish screening for the project will also follow the draft *Fish Protection Screen Guidelines for Washington State* (WDFW 2000)

- Water quality in the main stem and the east fork of Nookachamps Creek will be protected during project construction by the use of BMPs described in the section "Best Management Practices."

- Through the implementation of appropriate BMPs, the project proponent and its contractor will ensure that turbidity is minimized as required. Any exceedance of the turbidity criteria during the project will be immediately reported to the Washington State Department of Ecology.

Conservation Measures Specific for the Protection of Bald Eagles

- Because construction activities, including vibratory pile driving, will occur during the bald eagle nesting period, the status of the onsite bald eagle nest will be monitored beginning in the spring, before the beginning of Phase 1 activities. If bald eagles are determined to be using the nest, construction activities will begin at the locations farthest from the nest. Construction activities will move closer to the nest as the project progresses, and a

qualified wildlife biologist will monitor the progress of the nest throughout construction if it is an active nest.

- Under existing conditions, there are few large trees on the project site. Adverse effects on listed bird species in the project area will be minimized by avoiding to the maximum extent practicable the removal of significant trees in the roadway areas used for construction access that were identified as suitable habitat for birds. In general, the removal of existing vegetation on the project site will be minimized to the extent practicable.

- Vegetation removal will not include any potential perch trees that could be used by bald eagles.

- Timing limitations will be applied, if needed, to restrict noisy construction activities during early morning hours.

Monitoring of Conservation Measures

- TESC measures will be inspected and maintained throughout the duration of construction.

- All restoration plantings, with the exception of those on top of the ELJ structures, will be monitored annually for 3 years to ensure that the finished grade slopes are at stable angles of repose and that woody plantings are achieving a cumulative survival of at least 80 percent.

- If the 80 percent survival standard is not achieved, dead plantings will be replaced to bring the site into conformance. If failed plantings are deemed unlikely to succeed, replacement plantings will be installed at other appropriate locations on the project site.

- The water quality of the main stem and the east fork of Nookachamps Creek will be monitored throughout the duration of in-water construction activities.

- The bald eagle nest on the project site will be monitored in the spring before construction begins, to determine the status of the nest. If bald eagles are determined to be using the nest, it will be monitored throughout the construction of the project. All monitoring related to bald eagles will be performed by a qualified wildlife biologist.

Action Area

The *action area* is defined as all areas within the project construction limits (i.e., all areas used for staging and mobilization, all construction areas, and all other areas specifically related to the

project activities), as well as adjacent and downstream areas where direct and indirect effects and effects due to interrelated and interdependent activities may occur during and after construction. Hence, the action area for the Skagit Environmental Bank habitat restoration project includes all areas that may be affected by the actions associated with the proposed project, including but not limited to the actual work site (Figure 5).

The project action area associated with the Skagit Environmental Bank habitat restoration project consists of areas associated with potential terrestrial effects and aquatic effects. The terrestrial portion of the project action area encompasses a 1-mile radius around all noise sources generated by the proposed project. This 1-mile radius represents the zone of potential disturbance due to any source of noise (USFWS 1986). Activities associated with the proposed project include vibratory pile driving and other construction noises.

The zone of potential aquatic impacts extends downstream from the northern end of the project site approximately 1.5 miles to the confluence with the Skagit River, where any sediment would likely settle out and potential turbidity effects would likely become insignificant.

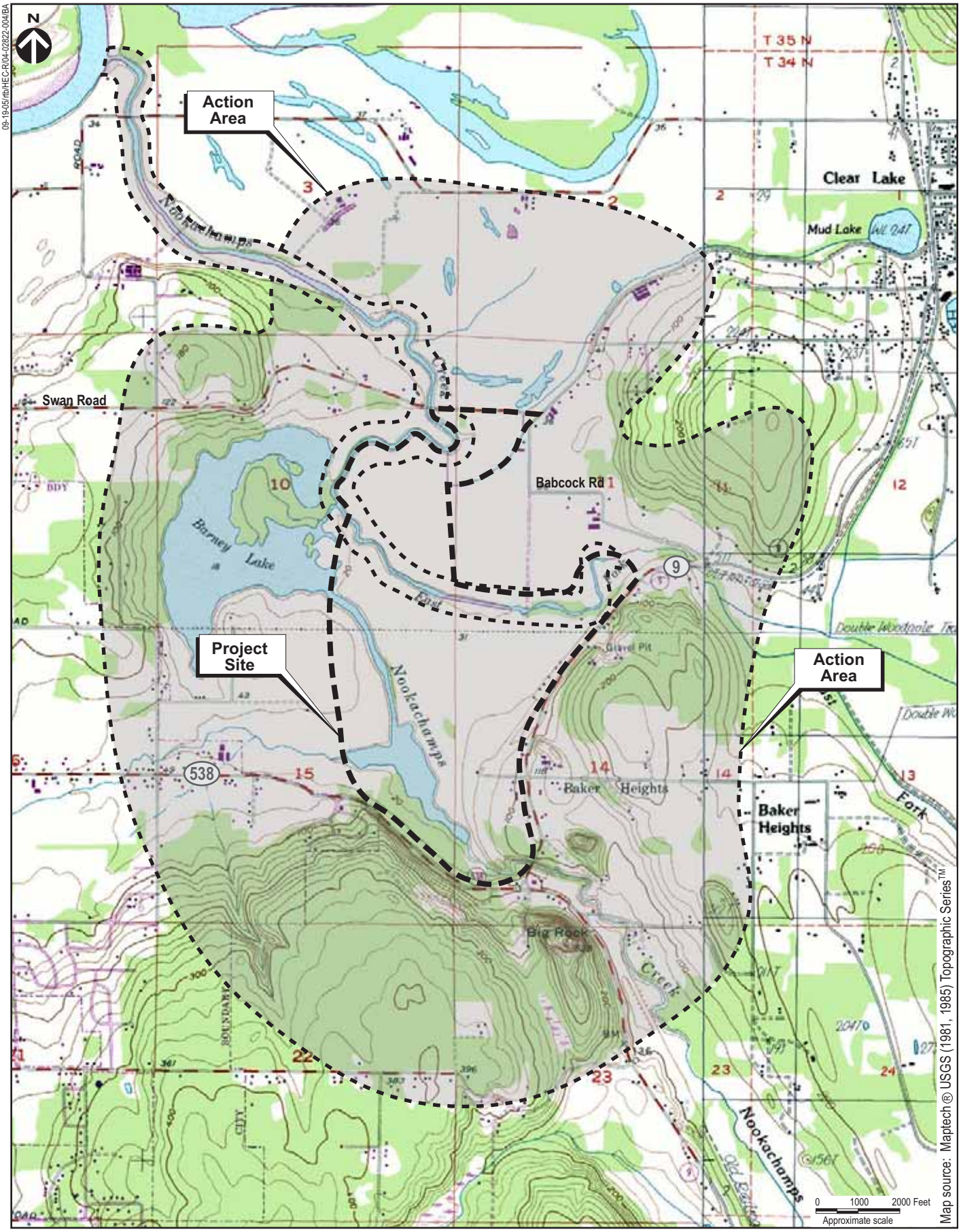

Figure 5. Action area of the Skagit Environmental Bank habitat restoration project, Skagit County, Washington.

Species and Habitat

A listing of protected species for the proposed project was viewed on the U.S. Fish and Wildlife Service webpage on September 5, 2005 (see Appendix A). The USFWS provides only county-level species information (USFWS 2004a). The species listed by the USFWS were cross-referenced with those identified in the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species database (WDFW 2005) to determine which species potentially occur in the vicinity of the proposed project.

Two species listed by the USFWS and WDFW are most likely to be present in the project action area and therefore are addressed in this report:

- Bald eagle (*Haliaeetus leucocephalus*): federal threatened and state threatened species
- Bull trout (*Salvelinus confluentus*): federal threatened species and state species of concern.

The marbled murrelet is known to nest in forests located approximately six miles upstream from the site. The typically use the river valley as a flyway when traveling towards open water in the Puget Sound. The proposed project will not change the flyway or disturb any flight patterns of the murrelet; and therefore, this species is not addressed further in this report.

Information from NOAA Fisheries indicates that the following species may also occur in the project action area:

- Puget Sound chinook salmon (*Oncorhynchus tshawytscha*): federal threatened species and state species of concern (NOAA Fisheries 2005)
- Puget Sound Steelhead (*Oncorhynchus mykiss*): petition accepted to review the federal status (NOAA Fisheries 2005).

Bald Eagle

Species Status

The bald eagle is currently listed as a threatened species under the Endangered Species Act. Historically, bald eagles inhabited most of the continental United States. However, by the mid-twentieth century, their distribution was limited to areas such as the Pacific Northwest, the Great Lakes states, and Florida. There is no critical habitat for bald eagles currently designated.

Life History Information

In the Pacific Northwest, bald eagle populations include local nesting birds and wintering birds. Bald eagles typically breed between January 1 and August 15 in Washington state (Anthony

et al. 1982). Wintering bald eagles congregate along Washington rivers between October 31 and March 31 to feed on stranded, spawned-out salmon. Wide, braided river reaches with numerous gravel bars are the optimal areas for feeding because the gravel bars catch and retain salmon carcasses and provide the eagles with unrestricted flight paths. Diurnal feeding perches selected by eagles tend to be the highest perch site overlooking a good food source. Nocturnal communal perches, on the other hand, tend to be in mature conifer stands that offer protection from cold and inclement weather.

Bald eagles appear to acclimate to traffic noise and are more tolerant of auditory disturbances when the sources are partially or totally concealed from view (Stalmaster and Newman 1979). Human activity is considered potentially disturbing to bald eagles within 0.5 miles of a nest or roost in direct line of sight, or within 0.25 miles when not in direct line of sight. Wintering bald eagles are considered less sensitive to human disturbance than are nesting eagles; however, wintering bald eagles avoid areas with significant human activity. Eagle sensitivity appears greatest during feeding.

Site-Specific Occurrence

Although terrestrial habitat in the project action area is highly influenced by agricultural land uses, the riparian corridor of Nookachamps Creek provides some potential perch trees and habitat for bald eagles (see Photos 4 and 5 in Appendix C).

The Washington Department of Fish and Wildlife has identified one bald eagle nest within the project action area, located on the project site (see Appendix A; WDFW 2005). WDFW has also designated several bald eagle nesting territories in the vicinity of the project site. During visits to the site in 2004 and 2005 by Herrera biologists, bald eagles were observed perched in one of the few large black cottonwood trees that exist in the vicinity of the nest on the project site.

Bald eagles could potentially forage within the main stem and the east fork of Nookachamps Creek but are most likely to use the lowest portions of the stream and the Skagit River to forage. Despite the abundance of fish in Nookachamps Creek, gravel bars and large, overhanging perch tree branches are lacking on the project site, limiting the preferred foraging habitat for bald eagles. However, the Skagit River and Puget Sound shoreline provide relatively good foraging habitat for bald eagles as an alternative habitat to the project site.

In addition, waterfowl on Barney Lake likely provide foraging opportunities for bald eagles on the project site.

Bull Trout

Species Status

The Coastal/Puget Sound bull trout distinct population segment encompasses all Pacific Coast drainages within Washington, including Puget Sound. This population segment is discrete because the Pacific Ocean and the crest of the Cascade Mountain Range geographically

segregate it from subpopulations. The population segment is significant to the species as a whole because it is thought to contain the only anadromous forms of bull trout in the contiguous United States, thus occurring in a unique ecological setting. There is currently no designated critical habitat for bull trout within the project area. There is designated critical habitat for bull trout in the Columbia River basin of Washington state only (USFWS 2004a). However, critical habitat is proposed for the Coastal-Puget Sound bull trout distinct population segment (USFWS 2004b), which includes tributaries of the Skagit River, such as Nookachamps Creek.

Life History Information

The bull trout occurs in four life history forms: anadromous (associated with marine waters), resident (remaining in headwater areas), adfluvial (associated with lake areas), and fluvial (associated with river areas). Fluvial, anadromous, and resident adults can spawn in the same area (WDFW 1998). After spawning, fluvial adults move throughout the upper river areas and remain in pools throughout the winter, spring, and early summer. Bull trout return to their spawning staging areas in late summer. After spawning, anadromous adults begin the downstream migration from late fall through the winter. These adults then enter the estuary area in the spring where they remain until late spring/early summer when they begin their upstream spawning run again. Anadromous bull trout is the likely life history form that could potentially occur within the project action area, and would likely only be foraging and rearing as no suitable bull trout spawning habitat exists in Nookachamps Creek.

Bull trout have more specific habitat requirements than other salmonids and are most often associated with undisturbed habitat with diverse cover and structure. Spawning and rearing activities are restricted primarily to relatively pristine, cold streams, often within headwater reaches. Water temperature is also a critical factor for bull trout, and areas where water temperatures exceed 15 degrees Celsius (°C) limit their distribution (Rieman and McIntyre 1993). Spawning occurs in upstream areas as water temperature decreases to approximately 8°C (WDFW 1998).

Site-Specific Occurrence

Bull trout are reported to occur in the vicinity of the project site, within the main stem of Nookachamps Creek (StreamNet 2005; USFWS 2005 [included in Appendix A]). Bull trout could use Nookachamps Creek for feeding (especially juvenile bull trout) but do not likely spawn in the project action area (StreamNet 2005; Barkdull 2005). Nookachamps Creek does not provide suitable conditions for bull trout spawning, and bull trout have not been documented in the project action area during spawning surveys (Barkdull 2005). During the summer (and potentially year-round), bull trout are not expected to be present in the main stem of Nookachamps Creek upstream of the confluence with the east fork of Nookachamps Creek. Poor water quality conditions and limited through-flow likely preclude the use of this stream reach by bull trout.

Chinook Salmon

Species Status

The Puget Sound chinook salmon was listed as a threatened species by NOAA Fisheries on March 24, 1999. The identified evolutionarily significant unit (ESU) includes all naturally spawned populations of chinook salmon from rivers and streams flowing into Puget Sound, from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula.

There is currently not designated critical habitat for chinook salmon. However, critical habitat is proposed for the Puget Sound chinook salmon distinct population segment (USFWS 2004c). The proposed critical habitat designation extends into the project action area and is designated for the main stem of Nookachamps Creek up to and including the east fork of Nookachamps Creek.

Life History Information

The chinook salmon is the largest of the Pacific salmon, averaging 90 centimeters in length and 8 to 19 kilograms in weight. Because of their large size and inability to jump significant heights, adult chinook salmon prefer large, low-gradient rivers and streams for spawning. Consequently, the species has been significantly affected by the construction of dams in major river systems (Wydoski and Whitney 1979). Their population decline can also be attributed to degradation of water quality and loss of spawning habitat due to the effects of logging, road construction, and urbanization of streams and rivers (WDF et al. 1993).

Chinook salmon eggs hatch 33 to 178 days after deposition, depending on water temperatures, dissolved oxygen concentrations, and other physical and chemical factors. Streamflow, gravel quality, and silt load all significantly influence the survival of developing chinook salmon eggs. Juvenile chinook may spend from 3 months to 2 years in fresh water after emergence and before migration to estuarine areas as smolts, and then into the ocean to feed and mature. Juvenile chinook salmon feed primarily on aquatic insect larvae and terrestrial insects, typically in nearshore areas.

In general, ocean-type juveniles migrate downstream to estuarine and marine areas during the first few months after hatching. Juvenile ocean-type chinook tend to utilize estuaries and coastal areas more extensively for juvenile rearing. Fall chinook fry usually feed for a short time, then undergo smoltification and migrate to the ocean. Some fry rear for a year, especially juveniles in systems with lakes, before smolting and migrating to the Pacific Ocean (Wydoski and Whitney 1979; Emmet et al. 1991).

During the downstream migration of juveniles, low concentrations of dissolved oxygen and high water temperatures can hamper their swimming ability. Juvenile preference for winter habitat has not been well studied. Use of the main channel, side channels, overhanging banks with cobble substrate, and backwater areas have all been reported (Healy 1991).

Site-Specific Occurrence

Chinook salmon are reported to use the main stem of Nookachamps Creek for rearing and migrating purposes up to the confluence with the east fork of Nookachamps Creek (StreamNet 2005). They also use the east fork of Nookachamps Creek for rearing and migrating purposes (StreamNet 2005). During spawning surveys by the Skagit Fisheries Enhancement Group between 1998 and 2003, chinook redds were observed in tributaries of the east fork of Nookachamps Creek (SFEG 2003). Adult chinook begin to enter the main stem of Nookachamps Creek in mid- to late-September and should continue to enter the stream through the first week of November (Rensink 2005). Some chinook have been observed entering Nookachamps Creek as late as December. Juvenile chinook could be present in Nookachamps Creek throughout the year.

Steelhead

Species Status

On April 5, 2005 NOAA Fisheries accepted a petition to list the Puget Sound steelhead under the ESA (NOAA Fisheries 2005). Previously in August 1996, NMFS had determined from an initial status review that listing the Puget Sound steelhead was not warranted. The acceptance of this petition will reinitiate and update the initial status review. The identified evolutionarily significant unit (ESU) includes all naturally spawned populations of steelhead from rivers and streams flowing into Straight of Juan De Fuca, Puget Sound, and Hood Canal, Washington, including rivers as far north as the North Fork Nooksack River and as far west as the Elwha River on the Olympic Peninsula.

Life History Information

Steelhead exhibit one of the most complex life histories of any species of Pacific salmonid. These salmonids can be either anadromous (steelhead) or freshwater resident (rainbow trout), and they can spawn more than once. Steelhead typically spend 2 years in freshwater and 2 years in the ocean. However, the anadromous salmonids can spend up to 7 years in freshwater prior to smoltification, and returning adults can spend up to a year in freshwater before spawning (NOAA 1996).

Washington stocks of steelhead consist of two races, or runs, depending on their spawning timing. In the Columbia River and other large rivers with many tributaries, steelhead likely enter year-round (Emmet et al. 1991). Summer-run steelhead migrate upstream from May to November (NOAA 1996) and spawn the following spring. Winter-run steelhead migrate to their native stream in the late fall (November through April) and spawn within the next few months, generally before May (Emmett et al. 1991).

Minimum depth requirement for adult steelhead upstream migration is 7 inches, but they prefer depths of 9.5 inches or more. Adult upstream migration is limited at flow rates greater than

7.9 feet per second (Pauley et al. 1986). Females dig redds (spawning beds) in substrates consisting of 0.5- to 4.5-inch-diameter gravels, where the water is aerated and flowing at a rate of approximately 30 inches per second (Pauley et al. 1986).

Eggs usually hatch in 4 to 7 weeks. The alevin absorb the yolk and are free-swimming in 3 to 7 days. Food items in the early stages of growth include microscopic aquatic organisms. Cover is extremely important and plays a key role in habitat selection by young fish (Pauley et al. 1986).

Juveniles spend 1 to 4 years in the freshwater environment before migrating to sea. The out-migration generally occurs in the spring (April through June). Steelhead may spend up to 4 years maturing in the ocean. Their size as adults is directly related to the duration of their ocean residency.

Juvenile fish prefer rubble substrates with water velocities of less than 6 inches per second and depths of 0.5 feet. Preferred rearing temperatures are 45 to 58°F, and the upper lethal limit is 75°F. As the young fish grow, they move to deeper parts of the stream and feed on larger organisms associated with the stream bottom such as isopods, amphipods, and aquatic and terrestrial insects (Pauley et al. 1986; Emmett et al. 1991). During the rearing stage, streamside vegetation and submerged cover such as rocks, logs, and aquatic vegetation provide food, temperature stability, and protection from predators.

Site-Specific Occurrence

Steelhead are reported to use both the main stem and east fork Nookachamps Creek (StreamNet 2005). Summer steelhead are reported to the East Fork Nookachamps Creek for migration to spawning grounds upstream of the project area. Winter steelhead are reported to migrate through the project site in both the main stem and East Fork Nookachamps Creek. Winter steelhead spawn in the east fork above RM 3.0 (above Turner Creek) and in the main steam above RM 11 (above Big Lake). Winter and summer steelhead rear in the both the main stem and east fork Nookachamps Creek (StreamNet 2005).

Environmental Baseline

On September 15 and 24, 2004 and August 5, 2005, Herrera biologists conducted site visits to evaluate environmental baseline conditions within the project area and the information collected is presented herein. For this biological assessment, the aquatic environmental baseline conditions and project-specific impacts are summarized in the environmental baseline and effects checklist (Table 6).

Table 6. Bull trout matrix of diagnostics/pathways and indicators for the Skagit Environmental Bank habitat restoration project.

Pathways: Indicators	Environmental Baseline Condition			Effect of Proposed Action(s)		
	Properly Functioning	Functioning at Risk	Functioning at Unacceptable Risk	Restore	Maintain	Degrade
Subpopulation Characteristics: Subpopulation size	X				X	
Growth and survival	X				X	
Life history diversity and isolation	Unknown	Unknown	Unknown		X	
Persistence and genetic integrity	Unknown	Unknown	Unknown		X	
Water Quality: Temperature			X	X		
Sediment/turbidity			X	X_2		X_1
Chemical contamination/nutrients			X	X		
Habitat Access: Physical barriers		X			X	
Habitat Elements: Substrate embeddedness			X	X		
Large woody debris			X	X		
Pool frequency and quality			X	X		
Off-channel habitat			X	X		
Refugia			X	X		
Channel Conditions/Dynamics: Wetted width/maximum depth ratio			X	X		
Stream bank condition			X	X		
Floodplain connectivity			X	X		
Flow/Hydrology: Change in peak/base flows		X		X		
Drainage network increase		X			X	
Watershed Conditions: Road density and location		X			X	
Disturbance history			X		X	
Riparian reserves		X			X	

X indicates both short- and long-term effects.
X_1 indicates short-term, temporary effects.
X_2 indicates long-term effects.

The Matrix of Diagnostics/Pathways and Indicators developed by the U.S. Fish and Wildlife Service for bull trout (USFWS 1998) was used to document the environmental baseline conditions and the potential effects of the proposed project on the relevant indicators for bull trout in the main stem of Nookachamps Creek and the east fork of Nookachamps Creek (Table 6). These indicators and the associated rating criteria are based on scientific data related to the habitat requirements of bull trout (USFWS 1998). The functionality of each indicator was evaluated according to the criteria established by the USFWS for freshwater and was rated as follows: *properly functioning*, *functioning at risk*, or *functioning at unacceptable risk*. The potential effect of the proposed project on the functionality of each indicator was then determined at the action area scale. This determination consisted of evaluating whether the project has the potential to *restore*, *maintain*, or *degrade* the functionality of each indicator.

Additionally, the Matrix of Pathways and Indicators developed for Pacific salmon (NOAA Fisheries) (NMFS 1996b) was also used as a reference to determine the status of the indicators in the vicinity of the proposed project on Pacific salmon. The functionality of each indicator was evaluated in terms of the criteria established by NOAA Fisheries and was rated as follows: *properly functioning*, *at risk*, or *not properly functioning*. The potential effect of the proposed project on the functionality of each indicator was then determined. This determination consisted of evaluating whether the project has the potential to *restore*, *maintain*, or *degrade* the functionality of each indicator. In the following section, the NOAA Fisheries matrix ratings are provided in parentheses following the USFWS indicator status.

Existing Habitat Conditions

In order to assess potential project impacts on species protected under the Endangered Species Act, their food sources, and their habitat, existing stream conditions in the vicinity of the Skagit Environmental Bank habitat restoration project were documented by conducting field visits and a review of the existing literature.

Basin and Drainage Configuration

Within the project area, there are two year-round flowing streams: the main stem of Nookachamps Creek and the east fork of Nookachamps Creek. According to the *Catalog of Washington Streams and Salmon Utilization,* Volume 1, Puget Sound Region (WDF 1975), the main stem of Nookachamps Creek is designated as Stream 03-0227 within WRIA 3, and the east fork of Nookachamps Creek is designated as Stream 03-0230.

The main stem of Nookachamps Creek originates at the outlet of Lake McMurray and drains an area of approximately 70 square miles (WDF 1975). The main stem flows for 14.3 miles to the northwest and drains into Big Lake before continuing south through the project site. The main stem flows into the Skagit River at RM 18.8, between the towns of Burlington and Sedro Woolley. The east fork of Nookachamps Creek is approximately 9.4 miles long and joins the main stem of Nookachamps Creek at RM 2.9, near the wetlands adjacent to Barney Lake.

Riparian Soils, Bank Stability, and Channel Morphology

During the site visits, riparian surficial soils were observed to consist of backwater sediments deposited in a low-energy floodplain environment predominantly made-up of fine grained materials ranging in composition from clay or silty loam to sand. These soils are classified with the Nookachamps and Sumas soil series.

The stream banks of the main stem and the east Fork of Nookachamps Creek are generally unstable, with several areas of bank erosion and channel incision (Photo 6 in Appendix C). The main stem and the east Fork of Nookachamps Creek are both single thread channels confined by levees along most of their lengths. Both channels lack abundant habitat features such as side channels, pools, LWD, and canopy cover from riparian vegetation. Shade provided by sparse riparian vegetation is limited to the southern property boundary and areas with discontinuous stands of trees and shrubs along banks and levees.

Substrate

The dominant channel substrate observed within the main stem and the east fork of Nookachamps Creek is sand followed by small gravel (Photo 7 in Appendix C). The substrate within Nookachamps Creek downstream of Barney Lake is dominated by sand derived primarily from the east fork of Nookachamps Creek. Sediment transported through the main stem of Nookachamps Creek above Barney Lake is limited to fine sand and silt. The substrate in the east fork of Nookachamps Creek consists of gravelly sand, with small gravel (less than ½ inch in diameter) forming a weak armor layer on bar tops and riffles.

Large Woody Debris and Pool Quality

Large wood debris recruitment from riparian areas to the main stem of Nookachamps Creek and the east fork of Nookachamps Creek has been limited due to deforestation, livestock grazing along the streams, and the conversion of native riparian vegetation to agriculture (Beamer et al. 2000). A lack of large woody debris within and along the stream channel was observed during the habitat survey performed for this biological assessment. The potential for future recruitment of large wood debris is extremely low for the main stem and east fork of Nookachamps Creek due to channel modifications (e.g., channelization) and a lack of riparian trees.

Due to the lack of large woody debris in the main stem and east fork of Nookachamps Creek, there are no natural pools that could provide high-quality habitat for salmonids. During site visits in September 2004, no pools were observed in the main stem of Nookachamps Creek above Barney Lake. There were several small pools observed in the east fork of Nookachamps Creek.

Riparian Conditions

Riparian vegetation is generally in poor condition and is characterized by isolated patches of trees and shrubs along the stream banks and levees of the main stem Nookachamps Creek and

the east fork of Nookachamps Creek. The riparian corridor is generally 15 to 20 feet throughout the project area, with some streamside vegetation providing shade and cover along the lower reach of the east fork of Nookachamps Creek. Reed canarygrass (*Phalaris arundinacea*) is the dominant herbaceous plant on the nonagricultural portions of the site (Photo 6 in Appendix C). Reaches with poor conditions typically support nonnative invasive species (reed canarygrass and Himalayan blackberry [*Rubus discolor*]) on their banks (or levees) with interspersed trees and shrubs. Limited cover is provided by a canopy of red-osier dogwood (*Cornus stolonifera*), willows (*Salix* sp.), and black cottonwood (*Populus balsamifera*).

Fish Habitat Utilization

Historically, the Nookachamps Creek watershed supported seven species of anadromous fish including: sea-run cutthroat trout (*Oncorhynchus clarki*), winter and summer steelhead trout (*Oncorhynchus mykiss*), coho salmon (*Oncorhynchus kisutch*), pink salmon (*Oncorhynchus gorbuscha*), chinook salmon (*Oncorhynch*us *tshawytscha*), chum salmon (*Oncorhynchus keta*), and bull trout (WDF 1975). Water quality problems such as elevated stream temperatures are a major limiting factor for salmonid production in the Nookachamps Creek drainage (Smith 2003).

Backwater from the Skagit River has been observed to move water upstream into Nookachamps Creek during significant flood events (Ecology 1997). As a result, the lower Nookachamps Creek in the project action area may serve as habitat refuge for fish when the Skagit River is at flood stage. In addition, the main stem of Nookachamps Creek and east fork of Nookachamps Creek provide a migration corridor and limited rearing habitat for salmonid species.

Geology and Soil Characteristics

Geology of the Skagit Environmental Bank project site as been mapped and compiled by Dragovich et al. (2002). Low-lying areas of the action area are underlain by unconsolidated Holocene alluvial sediment deposited in the Skagit River floodplain after retreat of the Cordilleran ice sheet. Upland areas surrounding Barney Lake consist of glaciomarine outwash and till. Glacial outwash found upstream of the action area supplies most of the coarse sediment observed in both the lower Nookachamps Creek main stem and east fork.

Existing geomorphic conditions within the action area are strongly influence by the Skagit River. Flow in the Skagit River sets the base level for Nookachamps Creek and influences the hydraulic gradient of the main stem and the east fork of Nookachamps Creek within the action area. The southern boundary of the action area is located at an abrupt gradient change from the upland plateau to the floodplain of the Skagit River. Gravel exposed in banks of the main stem immediately south of the action area are consistent with alluvial fan deposits and suggest that this is an area of ongoing aggradation and potential channel migration. Based on surveyed bed elevations, the average gradient of the main stem through the action area is 0.0002 percent.

Habitat and Species Indicators

Subpopulation Characteristics (Bull Trout)

Subpopulation Size

Bull trout are known to use the Skagit River and are reported to use the main stem of Nookachamps Creek (StreamNet 2005). The Skagit River supports the largest natural population of bull trout in the Puget Sound basin (WDFW 1998). This indicator is therefore is rated *properly functioning* in the project action area.

The project will not alter the subpopulation size and will *maintain* the status of the subpopulation size.

Growth and Survival

Bull trout are not known to spawn in the project action area or the main stem of Nookachamps Creek. Washington Department of Fish and Wildlife, Salmon and Steelhead Stock Inventory (WDFW 1998) classify the Skagit River stock as healthy. Therefore, the population size and resilience of the population to recover from short-term disturbances is expected to be high. This indicator is therefore rated *properly functioning* in the project action area.

The project will not affect the growth and survival of bull trout within the project action area and will therefore *maintain* the status of this indicator.

Life-History Diversity and Isolation

It is currently unknown whether the resident (unlikely) or anadromous life history forms of bull trout are present within the main stem Nookachamps Creek, or whether they are in relatively close proximity to other nearby spawning populations of bull trout. Therefore, this indicator is considered to be *unknown* in the project action area.

The project will not affect the diversity of bull trout life forms or isolation of bull trout in the vicinity of the main stem of Nookachamps Creek, and will therefore *maintain* the current status of bull trout diversity and isolation in the project action area.

Persistence and Genetic Integrity

It is unknown whether bull trout in the project action area are considered a distinct genetic stock, with adequate habitat to maintain a viable population. This indicator is considered *unknown* in the mainstream Nookachamps Creek portion of the action area. The project will not affect the persistence and genetic integrity of bull trout in the vicinity of action area, and will therefore *maintain* the status of this indicator in the project action area.

Water Quality

Temperature

During the summer, surface water temperatures are reported to reach as high as 20°C in the main stem of Nookachamps Creek and 24°C in the east fork of Nookachamps Creek (Ecology 2005b). These high water temperatures have led to the listing of the main stem and the east fork of Nookachamps Creek on the Washington State Department of Ecology's 303(d) list of impaired and threatened water bodies for temperature violations (Ecology 2005b). As Class A water bodies, these streams are supposed to maintain water temperatures below 18°C. Water temperature is therefore rated as *functioning at unacceptable risk* (*not properly functioning*) for salmonids in the project action area.

The proposed project will restore riparian vegetation along the banks of the main steam and the east fork of Nookachamps Creek, which will improve stream shading and subsequently lower water temperatures. Currently, the dominant vegetation in nonagricultural areas of the site is reed canarygrass and Himalayan blackberry. Therefore, the project will *improve* the current status of water temperature in the project action area.

Sediment/Turbidity

Water turbidity in the main stem and the east fork of Nookachamps Creek is relatively high, based on visual observations. Unstable and eroding stream banks likely contribute to the degraded water quality. Higher water turbidity is typically observed in the main stem of Nookachamps Creek where a higher concentration of suspended fine sediments exists in a portion of the stream channel, resembling a slough like habitat. The Skagit Stream Team, a citizen monitoring group, has documented high turbidity levels during storm events in lower Nookachamps Creek below Barney Lake (SCD 2002). The dominant substrate observed within the main stem and the east fork of Nookachamps Creek is sand followed by small gravel. The sediment and turbidity conditions are *functioning at unacceptable risk* (*not properly functioning*) in the project action area.

The proposed habitat restoration project will be conducted within the main stem and the east fork of Nookachamps Creek and along the stream banks. Activities for the project will include a stream diversion around the ELJ construction sites. Therefore, some sediment turbidity could enter water bodies during construction. However, the proposed project will not significantly affect turbidity levels in the overall project action area or in the stream channels due to the implementation of the stream diversion and BMPs. In the short term, some turbidity may occur, but would be expected to be minor in nature due to the implementation of BMPs. Turbidity will be monitored to ensure that it is no more than 5 NTU greater than the background level. Additionally, one of the features of the proposed project is to stabilize the eroding banks, which will improve the long-term condition of substrate downstream of the proposed project. The proposed project will therefore temporarily *degrade* the current status of sediment/turbidity, but will *restore* it in the long-term within the project action area.

Chemical Contamination/Nutrients

Bacteria levels in the main stem Nookachamps Creek have not met the Washington State Department of Ecology standard for Class A waters, with violations occurring in 100 percent of the sampling events (Entranco 1993). Data collected by the Skagit Stream Team from 1999 through 2001 have also documented violations of the state standards for dissolved oxygen in the main stem and the east fork of Nookachamps Creek (Ecology 2005b). Degradation of water quality for both water bodies has been linked to the discharge of livestock waste, sedimentation from agricultural runoff, and a loss of streamside riparian vegetative (NWMC and SCDPCD 1995). In addition, high volumes of liquefied manure enter the stream channel during crop irrigation operation of the farm. The main stem of Nookachamps Creek is currently listed on the Department of Ecology list of impaired waters (the 303 [d] list) for violations of the state fecal coliform bacteria standard. Furthermore, there is excessive aquatic vegetation and algal growth in the streams (Photo 2 in Appendix C), which is an indicator of high levels of nutrients and eutrophication. Chemical contamination and nutrients are therefore rated *functioning at unacceptable risk* (*not properly functioning*) in the project action area including the main stem and east fork of Nookachamps Creek.

The proposed project includes no additional development within the basin and it will establish new native vegetation within project area. Vegetation growth within riparian areas is likely to result in a decrease in nonpoint source pollutant loading to receiving waters form the former dairy farm. Consequently, the restoration of the project site will improve the existing water quality conditions by removing row-crop fertilization, and by reducing erosion on the entire site, which will substantially reducing nutrient inputs. Therefore the proposed project will *restore* the current status of this indicator in the project action area.

Habitat Access

Physical Barriers

There are no physical barriers that prevent salmonids from migrating through the main stem or the east fork of Nookachamps Creek up to the project area. However, limited flow through conditions exist during the summer in the main stem of Nookachamps Creek. Habitat access is therefore rated *functioning at risk* (*at risk*) in the project action area.

The project will not create new barriers to salmonids migrating through the main stem or the east fork of Nookachamps Creek. The proposed project will therefore *maintain* the current condition of this indicator in the project action area.

Habitat Elements

Substrate Embeddedness

Within the project site, the dominant substrate observed within the main stem and the east fork of Nookachamps Creek is sand followed by small gravel (less than 1/2 inch in diameter), which is not suitable for salmon spawning. The substrate within Nookachamps Creek downstream of

Barney Lake is dominated by sand derived primarily from the east fork of Nookachamps Creek. Sediment transported through the main stem of Nookachamps Creek above Barney Lake is limited to fine sand and silt. The substrate in the east fork of Nookachamps Creek consists of gravelly sand, with gravel forming a weak armor layer on bar tops and riffles. Within the project action area, substrate embeddedness was visually estimated at greater than 80 percent, and thus substrate is rated as *functioning at unacceptable risk* (*not properly functioning*) in the project action area.

The proposed project will decrease bank erosion within the project area by reforesting riparian areas and restoring wetland areas. Trees roots provide bank cohesion that anchors stream banks and prevents bank erosion and chronic inputs of sediment. Furthermore, riparian forests filter runoff entering stream channels. ELJs of large woody debris placed for grade control will sort sediment, retain suitable gravels (if any) traveling through the system, and reduce the transport of fines and silt from upstream sources. The proposed project will decrease bank erosion and suspended sediment transport within the project site. However, this indicator is not expected to improve the substrate embeddedness to below 50 percent, due to continued sources of sediment upstream of the project site. Therefore the proposed project will *maintain* the current status of substrate embeddedness in the project action area.

Large Woody Debris

The recruitment of large woody debris has been limited in the main stem and the east fork of Nookachamps Creek due to extensive clearing and land use changes in the riparian areas. Some instream LWD is present within the project action area in the vicinity of the confluence of the main stem and east fork of Nookachamps Creek, and a side channel off the east fork of Nookachamps Creek. Accumulations of large woody debris in these areas typically consist of one or two pieces and have little influence on channel hydraulics or morphology. Therefore, this indicator is rated as *functioning at unacceptable risk* (*not properly functioning*) in the project action area.

ELJs of large woody debris would be placed in the main stem and east fork of Nookachamps Creek to divert flow to newly created side channels as part of the proposed project. Additionally, native conifers that could become large woody debris in the future will be planted adjacent to the stream channels. The proposed project will therefore *restore* the status of large woody debris in the project action area.

Pool Frequency and Quality

Eleven pools were observed within the 3,200 feet surveyed within the east fork of Nookachamps Creek during the 2004 biological survey. This equates to approximately 36 pools per mile. No pools were observed on the main stem of Nookachamps Creek above Barney Lake. Furthermore, there is a lack of cover in both streams providing shade to moderate water temperature in pool habitat. This indicator is therefore rated as *functioning at unacceptable risk* (*not properly functioning*) in the project action area and on the project site.

The proposed project will improve pool quality and quantity in the project area through the placement of ELJs and other smaller woody grade control structures, and will therefore *restore* the current status of this indicator in the project action area.

Off-Channel Habitat

Limited off-channel habitat exists within the vicinity of the proposed project. A large portion of each stream is separated from the floodplain by the presence of levees. The only potential off-channel habitat is present within a side channel along the left bank of the east fork of Nookachamps Creek. This indicator is therefore rated *functioning at unacceptable risk* (*not properly functioning*) within the project action area.

The proposed project will develop or expand existing wetlands along banks of the main stem of Nookachamps Creek, east fork of Nookachamps Creek, and their associated floodplain areas. Additionally new wetlands and side channels will be created and hydrologically connected using ELJs. The proposed project will maintain the current off-channel habitat and create additional floodplain off-channel habitat thus *restoring* the overall status of this indicator.

Refugia

The lower reaches of the main stem and the east fork of Nookachamps Creek have been altered by agricultural land use practices. In this area, the main stem and the east fork of Nookachamps Creek have very limited riparian vegetation (Smith 2003) that would otherwise provide refugia for migratory or rearing aquatic species. Riparian vegetation along the main stem of Nookachamps Creek provides some refugia on the project site, with overhanging vegetation that reduces water temperatures. However, the overall condition of refugia on the project site and within the project action area is degraded due to the conversion of forested land uses to agricultural fields. This indicator is therefore *functioning at unacceptable risk* (*not properly functioning*) in the project action area.

The proposed project will enhance riparian conditions, restore wetlands, and increase the connectivity between off-channel habitat, the floodplain, and the active channel within the project site. Therefore, the proposed project will *restore* the refugia indicator within the project action area.

Channel Conditions and Dynamics

Width/Depth Ratio

In some portions of the main stem and the east fork of Nookachamps Creek within the project action area, the width-to-depth ratio is estimated to be less than 10 and in other areas it is estimated to be greater than 10 (based on stream measurements collected during the 2004 site visit). Due to the presence of levees, the estimated width-to-depth ratio of less than 10 is likely underestimated as some narrow portions of these stream channels are incising. This indicator is therefore rated as *functioning at risk* (*at risk*) in the project action area for the main stem and east fork of Nookachamps Creek.

The proposed project will improve stream channel width-to-depth rations and therefore it will *restore* the current condition of this indicator.

Stream Bank Conditions

The stream banks of the main stem and the east fork of Nookachamps Creek within the project action area are generally unstable, with several areas of active bank erosion and channel incision. The transport of suspended sediment has been significant in the Nookachamps Creek drainage. This indicator is therefore rated as *functioning at unacceptable risk* (*not properly functioning*) in the project action area and on the project site.

Proposed bank stabilization and control of streamflow with engineered large woody debris jams will improve some of the most eroded sections of stream bank within the main stem and the east fork of Nookachamps Creek. The proposed project will therefore *restore* the condition of this indicator in the project action area.

Floodplain Connectivity

The natural floodplain in the lower Nookachamps drainage basin has been disconnected from the active channel by diking and levees along the main stem and the east fork of Nookachamps Creek. These flood control structures, which protect agricultural fields, reduce the frequency of overbank flows to wetlands and the floodplain. This indicator is therefore rated *functioning at unacceptable risk* (*not properly functioning*) in the project action area.

The proposed project will remove levees and will increase the connectivity of the streams with the floodplain and adjacent and restored wetlands. Therefore, the proposed project will *restore* the current status of this indicator within the project action area.

Flow/Hydrology

Change in Peak/Base Flows

There are no historical records for the main stem Nookachamps Creek or east fork Nookachamps Creek documenting altered peak flow, base flow, or the timing of flows. The Nookachamps drainage basin does exhibit any significant area of impervious surface that would otherwise typically Result in high peak flows. However, agricultural practices have involved deforestation of the area which has likely contributed to localized changes in peak and base flows. Thus the indicator is rated as *functioning at risk* (*at risk*) within the project action area.

Streamflow maintenance, floodplain connectivity, storm-water attenuation, and ground water recharge will all be improved as a result of the proposed project by reducing stream width-to-depth ratios and by reducing the frequency and duration of low surface flows. The proposed project will remove some levees and will create forested, hydrologically connected wetland areas, and forested upland islands within the floodplain. In addition, new wetlands and side channels will be created and will be hydrologically connected through the hydraulic effect of

ELJs. These project actions will have a positive effect on controlling peak flows by reconnecting the floodplain, and improving base flow conditions by increasing ground water recharge within the project action area. Consequently, the proposed project will *restore* the current condition of this indicator within the project action area.

Increase in Drainage Network

Several levees and drainage ditches along roads and within fields have modified the natural drainage network of the Nookachamps drainage basin. Cumulatively, these drainage features have likely resulted in a low to moderate decrease in the active channel length within the basin. This indicator is therefore rated as *functioning at risk* (*at risk*) in the project action area and on the project site.

The proposed project will not alter and will therefore *maintain* the current status of this indicator.

Watershed Conditions

Road Density and Location

There is a small number of roads in the Nookachamps Creek watershed. According to Smith (2003) the road density within Nookachamps Creek is rated as fair. This indicator is considered *functioning at risk* (*at risk*) in terms of impacts on salmonid habitat within the project action area.

The project site will be accessed via existing roadways. The proposed project will not add permanent roads that would alter the existing road density or location; therefore the project will *maintain* the condition of this indicator.

Disturbance History

The Nookachamps Creek watershed has been extensively disturbed by conversion of forest habitat to non-forest land uses, which has directly and indirectly disturbed the stream habitat. This indicator is therefore rated as *functioning at unacceptable risk* (*not properly functioning*) in the Nookachamps Creek project action area.

The proposed project will not alter and will therefore *maintain* the condition of this indicator.

Riparian Reserves

As the basin has been converted to non-forest land use, the Nookachamps Creek watershed has experienced a loss of riparian cover or riparian reserves downstream of the project site to the confluence with the Skagit River. Upstream of the project site the main stem of Nookachamps Creek has low levels of conifer cover while the upper reaches of the east fork of Nookachamps Creek has high-quality riparian coverage. Therefore, this indicator is rated as *functioning at risk* (*at risk*) because there has been a loss of connectivity and riparian function in the Nookachamps Creek watershed.

The proposed project will not alter and will therefore *maintain* the condition of this indicator. Over time, the proposed project will result in a net increase in large riparian conifers at the project site.

Effects of the Action

Direct Adverse Effects

Direct effects are impacts caused by and during the construction process (or by removal of conservation measures installed during construction after the construction is completed). Construction activities have the potential to directly affect plant and animal species in the vicinity of the project site, including within the main stem and the east fork of Nookachamps Creek.

Restoration activities associated with the proposed restoration project will include work within the channel of the main stem and the east fork of the Nookachamps Creek. During this portion of the proposed work, the stream flow will be diverted around the in-channel work areas. Restoration activities will also include site grading, pile driving, filling of drainage ditches, and replanting of the site with native wetland and riparian vegetation. Any adverse impacts resulting from these activities will be minimized by implementing all the requirements set forth in the hydraulic project approval for the project as well as the BMPs described previously in the "Project Description."

Bald Eagle

The following project-related actions have the potential to affect bald eagles that may be present in the project action area:

- **Pile-driving and other construction-related noise-producing activities**. Nesting bald eagles that may be actively nesting or foraging in the project area may temporarily avoid the area due to noise generated at the project site. Bald eagles appear to acclimate to noise and are more tolerant of auditory disturbances when the sources are partially or totally concealed from view (Stalmaster and Newman 1979). One nesting area within the project action area is within the line of sight of proposed construction activities. Monitoring of the nest will begin in the spring before the Phase 1 construction is initiated to determine the status of the nest. If the nest is occupied, conservation measures will be implemented to limit the effects of restoration construction on the nesting eagles.

- **Vegetation removal**. Some vegetation will be removed within the project area and then replaced with native vegetation after the construction work is completed. Potential perch trees that could be used by bald eagles will not be removed. New riparian and wetland vegetation will be planted where nonnative and agricultural vegetation currently exists.

Bull Trout

The following project-related actions may affect bull trout or other salmonid species that serve as prey for bull trout:

- **Stream diversion and fish handling.** Fish handling and dewatering activities during in-water construction work proposed for Phase 1 may harass or harm fish that will be directly handled and become stressed during the procedure. This type of harm may induce responses ranging from behavioral changes to fatality. Dewatering has the potential to strand fish that are not captured and may cause stress or death during the construction period. Channel work performed during Phases 2 and 3 will not require fish handling because the channels will not be connected with the main stem or the east fork of Nookachamps Creek until the end of construction. This will eliminate the connection to fish-bearing waters during the construction activity and thus eliminate the need for fish handling in Phases 2 and 3.

- **Sediment-laden runoff**. The activities associated with construction of ELJ structures, habitat improvements, bank stabilization, and stream diversion could result in increased delivery of fine sediment to the main stem and the east fork of Nookachamps Creek. Fine sediment may influence egg survival and emergence success of the salmonid species that spawn in the project action area. This type of adverse effect has been reported in other systems (Weaver and White 1985). Juvenile salmonids make up a portion of the prey species for bull trout and therefore, the survival of salmonids affects the food web for bull trout. However, any sedimentation problem during project construction will be temporary. In addition, because of the implementation of BMPs described previously in the "Project Description," no significant impacts on water quality are expected. The hydraulic project approval to be obtained for this project will specify additional measures for avoiding impacts.

- **Increased turbidity.** Increased sediment delivery to the main stem and the east fork of Nookachamps Creek would increase turbidity, potentially affecting bull trout. In conditions of increased turbidity, bull trout and other fishes may temporarily avoid areas downstream of the disturbance. However, because of the BMPs described in the section "Project Description," significant increases in turbidity are not expected to result from the construction activities.

- **Accidental spills**. Bull trout are not expected to be adversely affected by the proposed project because BMPs will be implemented to avoid or minimize all potential impacts of accidental spills of construction-related chemicals.

- **Vegetation removal**. Some vegetation will be removed along the stream banks within the project area, which could temporarily affect fish habitat. However, native species will be planted as part of the project to replace the affected riparian and wetland vegetation along the stream bank, enhancing the existing habitat for bull trout and other salmonid species that serve as prey for bull trout.

Chinook Salmon

The potential project-related impacts described above for bull trout also apply to chinook salmon and their prey. However, chinook salmon are not expected to be present on the project site during in-water construction activities. Nonetheless, implementation of the BMPs described in the section "Project Description" will likely reduce any adverse impacts on chinook salmon.

Steelhead

The potential project-related impacts described above for bull trout also apply to steelhead and their prey. As with bull trout, implementation of the BMPs described in the section "Project Description" will likely reduce any adverse impacts on steelhead. Impacts on individual steelhead are expected to primarily result from potential fish handling activities, and therefore, will not impact populations or suitable habitat of Puget Sound steelhead.

Direct Beneficial Effects

The proposed project will restore reaches of the main stem and the east fork of Nookachamps Creek and their associated palustrine and riverine wetlands. These direct habitat improvements will reestablish or rehabilitate 13,000 feet (2.5 miles) of existing riverine channel and riparian habitat, restore 9,720 feet (1.8 miles) of new high-flow channel, and restore (reestablish or rehabilitate) 340 acres of palustrine emergent, scrub-shrub, and forested wetlands (including the powerline easement but excluding the waterline easement).

The proposed restoration will specifically benefit habitat in the following ways:

- **Improvement of water quality in the lower Skagit River watershed.** Water quality in the lower Skagit River watershed will be improved by means of an increase in dissolved oxygen concentrations. The dissolved oxygen concentration will be increased by reducing nutrient inputs to the streams and reducing erosion of the floodplain due to runoff. Removal of the dairy that is now on the property and discontinuation of the current agricultural practices will reduce the concentrations of nitrogen, ammonia, phosphorus, and fecal coliform bacteria in any runoff that enters the streams.

- **Improvement of hydrologic and other floodplain processes.** Streamflow maintenance, floodplain connectivity, stormwater attenuation, and ground water recharge will all be improved as a result of the proposed project by means of a reduction in stream width-to-depth ratios and a reduction in the frequency and duration of low surface flows.

- **Improvement of fish habitat.** The quality, diversity, and quantity of aquatic, riparian, off-channel, and floodplain habitats will be improved by means of an improvement in water quality, a reduction in sediment runoff into the streams, a reduction in water temperatures in the summer over the long term, and by providing of increased instream, off-channel, rearing, refuge, and migration habitat for fish, other aquatic species, and water-dependent species.

- **Improvement of wildlife habitat and local and regional wildlife habitat connectivity.** Restoring the wetlands and riparian vegetation on the project site will improve wildlife habitat by creating more diverse and complex habitat that will benefit numerous wildlife species. Additionally, foraging conditions for bald eagles will be improved as a result of the improved fish and aquatic habitat. The connectivity of wildlife habitat will be improved by connecting the 340 acres of wetland and the 2.5 miles of stream corridor that make up the project site, with nearby wetlands and stream corridors associated with the Nookachamps subbasin. Habitat connectivity will also be improved by adding holding and rearing habitat for migrating salmon species and a major feeding and resting area for migrating birds that come from a network of nearby significant waters of the state.

Indirect Effects

Indirect effects are potential impacts caused by the proposed project that occur later in time, after the proposed action has been implemented. These effects are generally permanent.

No indirect effects are expected to result from the operation of the mitigation bank. The project will not promote future development. Any potential adverse impacts are associated only with construction and will be temporary.

Interrelated and Interdependent Activities

Interdependent activities are those that have no independent utility apart from the proposed action. Interrelated activities are those that are a part of the primary action and are dependent upon that action for their justification.

There are no known interrelated or interdependent activities scheduled to occur in the vicinity of the project site during the construction period for the proposed Skagit Environmental Bank habitat restoration project nor are any such activities expected to occur as a result of the operation of the mitigation bank.

Cumulative Effects

Cumulative effects are defined as the effects of unrelated future public or private actions that do not involve a federal nexus. The proposed project is not likely to contribute to cumulative impacts on protected species, their habitat, or their food stocks. No future public or private activity lacking a federal nexus is likely to occur in the project action area.

Determinations of Effect

The proposed project **is likely to adversely affect bald eagles** for the following reasons:

- There is a documented bald eagle nest on the project site that is within 400 meters and within line of sight of the proposed construction activities. It is also within a 1-mile radius of proposed pile driving activities that may disturb bald eagles.

- In order to comply with the fish work window, construction restrictions for nesting bald eagles (January 1 through August 15) will not be followed. Construction activities will begin summer 2007.

This proposed project **is likely to adversely affect bull trout** for the following reasons:

- Fish handling and dewatering activities during in-water construction work may harass or harm fish that will be directly handled and become stressed during the procedure. This type of harm may induce responses ranging from behavioral changes to fatality. Dewatering has the potential to strand fish that were not captured and may cause stress or death during the construction period.

- The activities associated with construction of ELJ structures, habitat improvements, bank stabilization, and stream diversion could result in increased delivery of fine sediment to the streams, where bull trout could potentially be foraging. However, bull trout are not expected to be adversely affected by sediment-laden runoff because BMPs will be implemented to avoid or minimize potential adverse effects of construction activities such as erosion and sedimentation.

- Some vegetation will be removed along the stream banks within the project area, which could temporarily affect fish habitat. However, native species will be planted as part of the project to replace the affected riparian and wetland vegetation along the stream bank, enhancing the existing habitat for bull trout and other fish species that serve as prey for bull trout.

The proposed project **will not destroy or adversely modify proposed bull trout critical habitat.** There is no designated critical habitat for bull trout within the project action area; therefore, bull trout critical habitat will not be adversely altered or modified as a result of the proposed project. If bull trout critical habitat is designated within the project action area before the proposed project is completed, a provisional effect determination is that the project **will not likely adversely affect bull trout critical habitat**.

This project **is likely to adversely affect chinook salmon or its habitat**. This determination is based on the same rationale provided above for bull trout.

The proposed project **will not destroy or adversely modify proposed chinook salmon critical habitat.** There is no designated critical habitat for chinook salmon within the project action area; therefore, chinook salmon critical habitat will not be adversely altered or modified as a result of the proposed project. If chinook salmon critical habitat is designated within the project action area before the proposed project is completed, a provisional effect determination is that the project **will not likely adversely affect chinook salmon critical habitat.**

This project is **likely to significantly impact individual steelhead, but not significantly impact the population or suitable habitat**. This determination is based on the same rationale provided for the potential effects on bull trout.

Essential Fish Habitat

The Pacific Fishery Management Council, with the concurrence of the Secretary of Commerce, defines *essential fish habitat* for freshwater salmon as "the aquatic component of streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to chinook, coho, or Puget Sound pink salmon (except above certain impassable barriers) in Washington, Oregon, Idaho, and California identified by USGS hydrologic units" (PFMC 1999). This includes the waters and benthos necessary to a species' spawning, breeding, feeding, or growth to maturity.

The Magnuson-Stevens Fishery Conservation and Management Act (as amended through October 11, 1996) includes a mandate that the National Marine Fisheries Service identify essential fish habitat for federally managed marine fishes. The mandate also requires federal agencies to consult with the National Marine Fisheries Service regarding all activities or proposed activities that are authorized, funded, or undertaken by the agency that may adversely affect essential fish habitat.

There are 83 marine species managed by the National Marine Fisheries Service for which essential fish habitat is considered, including chinook and coho salmon stocks in Washington, Oregon, Idaho, and California, as well as pink salmon stocks of Puget Sound (PFMC 1999).

In the short term, essential fish habitat is not likely to be affected by the proposed project because of the implementation of BMPs during construction activities. In the long term, essential fish habitat will benefit from the proposed project, as erosion from stream banks will be reduced; runoff quantity from the site will be reduced; runoff water quality will be improved; peak flow will be controlled; historical wetlands will be restored, creating complex forested wetland areas and upland islands within the floodplain; and habitat structures such as ELJs, off-channel habitat, and high-flow channels will be installed at the project site.

Overall, the proposed project **is not likely to adversely affect essential fish habitat for Pacific salmon**. The proposed Skagit Environmental Bank habitat restoration project is likely to improve essential fish habitat over the long term.

Incidental Take Analysis

The Endangered Species Act, Section 3, defines *take* as "to harass, harm, pursue, hunt, shoot, wound, trap, capture, collect or attempt to engage in any such conduct." The U.S. Fish and Wildlife Service (USFWS 1998) further defines *harm* to include "significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering" and defines *harass* as "create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering."

The actions associated with the Skagit Environmental Bank habitat restoration project may potentially affect bull trout, chinook salmon, and/or steelhead by harassing individuals and affecting the normal behavior of these species during the construction of the project. Any incidental take of individual bull trout, chinook salmon, or steelhead will likely be restricted to harassment within the boundaries of the project site as a result of the physical handling of fish during fish removal activities.

Bald eagles may also be adversely affected by the proposed project as a result of the noise generated during construction of the ELJ structures, specifically as a result of pile driving. Nesting bald eagles may be harassed by the noise and activity that may occur during the eagle nesting work restriction period if the nest is active during construction. This harassment may result in altered nesting and rearing behavior by the adult eagles that could, in turn, adversely affect young eagles in the nest.

Incidental take and adverse effects will likely be in the form of harassment, and they are likely to be temporary, occurring only during construction activities associated with the site restoration. No adverse effects will occur during the long-term implementation of the Skagit Environmental Bank habitat restoration project.

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APPENDIX A

Agency Correspondence

State of Washington
DEPARTMENT OF FISH AND WILDLIFE

Mailing Address: 600 Capitol Way N • Olympia, WA 98501-1091 • (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building • 1111 Washington Street SE • Olympia, WA

Date: AUG 11 2005

Dear Habitats and Species Requester:

Enclosed are the habitats and species products you requested from the Washington Department of Fish and Wildlife (WDFW). This package may also contain documentation to help you understand and use these products.

These products only include information that WDFW maintains in a computer database. They are not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife, nor are they designed to provide you with guidance on interpreting this information and determining how to proceed in consideration of fish and wildlife. These products only document the location of important fish and wildlife resources to the best of our knowledge. It is important to note that habitats or species may occur on the ground in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site-specific surveys are frequently necessary to rule out the presence of priority habitats or species.

Your project may require further field inspection or you may need to contact our field biologists or others in WDFW to assist you in interpreting and applying this information. Generally, for assistance on a specific project, you should contact the WDFW Habitat Program Manager for your county and ask for the area habitat biologist for your project area. Refer to the enclosed directory for those contacts.

Please note that sections potentially impacted by spotted owl management concerns are displayed on the 1:24,000 scale standard map products. If specific details on spotted owl site centers are required they must be requested separately.

These products are designed for users external to the forest practice permit process and as such, does not reflect all the information pertinent to forest practice review. The Forest Practice Rules adopted August 22, 1997 by the Forest Practice Board and administered by the Washington Department of Natural Resources require forest practice applications to be screened against marbled murrelet detection areas and detection sections. Marbled murrelet detection locations are included in the standard priority habitats and species products, but the detection areas and detection sections are not included. If your project is affected by Forest Practice Regulations, you should specially request murrelet detection areas.

WDFW updates this information as additional data become available. Because fish and wildlife species are mobile and because habitats and species information changes, project reviews for fish and wildlife should not rest solely on mapped information. Instead, they should also consider new information gathered from current field investigations. Remember, habitats and species information can only show that a species or habitat type is present, they cannot show that a species or habitat type is not present. These products should not be used for future projects. Please obtain updates rather than use outdated information.

Because of the high volume of requests for information that WDFW receives, we need to charge for these products to recover some of our costs. Enclosed is an invoice itemizing the costs for your request and instructions for submitting payment.

Please note that sensitive information (e.g., threatened and/or endangered species) may be included in this request. These species are vulnerable to disturbances and harassment. In order to protect the viability of these species we request that you not disseminate the information as to their whereabouts. Please refer to these species presence in general terms. For example: "A Peregrine Falcon is located within two miles of the project area".

If your request required a Sensitive Fish and Wildlife Information Release Agreement and you or your organization has one on file, please refer to that document for conditions regarding release of this information.

For more information on WDFW you may visit our web site www.wdfw.wa.gov or visit the Priority Habitats and Species site at www.wdfw.wa.gov/hab/phspage.htm .

For information on the state's endangered, threatened, and sensitive plants as well as high quality wetland and terrestrial ecosystems, please contact the Washington Department of Natural Resources, Natural Heritage Program at PO Box 47014, Olympia Washington 98504-7014, by phone (360) 902-1667 or visit the web site at www.dnr.wa.gov/nhp .

If you have any questions or problems with the information you received please call me at (360) 902-2543 or fax (360) 902-2946.

Sincerely,

Lori L. Guggenmos

Lori Guggenmos, Information Technology Specialist
Priority Habitats and Species

Enclosures

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN WESTERN WASHINGTON AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WESTERN WASHINGTON FISH AND WILDLIFE OFFICE

(Revised October 8, 2004)

SKAGIT COUNTY

LISTED

Wintering bald eagles (*Haliaeetus leucocephalus*) occur in the county from about October 31 through March 31.

There are 25 bald eagle communal winter night roosts located in the county.

There are 11 bald eagle wintering concentrations located in the county in the following areas: Fidalgo Island; Guemes Island; Skagit River-S. Fork Nooksack River; Skagit River; Skagit-Sauk Rivers; Corkindale Staging Area; Illabot Creek Staging Areas; and Samish Bay.

There are 77 bald eagle nesting territories located in the county. Nesting activities occur from about January 1 through August 15.

Bull trout (*Salvelinus confluentus*) occur in the county.

Canada lynx (*Lynx canadensis*) may occur in the county.

Gray wolves (*Canis lupus*) may occur in the county.

Grizzly bears (*Ursus arctos = U. a. horribilis*) may occur in the county.

Marbled murrelets (*Brachyramphus marmoratus*) occur in the county. Nesting murrelets occur from April 1 through September 15.

Northern spotted owls (*Strix occidentalis caurina*) occur in the county throughout the year.

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.
2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.
3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

Castilleja levisecta (golden paintbrush) may occur in the county.

Major concerns that should be addressed in your Biological Assessment for this listed plant species include:

1. Distribution of taxon in project vicinity.
2. Disturbance (trampling, uprooting, collecting, etc.) of individual plants and habitat loss.
3. Changes in hydrology where taxon is found.

DESIGNATED

Critical habitat for the northern spotted owl has been designated in Skagit County.

Critical habitat for the marbled murrelet has been designated in Skagit County.

PROPOSED

Critical habitat for the bull trout (Coastal-Puget Sound distinct population segment) has been proposed in Skagit County.

CANDIDATE

Fisher (*Martes pennanti*) (West Coast distinct population segment)
Oregon spotted frog (*Rana pretiosa*)

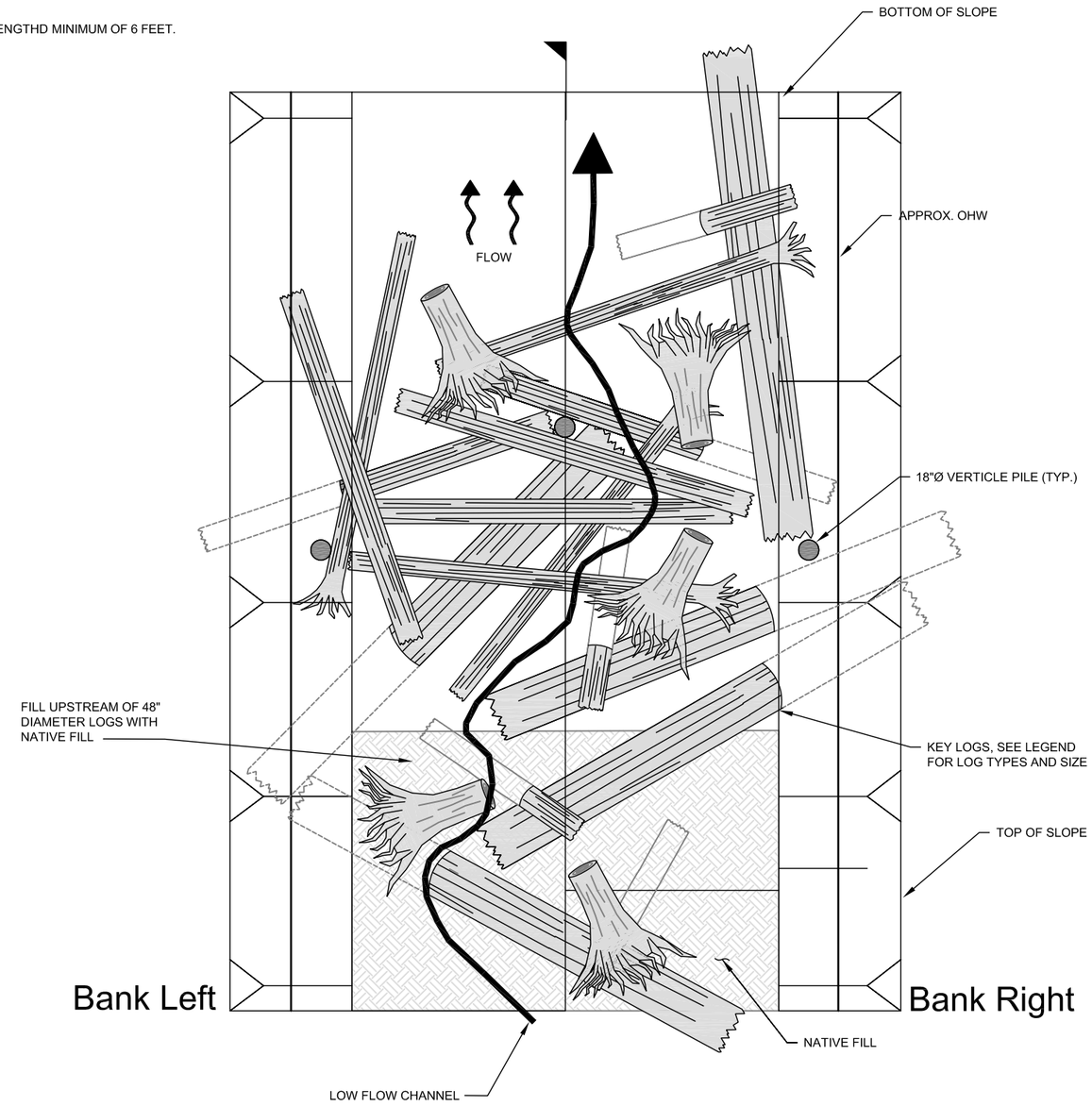
SPECIES OF CONCERN

California wolverine (*Gulo gulo luteus*)
Cascades frog (*Rana cascadae*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Olive-sided flycatcher (*Contopus cooperi*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Western toad (*Bufo boreas*)

APPENDIX B

Conceptual Project Plans

NOTE:
LOG EMBEDMENT LENGTHD MINIMUM OF 6 FEET.



A C-4

TYPICAL LOGJAM STRUCTURE PLAN VIEW 1/–
SCALE: NTS

LOGJAM CONSTRUCTION NOTES:

1. INSTALL WATER MANAGEMENT AND TESC BMPS
2. EXCAVATE SLOPE TO ACHIEVE 35' WIDTH AT BOTTOM OF EXCAVATION (NEW STREAM BOTTOM)
3. SLOPES TO BE GRADED TO 2:1
4. EXCAVATE 2' TRENCH FOR 48" DIAMETER LOGS
5. PLACE LAYER 1 LOGS. 48" DIAMETER LOGS TO REST IN KEYED TRENCH.
6. PACK LAYER OF SLASH UPSTREAM OF LAYER 1 LOGS AND DOWNSTREAM OF LAYER 1 LOGS
7. PLACE 1' BACKFILL ON TOP OF SLASH IN FRONT OF LAYER 1 LOGS
8. PLACE SLASH POLES BETWEEN LOGS
9. PLACE LAYER 2 LOGS
10. PLACE LAYER 3 LOGS
11. PACK ADDITIONAL SLASH INTO LOGJAM
12. PLACE ADDITIONAL POLES INTO BANKS AND LOGJAM
13. PLACE BANK PROTECTION LOGS

NOTES:

1. TYPE B LOGS MAY HAVE ROOTWADS
2. KEY LOGS SHOWN ONLY. SLASH AND ADDITIONAL LOG FILL NOT SHOWN FOR CLARITY.

MINIMUM EMBEDMENT VALUES

LOG TYPE	ANGLE OF INCLINATION			
	0° (EMBED / DEPTH)	15°	30°	45°
A	20' / 10'	30'	23'	22'
B	10' / 6.5'	23'	17'	16'
C	10' / 4'	17'	13'	12'

LEGEND:

48"Ø by 40' Long — TYPE A

24"Ø by 30' Long — TYPE B

18"Ø by 30' Long w/Rootwad — TYPE C

18"Ø VERTICAL PILE

STUMP

EXPOSED PORTION — BURIED PORTION

NATIVE FILL

ONE INCH
AT FULL SIZE. IF NOT ONE INCH SCALE ACCORDINGLY

PRELIMINARY SET - NOT FOR CONSTRUCTION

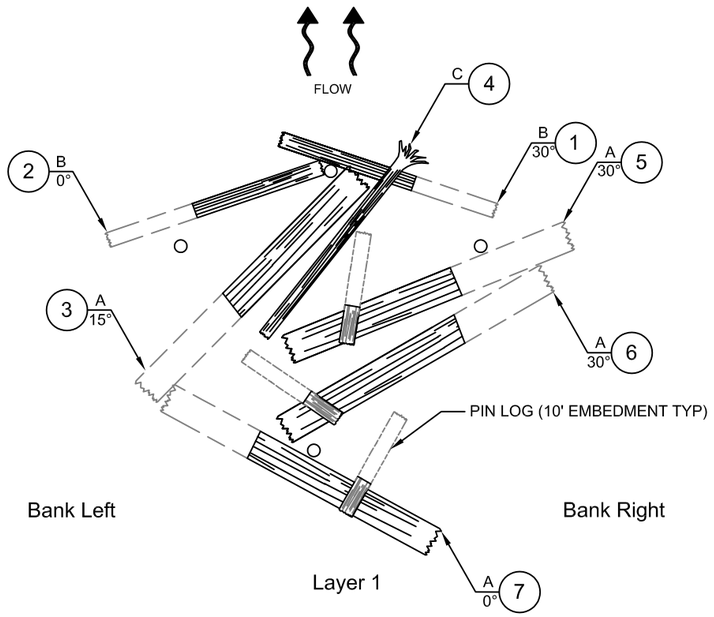
No.	REVISION	BY	APP'D	DATE

HERRERA ENVIRONMENTAL CONSULTANTS
2200 Sixth Avenue
Suite 1100
Seattle, Washington
98121-1820
206-441-9080
206-441-9108 FAX
http://www.herrerainc.com

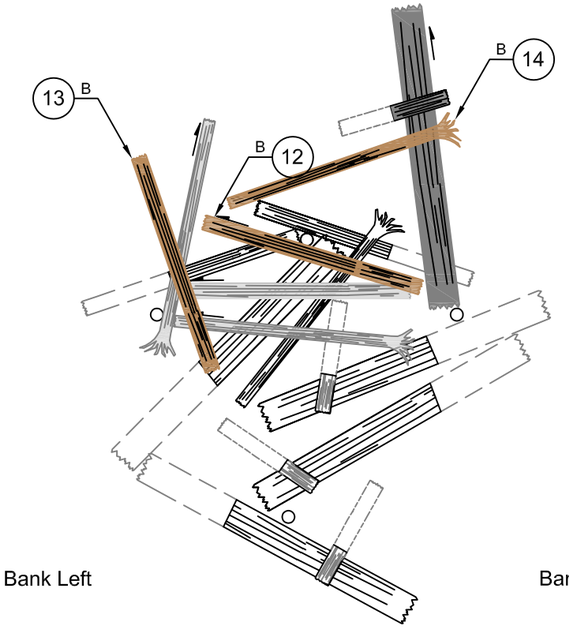
DESIGNED: M.SPILLANE	CHECKED:
DRAWN: T.PRESCOTT	SCALE: NOTED
RECOMMENDED:	CONTRACT NO:
APPROVED:	

SKAGIT ENVIRONMENTAL BANK
PHASE - 1
INSTREAM HABITAT AND FLOODPLAIN IMPROVEMENTS
TYPICAL ELJ PLAN

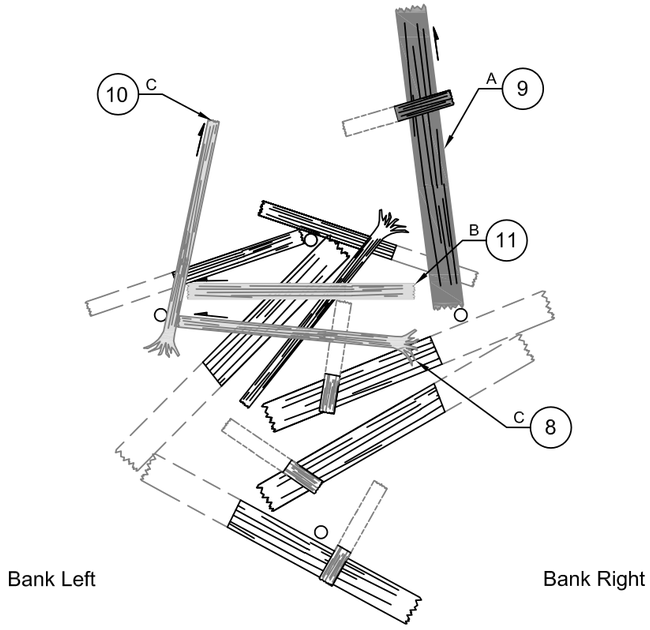
DATE: MAY 2005
FILE NO: 05-03049-000
DRAWING NO: C-1
SHEET NO: 4 OF 9



Layer 1



Layer 3



Layer 2

LOG TYPE LEGEND:	
48"Ø by 40' Long	TYPE A
24"Ø by 30' Long	TYPE B
18"Ø by 30' Long w/Rootwad	TYPE C
	PIN LOG ½ LOG TYPE B
	18"Ø PILE
EXPOSED PORTION	BURIED PORTION
LOG SEQUENCE NUMBER (#)	LOG TYPE; ANGLE OF LOG INCLINATION (X 0°)

LOG LAYERING COLOR LEGEND:
LAYER 1
LAYER 2
LAYER 3

NOTES:
1. TYPE B LOGS MAY HAVE ROOTWADS

MINIMUM EMBEDMENT VALUES

LOG TYPE	ANGLE OF INCLINATION			
	0°	15°	30°	45°
	EMBED / DEPTH			
A	20' / 10'	30'	23'	22'
B	10' / 6.5'	23'	17'	16'
C	10' / 4'	17'	13'	12'

ONE INCH
AT FULL SIZE. IF NOT ONE INCH SCALE ACCORDINGLY

PRELIMINARY SET - NOT FOR CONSTRUCTION

No.	REVISION	BY	APP'D	DATE

HERRERA ENVIRONMENTAL CONSULTANTS
2200 Sixth Avenue
Suite 1100
Seattle, Washington
98121-1820
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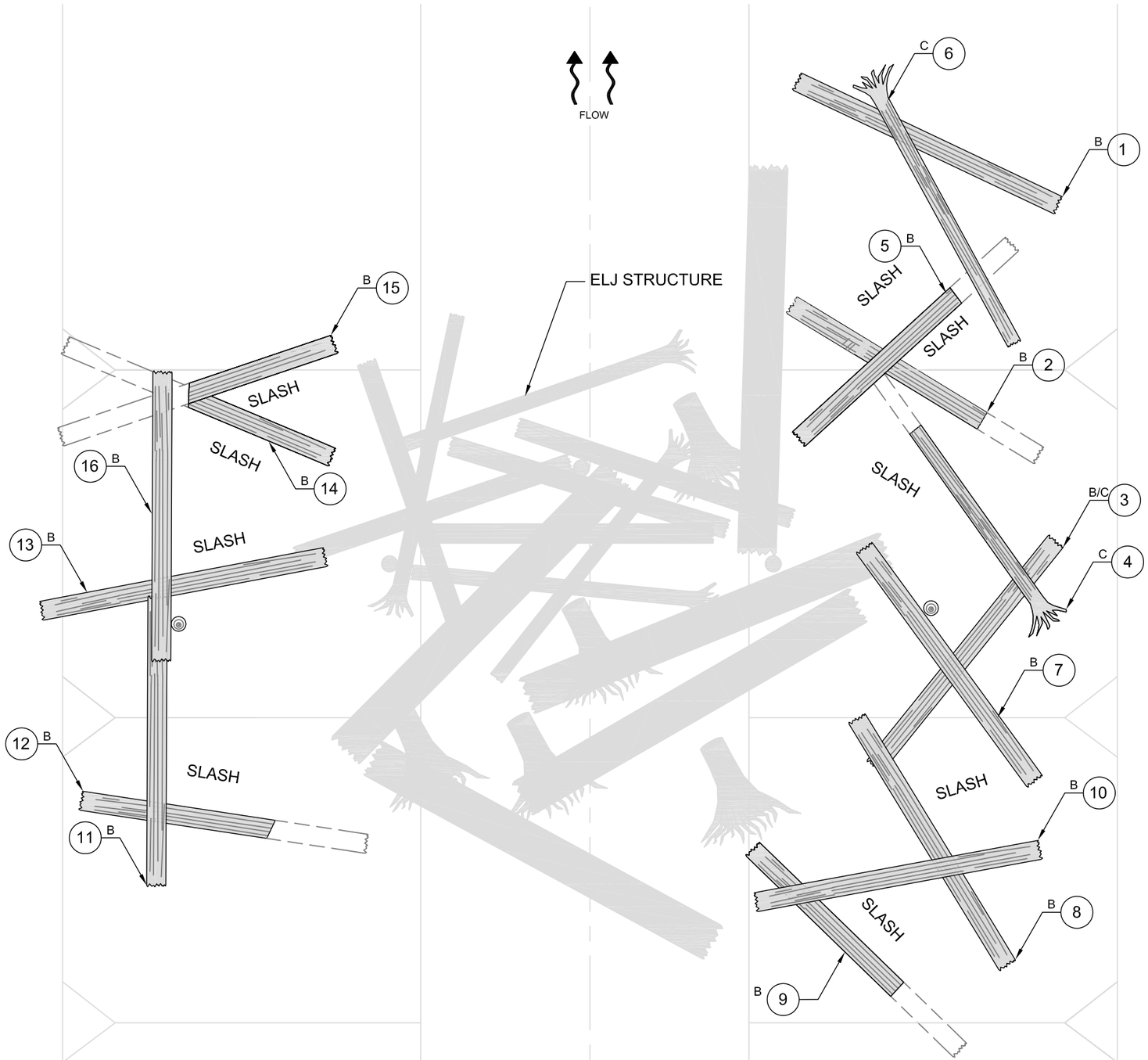
DESIGNED: M.RUEBEL	CHECKED: M.SPILLANE
DRAWN: T.PRESCOTT	SCALE: AS NOTED
RECOMMENDED:	CONTRACT NO:
APPROVED:	

SKAGIT ENVIRONMENTAL BANK

PHASE 1

ELJ LAYER PLAN

DATE:	JULY2005
FILE NO:	05-03049-000
DRAWING NO:	C-2
SHEET NO:	5 OF 9



NOTES:
1. LENGTH OF EMBEDMENT MINIMUM 6 FEET
2. ELJ-1 LOG #3 = TYPE B, ELJ-2 LOG #3 = TYPE C
3. TYPE B LOGS MAY HAVE ROOTWADS

LEGEND:

48"Ø by 40' Long — TYPE A

24"Ø by 30' Long — TYPE B

18"Ø by 30' Long w/Rootwad — TYPE C

18"Ø VERTICAL PILE

EXPOSED PORTION — BURIED PORTION

LOG SEQUENCE NUMBER — # X — LOG TYPE

ONE INCH
AT FULL SIZE. IF NOT ONE INCH SCALE ACCORDINGLY

PRELIMINARY SET - NOT FOR CONSTRUCTION

No.	REVISION	BY	APP'D	DATE

HERRERA ENVIRONMENTAL CONSULTANTS
2200 Sixth Avenue
Suite 1100
Seattle, Washington
98121-1820
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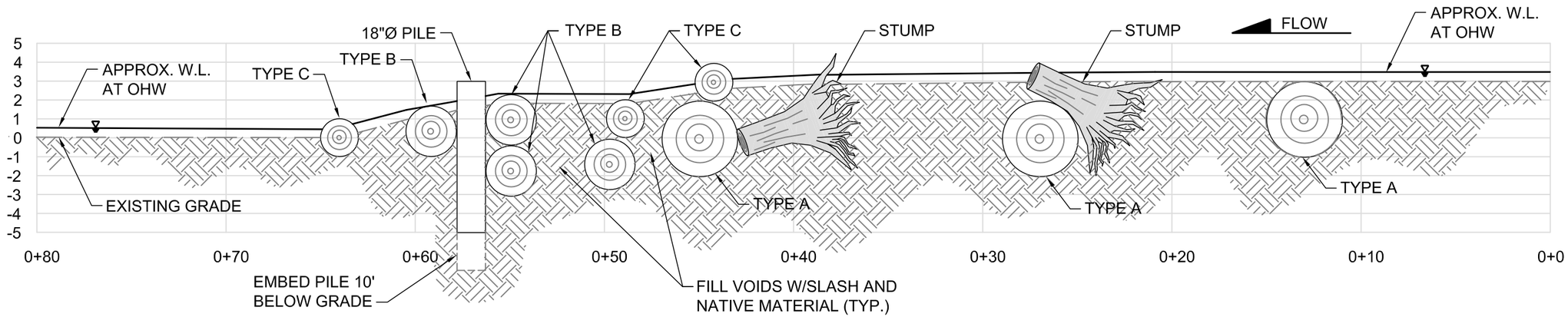
DESIGNED:	M.RUEBEL
DRAWN:	T.PRESCOTT
RECOMMENDED:	
APPROVED:	
CHECKED:	M.SPILLANE
SCALE:	N.T.S.
CONTRACT NO:	

SKAGIT ENVIRONMENTAL BANK

PHASE 1

TYPICAL BANK PROTECTION PLAN

DATE:	JULY2005
FILE NO:	05-03049-000
DRAWING NO:	C-3
SHEET NO:	6 OF 9



SECTION A

SCALE: N.T.S.

C-1

PRELIMINARY NOT FOR CONSTRUCTION

ONE INCH
AT FULL SIZE. IF NOT ONE INCH SCALE ACCORDINGLY

No.	REVISION	BY	APP'D	DATE

HERRERA ENVIRONMENTAL CONSULTANTS
2200 Sixth Avenue
Suite 1100
Seattle, Washington
98121-1820
206-441-9080
206-441-9108 FAX
http://www.herrerainc.com

DESIGNED: M.RUEBEL	CHECKED: M.SPILLANE
DRAWN: T.PRESCOTT	SCALE: AS NOTED
RECOMMENDED:	CONTRACT NO:
APPROVED:	

SKAGIT ENVIRONMENTAL BANK

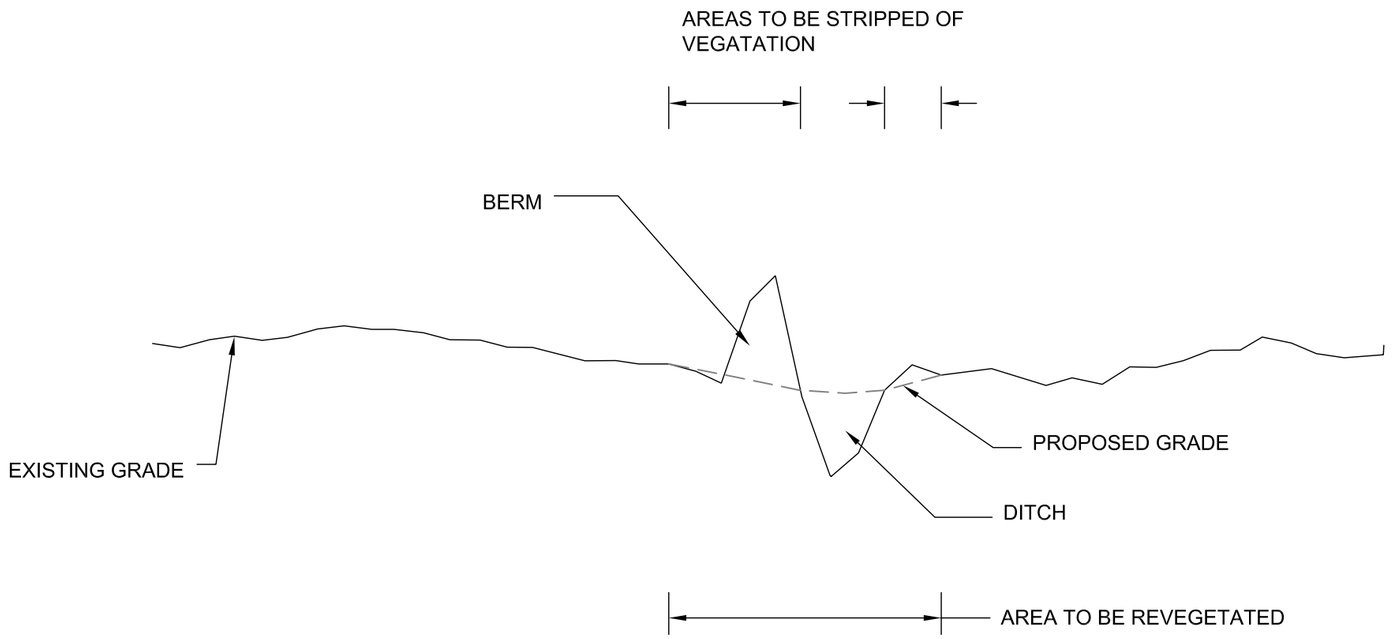
PHASE 1

ELJ PROFILE

DATE:	JULY2005
FILE NO:	05-03049-000
DRAWING NO:	C-4
SHEET NO:	7 OF 9

DITCH FILLING NOTES

1. DITCHES WILL BE FILLED MATERIAL FROM ADJACENT BERMS.
2. WHERE ADJACENT BERM VOLUMES ARE NOT SUFFICIENT TO FILL DITCHES, ANTICIPATED LOCATIONS OF PHASE 2 CHANNELS WILL GENTLY GRADED FOR MATERIAL.
3. ALL BERMS AND AREAS GRADED FOR MATERIAL TO FILL DITCHES WILL BE STRIPPED OF VEGETATION PRIOR TO GRADING.
4. VEGETATIVE MATERIAL REMOVED DURING STRIPPING WILL BE COMPOSTED IN UPLAND AREAS.
5. ALL DISTURBED AREAS ASSOCIATED WITH DITCH FILLED WILL BE REPLANTED WITH TEMPORARY EROSION CONTROL VEGETATION AND LATER WITH WETLAND PLANTS.



ONE INCH AT FULL SIZE. IF NOT ONE INCH SCALE ACCORDINGLY

PRELIMINARY SET - NOT FOR CONSTRUCTION

No.	REVISION	BY	APP'D	DATE

HERRERA ENVIRONMENTAL CONSULTANTS
2200 Sixth Avenue
Suite 1100
Seattle, Washington
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206-441-9080
206-441-9108 FAX
http://www.herrerainc.com

DESIGNED: M.RUEBEL	CHECKED: M.SPILLANE
DRAWN: T.PRESCOTT	SCALE: N.T.S.
RECOMMENDED:	CONTRACT NO:
APPROVED:	

SKAGIT ENVIRONMENTAL BANK

PHASE 1

TYPICAL BANK PROTECTION PLAN

DATE:	JULY2005
FILE NO:	05-03049-000
DRAWING NO:	X1
SHEET NO:	OF

Path: O:\proj\04-02822-003\Cad\Current\D Filename: X1 Plot date: Sep 26, 2005-11:38:02am CAD User: tprescott.
Xref Filename: |

APPENDIX C

Photographic Documentation

Skagit Environmental Bank Habitat Restoration Photographic Log

Photo Number	Photo Description
1	View of the main stem of Nookachamps Creek, facing southeast.
2	View of main stem of Nookachamps Creek facing southeast, showing the aquatic vegetation in the stream channel.
3	View of the main stem of Nookachamps Creek facing north, showing an agricultural bridge and typical riparian conditions at the site.
4	View 1 of the bald eagle nest on the project site, facing west.
5	View 2 of the bald eagle nest on the project site, facing west.
6	An eroding stream bank on the main stem Nookachamps Creek with reed canarygrass on the bank.
7	Small gravel substrate typical of the Nookachamps system within the project area.


1


2


3


4

5

6

7

APPENDIX D

Wetland Functional Assessment Report

SKAGIT ENVIRONMENTAL BANK

Skagit County, Washington

Function Assessment Results: WAFM

Prepared for

The Mitigation Bank Review Team

Prepared by

Sustainable Environments Skagit, LLC
Seattle, Mount Vernon, San Francisco, Denver
Kevin F. Noon Ph.D. PWS
Telephone: (303) 679-8262

August 2005

CONTENTS

WAFM Application to Existing Wetlands, Existing Wetlands After Restoration, Existing Historic Wetlands, and Existing Historic Wetlands After Restoration

In summary, the WAFM exercise has proven the obvious. The 15 functional value scores for the existing on-site wetlands and for the remaining agricultural fields, along with the net change in the scores for each function (once the bank is complete) are listed in the summary table in this report. The Riverine Flow Through or Impounded Units are existing reed canary grass wetlands or ponded water areas in the plowed fields (that total only 59 acres). On a scale of 1 to 10, the net change in functional value for the water quality and hydrology functional values average around 2. This is because these areas are serving existing water quality and hydrologic functions. However, since the design we propose will change the topography and vegetation structure of these existing wet areas, the net change in habitat suitability functions will be significant – the average net change values are over 9 in two Riverine Flow Through or Impounded Units and average around 6 in the other two units.

On the remaining 3 assessment unit areas of the site, the Riverine Flow Through Historic Units which are plowed soils where the hydrology has been altered, (which total 252 acres or the majority of the site) the net change in functional lift will be significant for all 15 of the functional categories. By grading, adding vegetation, and stabilizing the soils, the net change values for the water quality and hydrology functions average around 9 for all three historic units. The net change in habitat suitability function values vary around 8 for one unit and 6 for the other two.

We used the *Methods for Assessing Wetland Functions, Volume I: Riverine and Depressional Wetlands in the Lowlands of Western Washington* (WFAM, Hruby et al. 1999) to evaluate the existing and proposed functional value of the existing and historic wetlands. We quantified functional improvement from our proposed restoration activities using the WFAM model. The model developers make their justification for function scoring clear and logical, and therefore, we did not develop or use any type of weighting system to reflect our perceived importance of certain wetland functions. We applied the evaluation exactly as it is described in the WFAM manual, using their model, which is based on optimum functional values of regional reference areas.

Functional improvement is defined here (according to the Corp's "Christmas Guidance" the *Guidance on Compensatory Mitigation Projects for Aquatic Resource Impacts Under the Corps Regulatory Program*, No. 02-2, 12/24, 2002) as the net increase change in the quantity and quality of the "*wetland or floodplain physical, chemical, or biological functions*," that will be in addition to the baseline conditions of the wetland or floodplain existing functions after restoration. We completed the following steps.

<u>Existing</u> Wetland Assessment Units (4)

First we defined each existing wetland group according to the obvious hydrologic breaks or hydrologic regimes called Assessment Units (AUs) and then applied the WAFM to each existing wetland AU. The model developed a set of indices, one for each function in each of the four existing wetland AUs. These 4 Wetland Assessment Units make up the 59 acres of existing wetlands that we have delineated on the 311 acres (355 minus the 44 buffer) of the bank site. (We did not include the 44 acres of buffer in this functional assessment.

- **Riverine Flow-Through 1 (RF-1).** The RF-1 wetland AU includes the riverine and palustrine wetlands along Mud Lake Creek drain. The existing wetland area is a trough that had been graded and ditched to expedite creek flow and drain the adjacent fields as quickly as possible. The current condition of the wetland is basically a ditch through a reed canary grass depression.

- **Riverine Flow-Through 2 (RF-2).** The RF-2 wetland AU includes the riverine and palustrine wetlands (emergent reed canary grass edges) along the East Fork reach.

- **Riverine Flow-Through 3 (RF-3).** The RF-3 wetland AU includes the riverine and palustrine wetlands (emergent reed canary grass and some scrub-shrub edges of the Nookachamps riverine system) along the Nookachamps reach. Included in this unit is a 3.2 - acre area of disturbed, atypical (plowed) wetland that still exhibits hydric characteristics and can be delineated as a wetland.

- **Riverine Impounding (RI-1).** The RI-1 wetland AU is associated with the East Fork reach. This unit is what the WAFM authors define as wetlands that are non contiguous with the stream reach but depend on the river hydrologically through flooding and ground water connection. The wetland area is small (6.8 acres), is flooded at least once a year from overflow of the East Fork, has a closed drainage system, and impounds surface water that will flow out only if the depth (approximately 12 inches) overtops the edge of the adjacent drainage ditch.

<u>Proposed</u> Changes to Existing Wetland Assessment Units (4)

Next, we made our best estimate of conditions that will occur after restoration in each of the existing wetland AUs (listed above) and then input the proposed condition details into the WAFM to give us a set of functional values for the proposed bank site restoration conditions. In other words the input is the dimensions of the variables that we expect to occur as a result of our restoration efforts, or what we expect to be present in the AUs after we restore the areas and after the areas mature for 10 growing seasons.

Proposed Riverine Flow-Through 1 (PRF-1). This is the same area of AU defined above as RF-1; however, the variables input to the model for this AU were the conditions we expect to evolve on the AU after ten growing seasons.

Proposed Riverine Flow-Through 2 (PRF-2). This is the same area of AU defined above as RF-2: however, the variables input to the model for this AU were the conditions we expect to evolve on the AU after ten growing seasons.

Proposed Riverine Flow-Through 3 (PRF-3). This is the same area of AU defined above as RF-3; however, the variables input to the model for this AU were the conditions we expect to evolve on the AU after ten growing seasons.

Proposed Riverine Impounding (PRI-1). This is the same area of AU defined above as RI-1; however, the variables input to the model for this AU were the conditions we expect to evolve on the AU after ten growing seasons.

<u>Existing</u> Historic Wetland Assessment Units (3)

Next, we defined the remaining AU areas of the bank site according to obvious hydrologic breaks and then applied the WAFM method to each AU. These AUs are areas that historically (prior to 1941) were wetlands and that are not currently delineated as wetlands (please see our discussion of historic conditions in the Conceptual Design Addendum to the Wetland Mitigation Bank Prospectus: Functional Phasing Approach). The model produced a set of indices, one for each of the 15 functions in each of the three existing historic wetland AUs.

Riverine Flow-Through Historic 1 (RFH-1). This AU is the watershed area of Mud Lake Creek, which is in the Bank Site area, and which has been graded and drained. This area (as defined above in the existing conditions section) was historically a forested wetland system. It is currently graded, plowed, and does not exhibit hydric characteristics that would qualify it as a wetland.

Riverine Flow-Through Historic 2 (RFH-2). A system of drainage ditches currently drains most of the area to the Nookachamps north of the East Fork and therefore this AU is hydrologically defined as part of the Nookachamps watershed.

Riverine Flow-Through Historic 3 (RFH-3). A system of drainage ditches currently drains most of the area to the Nookachamps south of the East Fork and therefore this AU is hydrologically defined as part of the Nookachamps watershed.

<u>Proposed</u> Changes to Existing Historic Wetland Assessment Units (3)

Next, , we made our best estimate of conditions that will occur after restoration in each of the existing historic wetland AUs (listed above) and then input the proposed condition details into the WAFM to give us functional values for the proposed bank site restoration conditions. In other words the input is the dimensions of the variables that we expect to occur as a result of our restoration efforts, or what we expect to be present in the AUs after we restore the areas and after the areas mature for 10 growing seasons.

Proposed Riverine Flow-Through Historic 1 (PRFH-1). This is the same AU as defined above as RFH-1: however, the variables input to the model for this AU were the conditions we expect to evolve on the AU after ten growing seasons.

Proposed Riverine Flow-Through Historic 2 (PRFH-2). This is the same AU as defined above as RFH-2: however, the variables input to the model for this AU were the conditions we expect to evolve on the AU after ten growing seasons.

Proposed Riverine Flow-Through Historic 3 (PRFH-3). This is the same AU as defined above as RFH-3; however, the variables input to the model for this AU were the conditions we expect to evolve on the AU after ten growing seasons.

Next, a summary form was compiled that shows the individual scores for each of the 14 existing or proposed Assessment Units. The results are discussed in the next section.

Legend for WFAM Assessment Units

Existing Assessment Units:	Proposed (10 growing seasons) Assessment Units:
RF-1 (Riverine Flow-Through 1)	PRF-1 (Proposed Riverine Flow-Through 1)
RF-2 (Riverine Flow-Through 2)	PRF-2 (Proposed Riverine Flow-Through 2)
RF-3 (Riverine Flow-Through 3)	PRF-3 (Proposed Riverine Flow-Through 3)
RI (Riverine Impounding)	PRI (Proposed Riverine Impounding)
RFH-1 (Riverine Flow-Through Historic)	PRFH-1 (Proposed Riverine Flow-Through Historic)
RFH-2 (Riverine Flow-Through Historic 2)	PRFH-2 (Proposed Riverine Flow-Through Historic 2)
RFH-3 (Riverine Flow-Through Historic 3)	PRFH-3 (Proposed Riverine Flow-Through Historic 3)

Physical, chemical, and biological functional improvement will come from three sets of activities that we will complete on the Bank Site: 1. The restoration of the creek and floodplain geomorphic processes, 2. The addition of off channel rearing and refuge habitat, and 3. The restoration of the emergent, forested, and scrub-shrub habitats. We believe intuitively that a fourth activity-- the removal of the dairy and farming operation that now occupies the land on and around the Bank Site-- will provide for some water quality functional lift, but is not the focus of the creation of the mitigation Bank.

Summary of Function Assessment Input Data and Results

The model produced a set of indices (between 0 and 10) for each function. (Please see Table: Entire Bank Site WFAM Results below, which is the summary for all Assessment Unit function results and see Appendix 2: WFAM Background Tabulations for the input data.) Ten represents the highest level of performance for that function. The scores cannot be compared across functions. Therefore the scores cannot be summed across all functions in an AU to give a total score.

Water Quality and Hydrology. The net change in the group of water quality functions scores are only slightly higher on existing wetlands (RF- 1, 2, and 3, and RI - 1) than on proposed or restored AUs primarily because the existing reed-canary grass emergent systems are functioning well for water quality. We propose to cut and fill these areas to create greater areas of native emergent and submergent species. Therefore, the scores went up slightly for water quality and significantly for the group of habitat suitability functions. The model did not take into consideration the fact that we will be removing the adverse impacts from spraying of 350 pounds per acre of nitrogen and 55 pounds per acre of phosphorous per year (distributed primarily in the fall after corn harvest and before the rainy season) and the addition of 600 pounds per acre of commercially produced nitrogen that is added in the spring (in addition to the manure) to the Bank Site and surrounding farm fields. We feel that, if discontinuing this practice was incorporated into the model, then the net change in water quality suitability would calculate out at significantly higher values in the restored existing wetlands.

The water quality and hydrology function scores are significantly higher for the restored historic (graded and drained) wetland areas because permanently covering 252 acres of plowed,

exposed, soils with vegetation will significantly reduce erosion and improve water quality. The vegetation will reduce splash erosion, slow water movement, and reduce sediment transport.

Suitability (general habitat, invertebrates, amphibians, and salmonids and non-salmonids). We believe that the significant increase in change in suitability scores, on all restoration AUs, for general habitat, invertebrates, amphibians, and anadromous and resident fish, is because the restored conditions will:

- Reduce the effects of winter storm events
- Increase the quality and diversity of aquatic and riparian habitat
- Improve water quality, reduce sediment runoff into the creeks, and lower water temperatures in the summer
- Provide rearing, refuge, and migration habitat for fish, amphibians, reptiles, and other aquatic dependent species
- Improve stream flow maintenance and reconnect the creeks with the floodplain and create active channel migration zones
- Increase linkages between the channel systems and restored riparian floodplain emergent, scrub-shrub, and forested wetlands
- Slow the rising and falling stormwater movements through the floodplain, i.e., slow the peak timing and flows and increase the detention time of stormwater in the Bank Site area. This will reduce flooding and increase infiltration into the ground water.

In addition, we believe that the significant increase in change in suitability scores, on all restoration AUs, for anadromous and resident fish is because the Bank Site project will reduce water temperatures by revegetating and shading creek channels, improve width to depth channel ratios, and increase ground-water flows. EPA's 303(d) impairment status lists the Nookachamps, the East Fork, and the Lower Skagit River as falling short of State water quality standards for Temperature (WDOE 2004c, USEPA 2003). Stream temperatures in the lower Skagit River tributaries are of particular concern because of their use by Puget Sound Chinook salmon (a species listed as threatened under the Endangered Species Act) as a migration corridor and as spawning, rearing, and refuge habitat (WDOE 2004c). Water temperatures warm enough to cause thermal stress in salmonids have been measured in the Skagit River, Nookachamps Creek, and the East Fork.

In the *Lower Skagit River Tributaries Temperature Total Maximum Daily Load Study*, the Department of Ecology scientists (WDOE 2004c) determined that creek temperatures are driven primarily by thirteen variables. The Bank Site project will improve or provide eight: Streamside Vegetation; Groundwater Temperatures; Channel Conditions such as width and depth; Stream Flow (or discharge); Geomorphic Characteristics such as stream gradient and aspect, channel incision, and stream valley topography; Affects of Water Withdrawals; Groundwater Inflow; and Hyporheic Flow. According to the study, by improving these conditions, the Bank Site project should lower summer water temperatures and add functional lift to the existing temperature regime.

Suitability (birds, mammals, native plant richness and organic production). We believe that the significant increase in change in suitability scores, on all restoration AUs for birds, mammals, native plant richness, and organic production and export is because the restored conditions will:

- Improve riverine habitat for the bull trout and the bald eagle, which are both "listed" species, and other fish and wildlife
- Provide additional winter roosting refuge habitat for ducks, trumpeter swans, Wrangel Island snow geese, Canada geese, and other wildlife during established hunting seasons. We acknowledge that the Bank will be transforming areas of row crops that the waterfowl in the area have historically used as foraging areas, but feel that given the abundant farming in the Skagit watershed (over 75,000 acres) and the limited amount of winter roosting refuge habitat in the area, that this should be considered a net positive for the waterfowl.
- Enhance the eagle habitat (there is a nesting bald eagle pair on the Bank Site) by increasing fishing opportunities and increasing privacy with forest cover
- Improve local and regional wildlife habitat connectivity by connecting with wetlands adjacent to four sides of the Bank Site to form a total wildlife corridor of contiguous wetlands 11.1 miles long and totaling 925 acres. (i.e. the Wetland Reserve Program (USDA-Natural Resources Conservation Service) East Fork Nookachamps restoration project is part of an existing 63-acre forested wetland area located adjacent to the east edge of the Bank Site. The NRCS restored wetland connects with the Turner Creek wetlands further east. Major portions of the upper and lower reaches of the Nookachamps Creek (upstream of the south edge of the site and downstream of the north edge) are forested and scrub-shrub wetland riparian corridor. The Barney Lake wetland (162 acres in total) is located next to the Bank Site, to the west. Please see Figure: Connectivity in Appendix 1, for an aerial photograph with the approximate boundaries of this 925 acre wetland area shaded in blue (this area encompasses the Bank Site and is intended to represent the connectivity that is created by the restoration of the Bank Site).

  (As the MBRT requested in its comments, we have researched the legal state of the four wetland areas that we will connect by developing the Bank. Of the area to the west of the Bank Site that includes that area of Barney Lake that is not on the Bank Property, approximately 113 acres are held in conservation easement, 95 acres are held by the Skagit Land Trust; their tax parcel numbers are: P24821, P24970, P24484, P24485, P112527 and P24472. Of the area to the north of the Bank Site that includes the downstream north edge of the Nookachamps Creek, approximately 96 acres is held in conservation easement by the Skagit Land Trust; their tax parcel numbers are: PP23474, PP99048 and P23472. Of the area to the east of the property approximately 47 acres are held in conservation easement by the NRCS; their tax parcel numbers are: P24507 and P115498. There are no parcels that are held in conservation easement to the south of the Bank Site.)

  It remains doubtful that any of these wetland areas will be significantly impacted in the future for three reasons:

1. Zoning for the majority of these areas is Natural Resource Agricultural or Open Space, with a density restriction of 1 residence per 40 acres.
2. All of these areas of wetland are in the 100 year floodplain, and therefore it is highly unlikely that any structures that would impact the wetlands would be permitted.
3. Impacts such as agricultural use of the lands is either already in practice and allowed under the authority of Previous Converted Cropland, or if new agricultural uses were desired, they would require mitigation, which would be cost prohibitive given the agricultural value of the land versus the cost to provide for mitigation.

The Bank Site will also add a major feeding and resting stopover opportunity for migrating fish and birds. On a regional connectivity scale, the Bank Site will add a major feeding and resting stopover opportunity for migrating fish and birds coming from a network of ten other, nearby, wildlife refuges or significant waters of the State, that are within a few miles of the proposed Bank Site. The surrounding network includes: 1. the Debays Slough Game and Swan Reserve which is over 700 acres and 1.5 miles north of the Bank Site and within the Nookachamps watershed; 2. Mud Lake which is approximately one mile northeast of the property; 3. the Skagit River corridor located approximately 1.5 miles west of the Bank Site; 4. Beaver Lake; 5. Big Lake; 6. Lake McMurray; 7. Clear Lake; 8. Lake Challenge; 9. the Padilla Bay National Estuarine Reserve, which is 9 miles west of the Bank Site; and 10. The Skagit Wildlife Areas of Fir Island and Skagit Bay, which are 9 miles south-west of the Bank Site.

The following table is the compiled results for all AUs and for the entire 311-acre bank site. The first row of numbers next to the individual assessment unit shows the scores for each function (in each column) relative to the Assessment Unit's existing condition (e.g., RF-1 is the row of function scores for the Riverine Flow-Through Wetland area number 1). Data was derived from the existing conditions and input into the WAFM model. The second row of numbers next to the individual assessment unit shows the scores for each function (in each column) relative to the Assessment Unit's proposed condition after 10 growing seasons. The ten year physical and biological changes were characterized and input into the WAFM model.

The table is divided into four quadrants. The columns are separated with a heavy line between the habitat suitability functions and the water quality and hydrologic functions. The rows are separated with a heavy line between the existing wetlands and the remaining historic wetland areas. Please note that the Riverine Flow Through Historic Unit areas, which are plowed soils where the hydrology has been altered, total 252 acres. The areas of the existing Riverine Flow Through wetlands (either plowed hydric soils or reed canary grass fields) total 59 acres. Therefore, the majority of functional lift will occur on the larger areas or the Historic Units. The WAFM model does not take into account the difference in the size of each Unit. Therefore, a score of 9 for Potential to Reduce Peak Flows will be more valuable on the Riverine Flow Through Historic Units than a score of 9 on the Riverine Flow Through Units (because of the difference in total area of the two unit types).

Table: Entire Bank Site WFAM Results (existing and proposed after 10 years)

		Water Quality/Hydrology Functions						Habitat Suitability Functions								
Assessment Unit	Acres	Potential to Remove Sediment	Potential to Remove Nutrients	Potential for Removing Toxins	Potential to Reduce Peak Flows	Potential for Decreasing Erosion	Potential for Recharging Groundwater	General Habitat Suitability	Habitat Suitability for Invertebrates	Habitat Suitability for Amphibians	Habitat Suitability for Anadromous Fish	Habitat Suitability for Resident Fish	Habitat Suitability for Birds	Habitat Suitability for Mammals	Native Plant Richness	Potential for Primary Production and Organic Export
RF-1	14.4	6	6	7	9	2	7	1	0	0	0	0	2	3	0	7
PRF-1	14.4	9	9	7	9	7	7	7	9	4	5	2	8	9	9	7
net change		3	3	0	0	5	0	6	9	4	5	2	6	6	9	0
RF-2	19.7	4	4	6	6	2	3	1	3	5	5	5	6	5	0	7
PRF-2	19.7	6	6	6	6	4	3	8	10	10	10	10	10	10	7	7
net change		2	2	0	0	2	0	7	7	5	5	5	4	5	7	0
RF-3	18.1	3	3	5	5	1	1	1	4	5	1	5	6	5	1	7
PRF-3	18.1	5	5	6	5	3	1	8	10	10	8	10	10	10	10	7
net change		2	2	1	0	2	0	7	6	5	7	5	4	5	9	0
RI-1	6.8	6	7	4	9	8	7	0	0	2	0	0	2	1	1	0
PRI-1	6.8	8	9	7	9	10	5	5	4	5	2	3	4	5	3	4
net change		2	2	3	0	2	-2	5	4	3	2	3	2	4	2	4
RFH-1	17	0	0	0	6	3	1	0	0	1	0	0	4	1	0	0
PRFH-1	17	9	9	5	9	10	7	9	9	6	5	7	9	10	10	7
net change		9	9	5	3	7	6	9	9	5	5	7	5	9	10	7
RFH-2	101	0	0	0	7	4	1	1	0	1	0	0	3	1	0	0
PRFH-2	101	9	9	5	10	10	7	8	6	5	6	4	8	8	10	7
net change		9	9	5	3	6	6	7	6	4	6	4	5	7	10	7
RFH-3	134	0	0	0	7	4	1	1	0	1	0	0	3	1	0	0
PRFH-3	134	9	9	5	10	10	7	8	6	4	5	3	7	8	10	7
net change		9	9	5	3	6	6	7	6	3	5	3	4	7	10	7

WAFM AU Area Distribution According to the Functional Phases

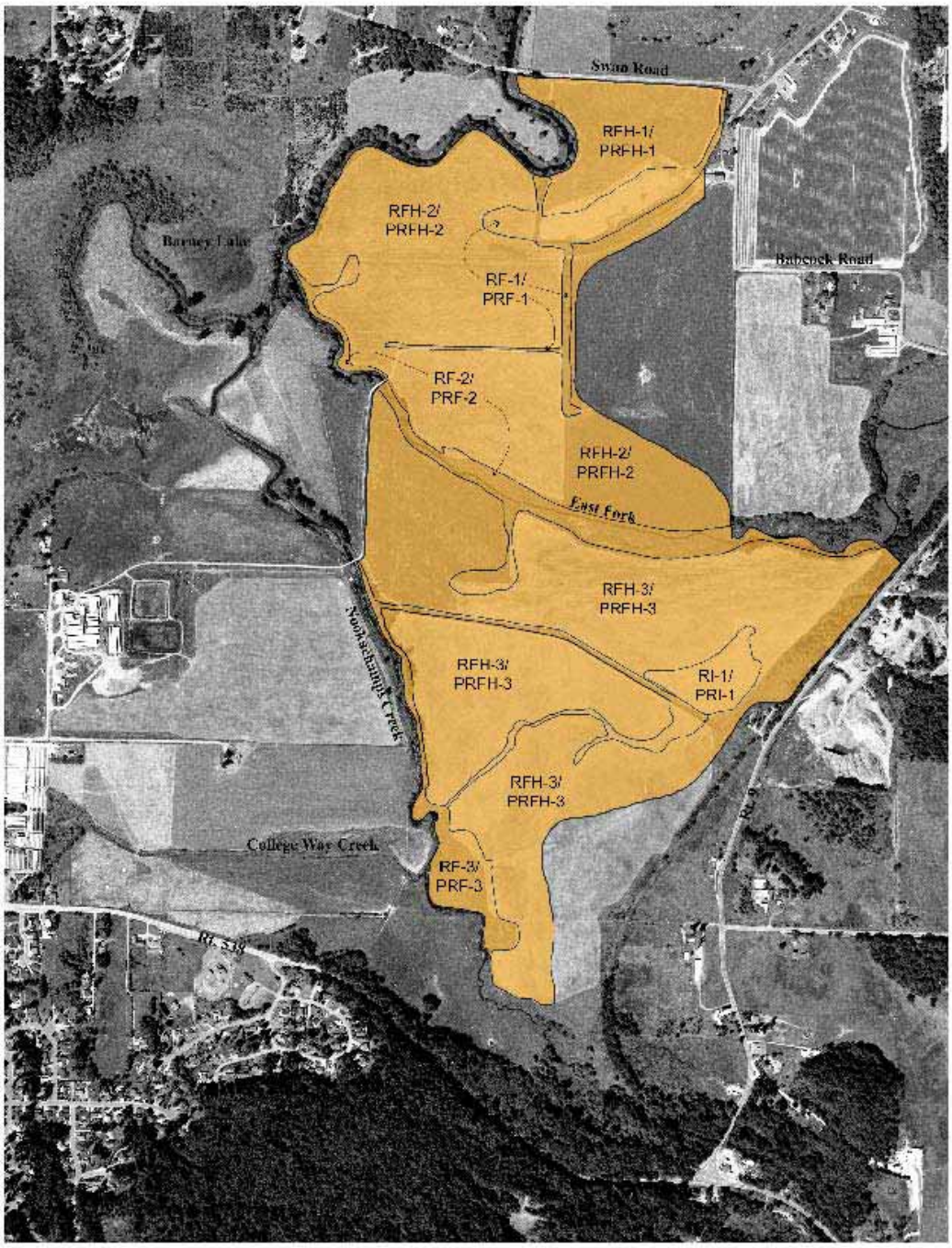
By filling in the ditches and creating the engineered log jams, phase one of our functional phasing approach will enhance the wetland hydrologic conditions on a total of 218 acres of the 311-acre bank site. This includes all of the 59 acres of riverine flow through and riverine impoundment AUs (RF-1,2,3 and RI-1), and restored wetland hydrology to approximately 159 acres of the remaining riverine flow through historic areas (RFH-1,2,3). If we only did this Phase 1 change, we expect that after 10 years, through natural re-vegetation there would be significant ecological lift across 218 acres of the Bank Site on all function indices.

In phase two we will construct the high flow channels based on the measured changes to river elevations and ground water hydrology. We will complete the planting of the high-flow channels and all areas that satisfy hydrologic conditions at the time we complete phase two which should equal approximately 250 acres. This includes all of the 59 acres of riverine flow through and riverine impoundment AUs (RF-1,2,3 and RI-1), and planting of the restored wetland hydrology on approximately 159 acres of the riverine flow through historic areas (RFH-1,2,3) plus planting upland islands. If we only did the restoration associated with these two Phases, we expect that after 10 years, through natural re-vegetation there would be almost complete ecological functional lift on 250 acres of the Bank site across all function indices.

The third phase will be to excavate (down to the appropriate hydrologic conditions) and plant most of the remaining 61 acres of the bank site in order to create a mix of upland and wetland forested island habitats out of the non-hydric areas that remain after phases one and two. This includes 10 acres of RFH-1, 20 acres of RFH-2, and 30 acres of RFH-3.

Appendix 1: Exhibit

WETLAND FUNCTION ASSESSMENT UNITS MAP



Skagit Environmental Bank
Wetland Functional Assessment Units

N
Not to Scale

Appendix 2: WFAM Background Tabulations

See Excel Spreadsheets:

WFAM Appendix\PRF-1 Calcs.xls

WFAM Appendix\PRF-2 Calcs.xls

WFAM Appendix\PRF-3 Calcs.xls

WFAM Appendix\PRFH-1 Calcs.xls

WFAM Appendix\PRFH-2 Calcs.xls

WFAM Appendix\PRFH-3 Calcs.xls

WFAM Appendix\PRI-1 Calcs.xls

WFAM Appendix\RF-1 Calcs.xls

WFAM Appendix\RF-2 Calcs.xls

WFAM Appendix\RF-3 Calcs.xls

WFAM Appendix\RFH-1 Calcs.xls

WFAM Appendix\RFH-2 Calcs.xls

WFAM Appendix\RFH-3 Calcs.xls

WFAM Appendix\RI-1 Calcs.xls