7/19/2011

Upper Quinault River Salmon Habitat Restoration NEPA Compliance

FINAL

This National Environmental Policy Act (NEPA) Compliance document, in the form of an Environmental Assessment (EA) addresses the restoration of salmon habitat of the Upper Quinault River located within the geologic floodplain of the Quinault River (coastal Washington State, in the west slope of the Olympic Mountains). This EA considers the preferred alternative of installing Engineered Logjams and restorative planting of conifer and hardwood trees to meet the goals of improving river processes and salmon habitat, especially for Blueback salmon (Oncorhynchus nerka). This NEPA Compliance document has been prepared by the Quinault Indian Nation with the Bureau of Indian Affairs serving as the Lead Federal Agency

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This **Quinault Indian Nation Environmental Assessment**
is completed in cooperation with the **Bureau of Indian Affairs**
for the fulfilment of **National Environmental Policy Act**
requirements to implement salmon habitat restoration
in the Upper Quinault River in Coastal Washington State
of the Olympic Mountains.

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This planning effort has been completed with the consultation of a Planning Committee comprised of representatives of administrative Divisions from the Quinault Indian Nation, representatives from adjacent government agencies including the offices of Congressman Norm Dicks, Olympic National Forest, Olympic National Park, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. Geological Survey, NOAA Restoration Center, National Marine Fisheries Service, Washington Department of Natural Resources, Washington Department of Fish and Wildlife, Washington Department of Ecology, Jefferson County, Grays Harbor County, The Nature Conservancy, The Wild Salmon Center, Upper Quinault River Committee, and planning consultants from Kamiak Ridge, LLC.

Epigraph

"WHAT WE DO TO THE LAND, WE DO TO OURSELVES."

Joe DeLaCruz, President, Quinault Indian Nation (Storm, et al. 1990)

Significant Analyses Incorporated by Reference

Two notable guiding documents have been developed to address the Upper Quinault River, the historical process of resource degradation, potential restoration activities to recover the sockeye (Blueback) salmon, and other salmonid species in the river ecosystem, and both are hereby incorporated in this document by reference. These documents, along with others, are cited within this Environmental Assessment to provide the scientific basis for implementing actions intended to achieve the desired future condition. These two documents provide the foundation for analyzing the expected outcomes of the river restoration and salmon habitat restoration in the Upper Quinault River.

Bureau of Reclamation. (2005). *Geomorphic Investigation of Quinault River, Washington; 18 Km Reach of Quinault River Upstream from Lake Quinault.* Denver, Colorado: US Bureau of Reclamation.

Quinault Indian Nation. (2008). *Salmon Habitat Restoration Plan; Upper Quinault River.* Quinault Indian Nation, QDNR, Department of Fisheries. Taholah, Washington: Including contributions by Herrera Environmental Consultants, Inc.

The Geomorphic Investigation of Quinault River conducted by the Bureau of Reclamation (BOR) identified and examined the causes and scale of habitat loss; the restoration plan identified the restoration strategy and approach necessary to achieve salmon habitat restoration. The BOR evaluated the current large-scale physical river processes (its past and present shape, or morphology) against the background of available historical data, and analyzed the rates of change in that morphology as influenced by the river's hydrology, its sediment supply, existing vegetation, human impacts, and geological controls on the valley system. These were evaluated with the final conclusion that further degradation of the river is inevitable due to its inability, if left on its own, to heal itself, thus providing a necessary basis for the identification and implementation of the recommended integrated restoration strategies on the Upper Quinault River that will lead to a more self-sustaining system.

The Salmon Habitat Restoration Plan – Upper Quinault River, describes in detail the scientific basis and a procedural framework initiated in the wake of the BOR geomorphic study for actions, local in nature and short-term in perspective, which are aimed at sockeye spawning habitat restoration, along with what is described as the long-term ultimate objective involving the entire floodplain: To recapture the initially existing natural balance within the river system, the essence of which lies in tying together physical and biological processes of the entire floodplain that results in a healthy functioning ecosystem.

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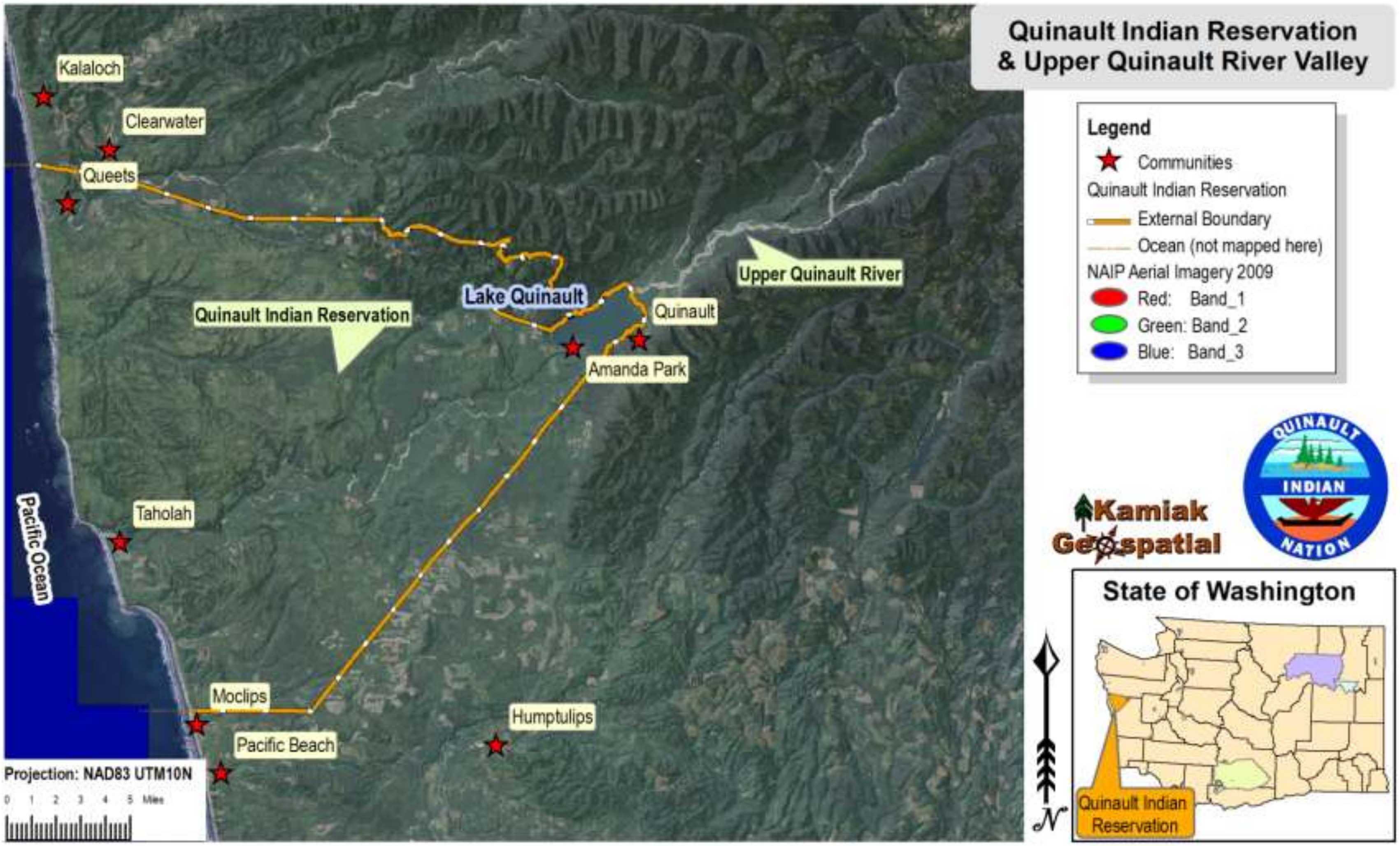
Quinault Indian Reservation
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Communities
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Kamiak Geospatial
QUINAULT INDIAN NATION
State of Washington
Quinault Indian Reservation

1. Introduction

The Quinault Indian Nation (Nation) is a self-governing, sovereign nation with demonstrated leadership in the development and implementation of fisheries policies which are recognized regionally and worldwide. The Quinault Indian Nation Tribal Business Committee signed a Tribal Government Resolution in June 2005 establishing the creation of a salmon habitat restoration initiative and identified restoration of the Upper Quinault River and Quinault Blueback (sockeye) salmon (*Oncorhynchus nerka*) a priority of the Nation. In response to the resolution, the Quinault Department of Fisheries developed the *Salmon Habitat Restoration Plan – Upper Quinault River* (QIN 2008) to guide restoration of natural riverine-forest-salmon habitat forming processes in the Upper Quinault River. The Plan serves as a long-term, science-based framework that integrates ecological and socio-economic factors into a cohesive approach to maintain and restore the quality of the natural environment and productivity of the Nation's salmon fisheries and natural resources.

The purpose of this Environmental Assessment is to evaluate 1) the scientific foundation for restoration of habitat forming processes (habitat restoration) in the Upper Quinault River channel migration zone, 2) the general approach for restoration, 3) methods and procedures for restoration, and 4) the framework for prioritizing, developing, and implementing projects. It will evaluate the need for the proposal, the alternatives, and the environmental impacts of the proposed action and alternatives, pursuant to the National Environmental Policy Act

This effort is a Programmatic Environmental Assessment intended to facilitate restoration activities within the Upper Quinault River Channel Migration Zone, regardless of current ownership, over the next 20 years, or more. This programmatic focus covers lands currently managed by the Olympic National Forest, Olympic National Park, Washington State, and private landowners. The comprehensive landscape-scale restoration approach encompasses a wide range of activities that can be implemented through a collaborative approach of all organizations, agencies and landowners to achieve river and salmon habitat restoration.

The Olympic National Forest and the Olympic National Park, as major land management federal agencies in the Upper Quinault River Basin, have a trust responsibility placed on them, which requires them to honor the Treaty of Olympia and aid the Nation in the protection of its treaty fishing resources. As such, the active participation of the federal agencies is anticipated.

In 1855, the Treaty of Olympia was signed by the Quinault Indian Nation and bands and tribes of the Hoh, Quileute, and Queets Indians. The Treaty was signed by Governor Stevens on behalf of the United States in 1856, and then ratified by the US Congress in 1859. The tribes ceded nearly a third of the Olympic Peninsula to the United States government in exchange for "*tract or tracts of land sufficient for their wants*". In exchange for the ceded territories, the U.S. Government promised to provide reservation homelands, education, and medical care. The tribes reserved their rights - to continue to harvest fish and shellfish in their usual and accustomed areas, and to hunt and gather roots and berries that were essential to coastal Salish people's ways of life (Treaty of Olympia, 12 Stat. 971, 1856).

Implementation of the elements evaluated in this Environmental Assessment will "promote the conservation of salmonid and wildlife population life history diversity and habitat in the short-term while implementing science based restoration of natural habitat forming processes that support recovery of landscape scale ecosystem function and fisheries resources over the long-term."

By applying the restoration approach that includes carrying out incremental actions (projects) over the next 20-30 years to provide positive cumulative benefits to the natural environment rather than cumulative negative impacts, the desired long term goals of the Quinault Indian Nation may be achieved. Benefits derived from implementation of plan elements would accrue over time and, while some objectives such as restoration of mature floodplain forests may require up to 100 years to materialize, others such as conserving existing salmon habitat and reducing risks to life and property should become apparent on a much shorter time scale.

This Programmatic EA focuses on restoration of seven specific reaches of the Upper Quinault River. Four restoration reaches have been designated within the Upper Quinault River geologic floodplain from Lake Quinault to the vicinity of the confluence of the East and North Fork Quinault Rivers. The restoration area then extends past this point to Graves Creek in the East Fork Quinault River (Reach 5) and to the North Fork Quinault River Ranger Station (Reach 6) in the North Fork Quinault River (Figure 15). The reaches were selected by examining local river channel morphology, hydrologic, and sediment source (i.e. alluvial fans) characteristics that create suitable break-point features. Thirty-five project areas within the active channel migration zone in reaches 2 and 3 have been identified by the Nation.

The Quinault Indian Nation will develop additional project areas in response to ever-changing river conditions such as river meandering and avulsion, changes in geologic material exposure, and habitat restoration opportunities. These additional project opportunities will be implemented with restoration partners to address prioritized areas for restoration and to develop cost estimates while at the same time providing manageable work areas within the greater reach scale context. The context of river restoration and salmon habitat protection will be conducted with the entire Upper Quinault River watershed's focus and the overall ability to restore necessary components within a holistic approach while recognizing that all projects must fit within the micro-scale approach of addressing one small area at a time. Project areas will include a few to several developments implemented together. When combined, the micro-scale projects will combine to achieve river restoration and salmon habitat recovery within the Upper Quinault River watershed.

Ownership boundaries and land use designations are not considered viable boundaries for treatment areas as the river itself knows no property boundaries.

This Environmental Assessment will consider alternatives to achieve restored river functioning. These potential actions would return large wood debris, stream-side forest structure, sediment deposition, and application of silviculture reforestation techniques necessary to provide improved salmon habitat.

The National Environmental Policy Act (NEPA) of 1969 process requires an evaluation of relevant environmental effects of a project or action (on federal lands or using federal dollars), including consideration of a series of pertinent alternatives. The NEPA process for the Upper Quinault River Restoration effort began when the Quinault Indian Nation developed a proposal to address a need to take an action. Once a determination was made that the proposed action required initiating the NEPA process, three alternative levels of analysis were evaluated for applicability and compliance with the law. These three levels included: 1) preparation of a Categorical Exclusion (CE), 2) preparation of an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI), or 3) preparation of an Environmental Impact Statement (EIS). In review of the supporting documents the Nation identified preparation of an EA and FONSI as the appropriate level of analysis and documentation.

The purpose of an EA is to determine the significance of environmental effects and to look at alternative means to achieve the Nation's objectives. The EA is intended to be a concise document that:

1) Briefly provides sufficient evidence and analysis for determining whether to prepare an EIS;
2) Aids the Nation's compliance with NEPA when no EIS is anticipated; and
3) Facilitates preparation of an EIS if one is necessary (40 C.F.R. §1508.9).

Public participation and comment was facilitated during EA preparation. Public review opportunities were scheduled for June 17 through July 20, 2011. Public meetings to share information about the proposed action and to collect feedback were scheduled in Taholah on July 2-5, 2011, and in Amanda Park on July 13, 2011 (field tour).

Although the Upper Quinault River basin is within the historical traditional lands of the Quinault Indian Nation, it is outside of the current external boundaries of the Quinault Indian Reservation. The Quinault Indian Nation has formed a planning committee of adjacent jurisdiction representatives to facilitate this multi-jurisdictional planning effort. The Bureau of Indian Affairs (BIA), Northwest Regional Office (Portland, Oregon) is serving as the Lead Federal Agency for this effort.

This multi-jurisdictional planning effort includes representatives from:

- Divisions and Administration from the Quinault Indian Nation
- Office of Congressman Norm Dicks
- Olympic National Forest
- Olympic National Park
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- NOAA Restoration Center

- National Marine Fisheries Service
- Washington Department of Natural Resources
- Washington Department of Fish and Wildlife
- Washington Department of Ecology
- Jefferson County
- Grays Harbor County
- The Nature Conservancy
- Wild Salmon Center
- Upper Quinault River Committee
- Kamiak Ridge, LLC

The goals and objectives of this NEPA compliance document are in the exercise of necessary habitat recovery to protect “coastal Salish people’s ways of life in their usual and accustomed areas”. In the words of a Tribal member and the Quinault Indian Nations’ Cultural Resources Liaison “It appears that the project will occur within the Quinault River’s Ordinary High Water Mark…and as we know, the ultimate cultural resource within that location is the Blueback” (p. c. James 2011).

This programmatic Environmental Assessment spans a period anticipated to exceed 20 years. In order to maintain environmental consistency, the Quinault Indian Nation will perform a review of the preferred alternative’s activities, applied science, and technology implementation and any changes brought about in the basin from anthropogenic or natural causes to determine the suitability of the approaches implemented.

1.1. Background

Two hundred years ago the channel migration zone of the Upper Quinault River was dominated by a mature rainforest with natural physical processes and local biological communities existing in a stable and dynamic equilibrium formed since the last glacier receded up the Quinault Basin more than 10,000 years ago. The resilient nature of regenerative natural processes and the slow rate of channel migration supported a complex system of stable habitats for large populations of anadromous salmon, including unique and abundant sockeye (Blueback) salmon. Historical Upper Quinault River channel morphology was characterized as anabranching with one or more narrow main channels flowing through heavily forested islands sustained by logjams and natural patterns of conifer floodplain forest regeneration (BOR 2005) (Figure 1). The mature forests maintained river channel stability that allowed for a complex lateral side channel network and tributary channel network to exist in the channel migration zone. These channel characteristics provided spawning and rearing habitat complexity that produced exceptional runs of salmon and steelhead.

Figure 1. The pristine Taiya River in Alaska represents what the Upper Quinault River once looked like (and is representative of the Desired Future Condition of the Upper Quinault River).

The indigenous population that became known as the Quinault Indian Nation, developed its culture and identity supported by an abundance of natural resources while utilizing the entire Quinault River System and adjacent watersheds in balance with its historically established processes and cycles. The effects of Euro-American settlement and economic expansion for farming and settlement that started as homesteading in the 1890s then an ever increasing demand for timber resources, dramatically transformed the landscape of the Upper Quinault River channel migration zone and the river's natural patterns of geomorphic response. The removal of mature floodplain forests and large woody debris from the river channel initiated a transition in natural river conditions that is continuing into modern time (BOR 2005). Today the Upper Quinault River is dominated by a wide, shallow main channel and patches of young floodplain forests (Figure 2). Because of its constant shifting and frequent migration patterns, the river has reworked most of the lateral channel habitats that were successfully utilized by salmon for decades, even centuries, with the ensuing degradation of remaining spawning and rearing habitats and entire floodplain communities in general.

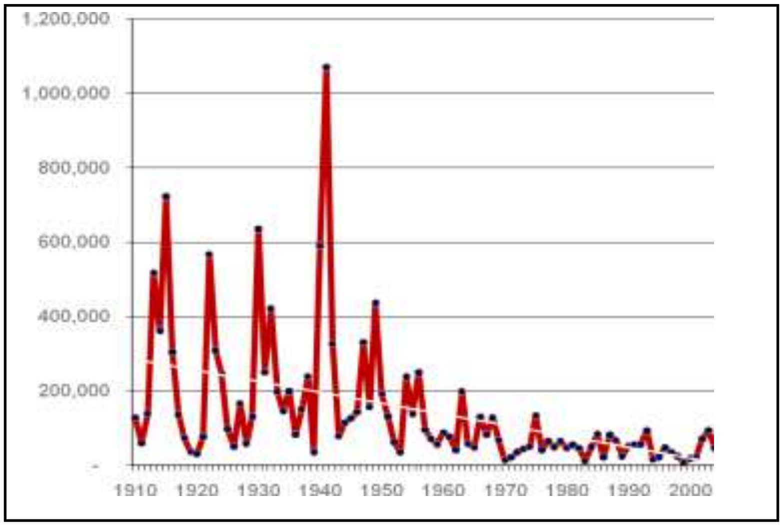
Figure 2. The Upper Quinault River in current times.

Other anthropogenic factors include a concrete abutment bridge constructed in 1973 by Olympic National Park to connect the North and South Shore Roads following the loss of a log stringer bridge constructed in the 1950s (BOR 2005). The new bridge altered natural river flow conveyance and sediment transport during high water events. Channel modifications and degraded habitat conditions in other areas were caused by construction of riprap levees to protect roads. These actions altered natural river dynamics and ecological processes, and disconnected lateral channels from the river, resulting in a cumulative loss of salmon habitat. Salmon resources which depended on the Upper Quinault River have suffered from these developments. The Quinault River supports spring and fall runs of Chinook salmon (*Oncorhynchus tschawytscha)*, winter and summer steelhead (*O. mykiss*), coho (*O. kisutch*), Dolly Varden (*Salvelinus malma malma*), bull trout (*Salvelinus confluentus*), and the famed Blueback (sockeye) salmon. Of great concern to the Quinault Nation is the damage to Blueback salmon habitat.

The Blueback is a national treasure of the Quinault Indian Nation. This unique salmon once entered the Quinault River in surprising abundance and has been the foundation of a rich and stable culture for thousands of years. Blueback enter the Quinault River from February through July and stay in the depths of Lake Quinault for several months, living off reserves of energy stored as fat before spawning in side channels and tributaries of the Upper Quinault River in late fall and winter. Shortly after emergence from the spawning beds, juveniles migrate to Lake Quinault where they rear for about a year prior to seaward migration. Blueback return as adults after spending three to four years in the North Pacific Ocean.

In the early 1950's the Blueback runs started to decline, and today are only a fraction of their former abundance (Figure 3). The deteriorating condition of the Blueback run has socio-economic and cultural implications that affect the very fabric of the Quinault Indian Nation.

Figure 3. Blueback salmon runsize response to side channel loss and habitat degradation within the Upper Quinault River channel migration zone.



Blueback were once an economic mainstay that provided a primary source of income and subsistence for many Quinault families. Blueback runs supported a robust commercial fishery that contributed millions of dollars, in present value, to the local economy. More recently, Blueback fisheries have been closed and enhancement programs initiated to try to stem the decline.

The transformed river continues to threaten all parties whose heritage and legacy are tied to the Upper Quinault River and its channel migration zone. Therefore, restoring the natural conditions of stability and productivity is beneficial to all of us. The Quinault Indian Nation has made restoration of the Upper Quinault River one of its primary initiatives along with restoration of natural physical and biological processes in the channel migration zone to provide future sustainability of biologic and human life in the area.

1.2. Purpose and Need for Action

The Upper Quinault River has changed markedly since the late 1800s, largely as a result of clearing of mature forests and large woody debris from the historic floodplain in the late 1800s and early 1900s (BOR 2005). After the mature trees and woody debris were removed from the channel migration zone, relatively stable hard points, formed by the root systems and stable debris jams, were gradually lost along the course of the river and have not been naturally replaced.

Once the channel containment provided by the hard points was gone, the active river channel was free to migrate and expand across the channel migration zone at an accelerated rate. The more rapidly migrating river liberated large amounts of sediment stored in bars, terraces, and vegetated islands, and this increased sediment load caused the river to become wider, shallower, and more uniform, resulting in a transformation of aquatic habitat compared to the historic condition. Today's river channel has few pools and less habitat complexity. This altered channel state has existed since at least 1939 and has not recovered back to a natural state because mature vegetated islands and large wood debris have not yet been restored to the system in enough quantity to recreate relative stability in the floodplain.

Habitat loss and floodplain degradation is ongoing. The historic channel migration zone (HCMZ; defined as the area the river has occupied over approximately the previous century) has increased substantially since 1939 as a result of erosion by the river, causing a loss of terrace bank areas at a rate of approximately 34,000 m^2 (40,664 yd^2) per year. The expanding HCMZ has reduced the number of stable side channels and terrace channels that are the critical spawning habitats for Quinault Blueback salmon.

Intervention is necessary to increase the rate of restoration. Increased channel migration has eroded large areas of river terraces during the twentieth century. These terrace areas, and the associated sockeye spawning habitats, cannot be recovered through a self-healing process. A more aggressive strategy is needed (BOR 2005).

Cumulative effects resulting from land use activities over the past 100 years that removed the mature forests from the HCMZ and damaged the pattern of conifer forest development are a leading cause for the degraded condition of the Upper Quinault River, lateral channel habitat loss associated with expansion of the active river channel, and the reduced productivity of salmon populations observed today.

Quinault Blueback salmon are genetically distinct with unique life history characteristics different from all other coastal sockeye populations, classifying the population as an Evolutionarily Significant Unit (Figure 4). An evaluation of Blueback trends in abundance by the Quinault Department of Fisheries indicate that Quinault sockeye are at risk of further population decline (QIN 2008).

Figure 4. The Quinault Blueback salmon.

Threats to the Blueback cannot be solved with simple, short-term technical solutions that involve fishery management and artificial propagation methods. The principal factor behind the decline of the Blueback is believed to stem from the loss of stable spawning habitat in the Quinault River system above Lake Quinault (BOR 2005). During the past several decades, the quality and quantity of habitat available for Blueback spawning has continued to deteriorate whereas today, only a small fraction of the spawning grounds that once supported Blueback production remain and the ability to sustain the biological diversity and population structure of this species is in doubt.

Despite threats to the continued existence of the Blueback, the salmon remain a vital link of Quinault People to their culture and heritage. Restoration of the Blueback would re-establish cultural and socio-economic benefits to the Nation's tribal community through additional income and subsistence. If restored, the Blueback salmon could once again support a fishery that contributes to the economic and spiritual vitality of the Quinault Indian Nation.

The purpose and need for action described in this document evaluates effects of restoration alternatives that will restore natural riverine-forest processes of the Upper Quinault River. Restoration elements present a long-term restoration approach and are intended to be implemented incrementally to achieve salmon recovery goals. Core elements include establishment of the missing features of the river including large wood materials, stream-side shading, nutrient cycling, and river stability.

The Quinault Indian Nation is proposing the activities analyzed in this Environmental Assessment in order to expand channel stability, increase mature conifer forest occupation within the channel migration zone, and improve aquatic habitat within the Upper Quinault River Watershed to the benefit of all salmonid and wildlife species. The actions evaluated in this assessment consider the components of the floodplain dominated by mature forests and more long-term natural physical and biological processes (longevity), while targeting short-term objectives to restore and maintain existing Blueback populations by providing immediate habitat stability to extant side channel pattern formation (urgency).

1.3. Desired Future Condition

The Upper Quinault River was more stable in its natural state and functioned as a natural, undisturbed river through most of the 1800s. The river channel had a large, coarse sediment and large woody debris load, and migrated slowly across its floodplain because the dense forest resisted erosion and avulsion. The gradual channel migration and occasional shifting, amid dense, mature forests and ample supplies of large woody debris, resulted in a continual cycle of erosion of older surfaces while at the same time building of new surfaces. The river consisted of one or two relatively narrow, deep main channels with many side channels, terrace channels, and tributary channels winding across a forested channel migration zone. Salmon would have utilized all of these channel regions in different capacities; i.e., the Upper Quinault River offered a complex variety of habitat features. This river prior to disturbance is the desired future condition (Figure 1).

The restoration actions considered increase channel stability sufficient to foster re-establishment of the natural forest-river-large-wood cycle (Fetherston 2005). As conifer forests throughout the valley reach maturity, the natural cycle of large wood recruitment and conifer forest regeneration will be self-sustaining. At that point, the channel- and floodplain-forming processes that are generated by large woody debris are anticipated to occur naturally, and the large, braided mainstem channel that is currently subject to shifting and migration will develop into a more stable anabranching system of multiple channels intermixed with mature forested islands. The anticipated future conditions of a channel migration zone dominated by mature conifer forest and a more stable, multi-channeled river are compatible with multiple beneficial uses and interests of all stakeholder's interests. The realization of this conversion to historical river components will improve aquatic, riparian, and terrestrial habitats, and recreational opportunities, and will benefit local businesses and residents.

2. Alternatives

Alternative courses of action to stem salmon habitat losses in the Upper Quinault River cover a wide expanse of options to include land use management, vegetation management, infrastructure modifications, and site specific river habitat improvements for salmonid species. The current negative conditions (introduced in Chapter 1) have developed over the past century and it is expected that the recovery from these events may take equally as long to realize. Although the span of potential activities includes several different components of actions and activities, this Environmental Assessment will focus on responses to turn the loss of salmon habitat in the short-term, while creating a long-term solution of species restoration to achieve the population numbers witnessed historically.

A scope of potential activities is summarized in Section 2.1 (Alternatives Considered but Not Analyzed in Detail). These activities necessitate the leadership of federal agencies; the US Forest Service – Olympic National Forest, and the National Park Service – Olympic National Park, because of their land management mandates to administer these lands within the public trust to sustain the health, diversity, and productivity to meet the needs of present and future generations. The Quinault Indian Nation is committed to participate with the federal and state organizations to realize these goals within the Quinault Indian Nation's ceded lands.

The Action Alternatives (Section 2.2, Alternatives Considered) are evaluated as a response to the need for immediate action within the Upper Quinault River. The Quinault Indian Nation welcomes the opportunity to work with cooperators from federal and state agencies, non-profit organizations, local community members, and others to realize the improvements sought to the river and salmon habitat. This section presents the Preferred Alternative in comparative form against the No Action Alternative, sharply defining the differences between these two options and providing a clear choice for the decision maker and the public.

Public participation in the NEPA process has been, and will continue to be, solicited and welcomed. Chapter 7 (Public Involvement) details many of the outreach activities incorporated into this assessment's approach.

2.1. Alternatives Considered but Not Analyzed in Detail

The Nation's approach to watershed restoration and salmon recovery is holistic. As this assessment will document, there have been several past actions within the Upper Quinault River basin that have singularly impacted the environment and have resulted in cumulative negative effects.

2.1.1. Infrastructure Modification / Improvement

Activities to mitigate damages to the river channel migration zone include addressing infrastructure components that have been installed and have a deleterious effect on river habitat. Actions to respond to these features include, but are not limited to:

- Removal of the bridge crossing the Quinault River below the confluence of the North Fork and East Fork Quinault River, or lengthening of the bridge with elevation, and site restoration
- Removal of upstream levees and site restoration
- Alteration of the existing road network of the Upper Quinault river within the channel migration zone

2.2. Alternatives Considered

This Environmental Assessment will analyze restorative actions to achieve the conditions articulated in the Desired Future Condition (Section 1.3) to curtail the loss of salmon spawning habitat. These efforts will result in positive, significant and meaningful changes to river morphology while increasing the amount of essential salmon habitat, especially for Blueback salmon. The Upper Quinault River Restoration Area (Figure 15) as the focus of restorative actions extends from the upstream end of Lake Quinault eastward within this geologic floodplain to the confluence of the North Fork and the East Fork of the Quinault River, then upstream within this geologic floodplain to above the confluence of Graves Creek and Litchy Creek, and within the North Fork to above the confluence of Wild Rose Cree k and Rustler Creek.

2.2.1. No Action Alternative

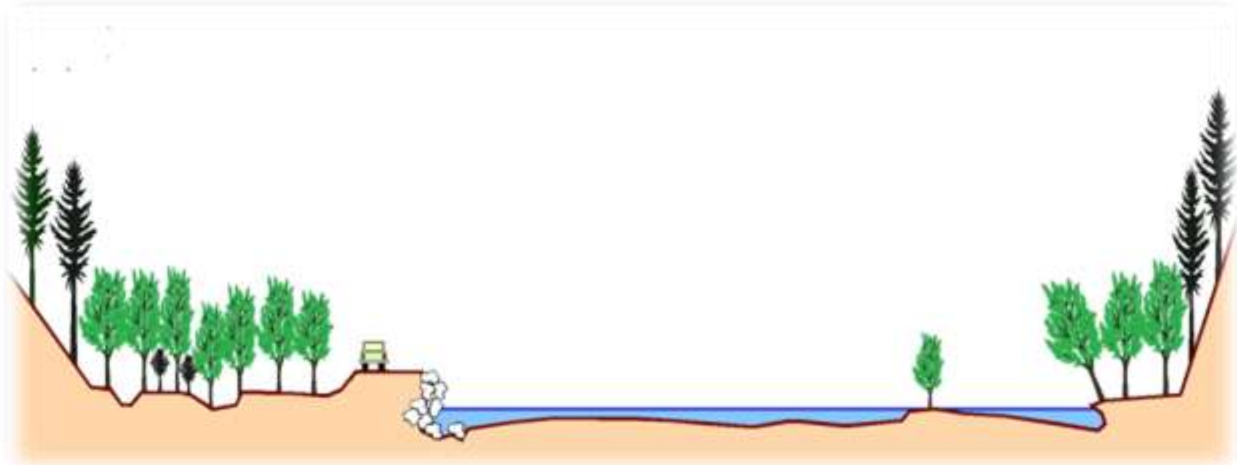
NEPA typically defines the No Action Alternative as the most likely future condition without the proposed action. It is anticipated that the No Action Alternative will see a continuation of the lack of meaningful response by land use managers to respond to the loss of critical habitat of all salmonid species, including the Blueback salmon and native char species (Dolly Varden and bull trout) in the Quinault River. Salmon habitat would continue to decline as a result.

The No Action Alternative is expected to result in continued river transformation leading to a wider, shallower, and more uniform braided stream network currently subject to rapid shifting and migration across the channel migration zone. Much of the main channel of the Quinault River is largely unvegetated (lacking mature conifer trees), wide and shallow, and inundated at times of high discharge (Figure 5). Salmon habitat is limited and generally transitory within this network and species that rely on side channel networks to spawn in, or rear in, are low in reproductive capacity. The presence of alluvial terraces (abandoned floodplains), produced by past vertical instability in the fluvial system are expected to continue to be limiting features of the river's stability and lead to further reduction in fish habitat and fisheries limitations.

The No Action Alternative is expected to lead to low channel complexity, and sedimentation levels (erosion rates) above historical levels because of the limited amount of in-stream structure, root cohesion, and vegetative roughness that normally intercepts sediment from the active channel and slows stream velocities. The lack of old, large trees within the channel migration zone that provide hard points to channel migration, are not expected to increase naturally because of the loss of this river channel complexity and large wood inputs. The movement of large wood debris through the river network is expected to remain transitory and not to coalesce into extended structures.

The river's hydrology, sediment supply, existing vegetation, human impacts, and geological controls on the valley system are expected to see further degradation due to the river's inability, if left on its own, to heal itself.

Figure 5. No Action Alternative and resulting floodplain forest structure.



2.2.2. Action Alternative 1 (Preferred Alternative)

The Salmon Habitat Restoration Plan – Upper Quinault River (QIN 2008) serves as the basis for the Preferred Alternative in the Upper Quinault River Basin. Much of the information presented in this alternative description incorporates, directly, the findings and recommendations presented in that document.

Action Alternative 1 is the Preferred Alternative. This alternative addresses disrupted watershed processes for short and long-term health of the aquatic and terrestrial ecosystem. Watershed improvement activities in the Preferred Alternative will address undesired watershed processes through restoring river meander stability, enhancing side channel development (Figure 6), reducing channel usage in areas with active or high potential for erosion. Hydrologic connectivity to lateral channels is essential to the ecological integrity of the landscape and the placement of large wood debris structures within the river channel migration zone can improve river processes and salmonid habitat by restoring process that facilitate the development of forested islands, which in turn facilitate the development of a forested island morphology, thereby improving sediment transport and habitat complexity at multiple spatial scales.

This alternative will combine the installation of engineered logjams within the river network with restoration planting of native hardwoods and softwoods to provide for short-term site stability and long-term hard points for channel migration. The overall goal of the engineered logjam design is to emulate the function once provided by old-growth riparian trees which stabilized the river banks. The huge old-growth trees also formed stable snags and logjams when they fell into the river which controlled channel migration and morphology (Abbe and Montgomery 1996, Abbe and Montgomery

2003). One of the primary functions of these natural logjams was to split flow and form islands, creating side channels and stable ground for the next generation of riparian forest to mature. Historic clearing of the old-growth forest set in motion the gradual degradation of the system that continues today. The average lifetime of current riparian forests within the active channel migration zone is approximately 25-35 years (BOR 2005), an order of magnitude less than the riparian forests that existed prior to historic clearing. The only way for the system to recover in a time period necessary to benefit salmon is to intervene with a restoration scheme that re-introduces the function the old-growth forest had on the Upper Quinault River. The proposed method to achieve this desired future condition is using engineered logjams (ELJs) to create long-term stable hard points within the river's channel migration zone (CMZ).

Figure 6. Remnant lateral side channel in the Upper Quinault River.

Some of the effects of the actions would be immediate and localized. Adding large wood to selected stream reaches will reduce sediment inputs in the watershed through restoration projects, will actively improve fish habitat by increasing channel complexity and reduce channel width to depth ratios. This alternative provides for both the urgency characteristics and the longevity components described in the Purpose and Need for Action (Section 1.2, pg 7).

Typical engineering designs have been detailed by Saldi-Caromile, *et al.* (Stream Habitat Restoration Guidelines Final Draft 2004, QIN 2008) and variations of these designs, will be implemented as part of this alternative (outlined below). These typical designs were developed for generic engineered structures and vegetation planting scenarios that can be undertaken within the Upper Quinault River floodplain ((QIN 2008) and other citations). However, in response to local site conditions, designs would be modified or developed to meet individual site conditions.

The term "engineered logjams" (ELJs) is used in a generic context throughout this document to represent many different structural engineering designs that may be applied. While structures may vary in sophistication of design, the construction "footprint" and principle effects evaluated in this environmental assessment are similar.

2.2.2.1. Engineered Logjam Structural Design

Typical designs of engineered logjams developed for river restoration activities (Saldi-Caromile, et al. 2004, QIN 2008) have been assessed for suitability within the Upper Quinault River. Although several designs are described here, the specific application of the design will be suited to the locations where these structures are placed, based on spatial and temporal needs.

Logjams provide valuable local habitat features such as pools, cover, and substrate variability (Abbe and Montgomery 1996). On a broader reach scale, logjams create and maintain side channel habitat areas, forested islands, and floodplain areas important for supporting biological diversity and productivity (Abbe and Montgomery 1996, Abbe and Montgomery 2003, Collins, Montgomery and Haas 2002, Saldi-Caromile, et al. 2004).Structural designs range from the simplest design that involves placing large wood debris in or along a stream channel to stabilizing a "key member" or wood debris pile using pilings or other programmatically approved form of stabilization (i.e. rock ballast) to the engineered logjam crib or log crib structure. The following list of techniques is derived from the Integrated Streambank Protection Guidelines (M. Cramer, et al. 2002) is provided to identify the range of design types that are available for use in restoration activities and effects evaluated in the EA. These techniques, including minor variations are similar in design to already approved structures and include mitigation measures covered under the umbrella of the programmatic biological assessments (USFWS 2006) and streamlined habitat restoration guidelines (NMFS & USF&WS 2008).

Flow Redirection Techniques

- Wood Groins
- Buried Wood Groins
- Wood Barbs

- Engineered Logjams (designs include, but are not limited to):
    - Bar apex/meander engineered logjam
    - Engineered logjam revetment structure
    - Flow deflector engineered logjam

Structural Techniques

- Anchor Points
- Roughness Trees
- Log Toes
- Log Cribwalls
- Flood Fence
- LWD Catch Structures

Biotechnical Techniques

- Woody Plantings
- Flood Fence
- Herbaceous Cover
- Soil Reinforcement
- Coir Logs
- Bank Reshaping

Avulsion Prevention Techniques

- Floodplain Roughness
- Floodplain Grade Control
- Floodplain Flow Spreaders

Side Channel/Off-Channel Habitat Restoration and Reconnection

- Creation of new side channel habitat
- Excavating pools and ponds in the historic floodplain/channel migration zone to create connected wetlands
- Reconnecting existing side channels with a focus on restoring fish access and habitat forming processes (hydrology, riparian vegetation)
- ELJs, barbs and groins to direct some flow through a side channel
- Restoration of existing side channels

In addition, typical vegetation planting schemes were developed for floodplain and terrace forest areas and for in-channel bars. These planting plans are included as part of the typical engineering designs (QIN 2008). All ELJ sites will be accompanied with restorative tree planting (detailed below in Section 2.2.2.2).

Engineered logjams are proposed as the primary plan element to develop structural hard points that will achieve the following:

- Protection of productive salmonid habitats
- Creation of stable side channel habitat areas
- Creation of a matrix of forested islands throughout the channel migration zone
- Initiation and protection of floodplain forest restoration areas

These structural hard points are designed to return to the river the components it is currently lacking. These features are necessary to stabilize rates of river channel migration and erosion within the channel migration zone and improve salmon habitat stability and quality.

The physical complexity of logjams and their effects on hydraulic conditions create an extremely wide range of habitats within a very small area. Natural and engineered logjams typically consist of several large tree boles and dozens or hundreds of smaller wood pieces, increasing the surface area along a bank by several orders of magnitude. Woody debris can affect channel processes at all scales, from pool formation to valley bottom landforms and floodplain formation. Salmon habitat is influenced by landscape processes that govern the supply and movement of water, sediment, and wood to and through rivers and streams.

A. *Log Jam Materials*

ELJ materials will be obtained through timber sales, road rights-of-way logging on the Quinault Indian Reservation, opportunistic collection, and donated timbers.

The collection of timbers with root-wads intact will take advantage of existing timber harvesting strategies and the construction of road rights-of-way logging on the Quinault Indian Reservation. The Quinault Indian Nation, Division of Natural Resources, has previously completed NEPA compliance requirements for the removal of tree stumps attached to the tree stem during the construction of roads used for logging (pers. correspondence with Stamon, Forester, Quinault Indian Nation 2011). Although these materials are not sufficient for all of the ELJs proposed in this analysis and the management plan, they are substantial and highly valued for these purposes. The trees possess both woody material and rootwads attached to the timbers. They also represent existing genetic resources of native tree species grown within the region's soils. As these materials decompose in the river over long periods of time, they are anticipated to contribute favorably to the aquatic bionetwork.

The opportunistic collection of large wood debris materials to be used as ELJ supplies take advantage of events such as tree blowdown resulting from wind storms. One such event occurred in December 2007 (Schlosser 2010) and several timbers were donated for use in the pilot project cited in this analysis. This collection of timbers relies on landowners' and land managers' willingness and ability to cooperate, and the capability of the Quinault Indian Nation to muster resources in a timely manner to collect the downed timbers and store them in a location with juxtaposition both near the job sites in the Upper Quinault River and outside of the floodplain. Another opportunistic source of materials consists of the otherwise mobile (transient) large wood debris deposited on the gravel bars during high flows. This source of large wood debris will be used locally to construct ELJs or stabilized to create stable hardpoints per site plan specifications. Some reworking of existing wood debris and piles may occur in the local setting. The Quinault Indian Nation demonstrated this technique by stabilizing an existing log jam and debris pile in 2008.

Donated timbers may come from landowners and land managers who are actively involved in land management activities such as road right-of-way construction, site development, and land use conversion. When donated, these timbers will face the same storage challenges as the opportunistic timbers, but potentially be obtained with less urgency than the windblown timbers.

B. Labor Recruitment

The goal of the proposed action is to employ the local community and other regional support personnel in restoring the physical and biological processes that will create and maintain a healthy riverine ecosystem supportive of wild anadromous fish. Specifically, ELJ site construction will recruit laborers from the local communities and regional workforce in the capacity of equipment operators, truck drivers, site management staff, environmental scientists, environmental engineers, technicians, and other component duties associated with the design and installation of site specific ELJ structures.

2.2.2.2. Floodplain and Terrace Forest Restoration

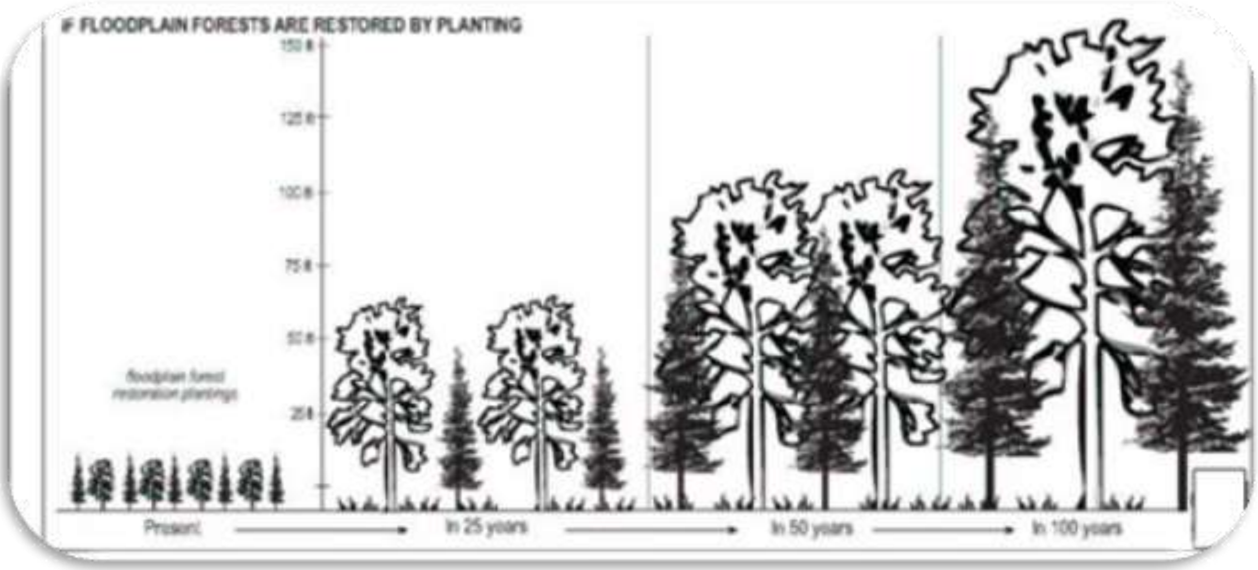
The floodplain and terrace forest restoration strategy consists of 1) planting rapidly established native conifer seedlings and black cottonwood materials that will become forests to eventually supply key member pieces for logjams, conifer nursery logs, and floodplain stabilization, and 2) restoring a mature self-sustaining forest (QIN 2008). In the first instance, the plantings will provide future materials for large wood debris recruitment to the river, while in the second, it will establish the terrestrial structure to the forest that gives shade and shelter to the stream banks (Figure 7). The forest restoration approach emulates natural floodplain and terrace development (e.g., forest succession) found within the Quinault River floodplain, while strategically using individual tree life history characteristics for specific reforestation conditions.

Sites targeted for long-term restoration will be considered for restorative reforestation efforts. Some of the restorative reforestation will focus on sites within the terrace islands and adjacent to active channels, while others may be outside of the active channel and designed to establish a mature conifer forest ahead of the anticipated avulsion of the meandering river.

Variable tree characteristics useful in reforestation include growth rates, flood tolerance, shade tolerance, reproduction type, maximum size, and decay rates. For example, fast-growing black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), Sitka spruce (*Picea sitchensis*), and Douglas-fir (*Pseudotsuga menziesii*) attain a size suitable for key members in logjams in 75 to 100 years, whereas western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*) require at least 150 years. The long-term objective of restoring a self-sustaining valley forest is accomplished when mature conifer forests become self-regenerating.

Two general types of Quinault River floodplain terrain are proposed for reforestation, each with a different flooding regime: active floodplains (areas flooded at least annually), and terraces (areas flooded only during high flow events). The restoration plantings are designed for either active floodplain or terrace terrain. The variety of planting conditions include 1) bare ground associated with engineered logjam islands, 2) floodplain meadow, shrub, and alder forest vegetation, or 3) terrace meadow, shrub, and forest vegetation.

Figure 7. Preferred Action Alternative and resulting pattern of mature forest regeneration.



Objectives of floodplain and terrace forest restoration projects include:

- Reestablishment of conifers and the conifer regeneration process,
- Establishment of black cottonwood for both floodplain and terrace stabilization and key member production,
- Establishment of mature mixed-conifer-deciduous forests adjacent to salmon spawning side channels.

The precise species selection, placement, and distribution of restorative planting components will be decided on a site-specific basis in response to topographic factors, surrounding vegetation distribution, flood potential, sun scalding potential, and other factors. Planting will be made within and around ELJ structures, and away from ELJ structures where restorative planting is needed and viable as a stable restoration component.

A. *Reforestation Designs*

ELJ Island Forest Establishment. Objective: Establish 0.23 Acres black cottonwood, conifer (Sitka spruce and Douglas-fir), red alder (*Alnus rubra*) and willow species (*Salix hookeriana, S. lasiandra, S. sitchensis*) vegetation for each ELJ island. Methods/standard: Plant black cottonwood live poles on an 8 foot on-center grid within ELJ cottonwood planting zone at elevation of active floodplain. Interplant Sitka spruce seedlings within the entire cottonwood matrix. Plant Douglas-fir seedlings around elevated island perimeter. Plant red alder plugs above cottonwood planting zone. Plant six foot wide band of willow cuttings (Salix spp; brush layer technique) around downstream perimeter of ELJ Island. Monitoring/measurement: Complete count and map of cottonwood, red alder, Sitka spruce and Douglas-fir. Success criteria: (1) short term, at year two: 80% survival of cottonwood, Douglas-fir, Sitka spruce and red alder. 80% continuous band of willow around ELJ island downstream perimeter, (2) long term establishment: 80% cover of ELJ island with mixed conifer, cottonwood, alder and willow forest. Contingency Measures: Replant areas not meeting success criteria.

ELJ Island Floodplain Complex Forest Establishment. Objective: Establish black cottonwood, red alder, and Sitka spruce floodplain between ELJ islands. Methods/Standard: Plant black cottonwood poles at elevation of adjacent active floodplain. Interplant Sitka spruce among existing patches of red alder. Planting density will vary depending upon existing conditions. Monitoring/Measurement: Initial forest stand inventory of floodplain forest patches. Measure tree stem density and basal area; shrub cover and herbaceous cover. Set 2-3 permanent transects with randomly placed permanent circular sample plots. Identify species and measure tree stem density and basal area; shrub cover and herbaceous cover. Number of transects and plots will be relative to size of area. Set 4-6 permanent monumented photo points. Success Criteria (1) Short term, at year two: 80% survival of cottonwood and Sitka spruce, (2) Long term forest establishment: >60% floodplain forest cover over ELJ Island floodplain complex. Contingency Measures: Replant areas not meeting success criteria.

Floodplain Forest Restoration. Objective: Restore degraded floodplain forest conditions. Establish 100-150 conifers (Sitka spruce) per acre within red alder dominated floodplain forests. Establish up to 75 black cottonwood per acre around perimeter of red alder floodplains. Methods/Standard: Thin continuous red alder canopy by 30% by either canopy gaps or variable stem retention. Plant 100-150 Sitka spruce within thinned area. Release thinning of existing conifer advance regeneration (Sitka spruce). Strategically plant aggregates of 6 cottonwood poles around floodplain forest perimeter for a total of up to 75 trees per acre. Monitoring/Measurement: (1) Initial forest stand inventory of floodplain forest patches. Measure tree stem density and basal area; snag density; shrub cover and herbaceous cover. (2) Set permanent circular plots within each conifer planting block. Measure tree density and basal area; shrub cover and herbaceous cover. (3) Set 4-6 permanent photo points per acre. Success Criteria/Monitoring: (1) short term, at year two: 80% survival of Sitka spruce and cottonwood plantings, (2) long term mixed conifer deciduous forest establishment. Contingency Measures: Replant areas not meeting success criteria.

Riparian Buffer Enhancement. Objective: Enhance existing riparian forest buffer at selected sites throughout 200 foot minimum riparian zone buffer outside of ordinary high water mark and extending into channel migration zone. Conifers will be planted (Sitka spruce, Douglas-fir, western hemlock, western red cedar) throughout riparian buffers where existing forest canopy cover is <75%. Methods/Standard: Planting density 150 trees per acre within open canopy zones. Monitoring/Measurement: (1) Initial forest stand inventory of floodplain forest patches. Measurements of tree stem density and basal area; shrub cover and herbaceous cover will occur. (2) Set permanent transects with randomly placed permanent circular pots. Success Criteria/Monitoring: (1) Short term, at year 2: 80% survival of planted trees, (2) Long term: >100 conifers per acre; >80% canopy cover. Contingency Measures: Replant areas not meeting success criteria.

B. Seedling Materials

Genetic provenance, or source, of native plants for the Quinault River restoration project is of significant ecological importance. For this project, provenance has been considered and plants used for reforestation will be guaranteed (purchase and collection) to originate from the following seed zones and geographic locations: Sitka spruce – HOH Zone 1 (old 012 Zone). Douglas-fir, western hemlock, western redcedar – 012 or 030 Zone. Black cottonwood and willow species will be collected from low elevation areas west of the Olympic Mountains.

All materials will use seed stock from local genetic seed sources to ensure no introduction of exotic plant materials. The establishment of preferred genetic materials will be integrated into long-term plans and purchase orders with tree seedling greenhouses to prepare local genetic plant materials suited to the uses of the river restoration process.

C. Labor Recruitment

The goal of the proposed action is to employ the local community and other regional support personnel in restoring the physical and biological processes that will create and maintain a healthy riverine ecosystem supportive of wild anadromous fish. Specifically, reforestation efforts will recruit laborers from the local communities and regional workforce in the capacity of tree planters, truck drivers, site management staff, foresters, environmental engineers, technicians, and other component duties associated with restorative planting activities.

2.2.2.3. Access, Storage Sites, and Staging Areas

Staging areas are locations where materials and equipment can be stored for the duration of project construction. All construction staging areas would be located in juxtaposition to work areas to minimize, to the extent practicable, the distance of travel for materials and equipment, be located above the ordinary high water mark of the river or channel, and would be active only during project construction. Staging areas cleared during site preparation would be revegetated after project construction is complete. Cleared staging areas would be flagged prior to construction; and where necessary, construction fencing would be placed around the staging area. In all cases, staging area sites would be agreed to by landowners and land managers of the affected properties.

These lands may require minor clearing of vegetation and placement of a gravel base as well as construction or improvement of access roads. Annual maintenance of access roads and storage sites will be required when used for multiple years until project completion.

Work sites may be accessed by track machines, trucks, helicopters (transporting LWD materials), or combinations of these. In each case, the storage site will accommodate the method of transportation needed for each means of moving equipment and materials to the work sites.

One identified long term inventory storage area will also need preparation, which consists of removal of brush.

2.2.2.4. Combining Restoration Components

It is anticipated that achievement of river channel stability and associated forest refugia will require construction of more than 400 engineered logjams in combination with comprehensive restorative forest tree planting, based on the conditions evaluated (QIN 2008).

This restoration approach to achieve the desired future condition (Preferred Alternative) consists of a suite of actions necessary to restore natural habitat forming processes in the channel migration zone including 1) installing ELJs to reestablish stable hardpoints throughout the floodplain to reduce rates of erosion and river channel expansions thereby establishing a matrix of forested islands and terraces within the floodplain (Figure 1), 2) recreating an anabranching mainstem river channel and lateral network of side channels and terrace tributary channels, 3) restoring the natural pattern of conifer forest regeneration, and 4) reestablishing habitat complexity that meets the unique ecological needs of the Blueback salmon as well as other fish and wildlife. The combination of these components addresses both the short-term needs to ensure salmon population stability and the long-term need to increase salmon habitat to historic levels. This combination also provides the temporal opportunity to address the systemic problems detailed in the Purpose and Need for Action (Section 1.2), and are further discussed in Appendix E: Restoration Areas.

The restoration design is modeled after natural floodplain forest developmental patterns and channel habitat forming processes found in river valleys of the west side of the Olympic Mountains (Fetherston 2005, Abbe and Montgomery 1996) (Figure 8). This alternative will utilize Washington State's coordinated regulatory permitting framework (Joint Aquatic Resource Permit Application) to implement restoration elements. A programmatic permitting approach is anticipated. The Quinault Indian Nation will seek to partner with state and federal permitting agencies to implement a streamlined regulatory program.

Figure 8. Large wood debris in remnant side channel characteristic of a mature conifer forested river valley.

The Quinault Indian Nation constructed a pilot project using these criteria that incorporates some of the plan elements developed for restoration during the summer of 2008 (Figure 9). The pilot project provided experience and information that facilitates development of permitting partnerships and a general regulatory framework, improvements to project designs and schedules, and more precise data for estimating project costs. The pilot project site was selected based on the initial site development plan (QIN 2008) objective of protecting currently used habitat areas, and based on ease of access, a ready local supply of wood (opportunistically acquired after the December 2007 windstorm), and interest and consent from adjacent property owners. The 2008 pilot project prevented the mainstem channel from moving further into floodplain areas previously outside the historic migration zone of the river, including valuable side channel habitat at the Alder Creek Side Channel. These ELJs allowed flow into protected areas to sustain side channels but not allow the mainstem channel to wipe out existing habitat or to re-set riparian forest development. Through the Alder Creek Side Channel Pilot Project, a wealth of information was gained by the Quinault Indian Nation on permitting, cost data, construction techniques, and project management as well as experience in overcoming inherent obstacles. The construction of the 12 engineered logjams in this pilot project was accomplished in just under 8 weeks with no known negative impact to the environment or species. The benefits realized during the subsequent salmon spawning events was recognized as a benefit of the restoration effort.

The QDNR plans to implement a task oriented project development procedure to satisfy design and implementation requirements for habitat restoration projects in the Upper Quinault River. The procedure includes but is not limited to, analyses necessary to 1) assess risks and benefits of treatment in a project area or river reach, 2) identify and develop the appropriate restoration technique, site plans, and engineering designs necessary to meet site or reach specific restoration objectives, 3) identify expected geomorphic and hydrologic responses to treatment, 4) provide sufficient information necessary to identify the specific mitigation or conservation measures necessary to complete the streamlined permitting and programmatic ESA consultation process. Varying levels of analyses are applied depending on location, project specific objectives, treatment technique or design complexity, and associated real risks to habitat, infrastructure, and property. These implementation guidelines are detailed in Appendix A: Project Development Procedures (Section 8).

Figure 9. Engineered logjam with racked wood debris.

Implementation of this Preferred Alternative will improve aquatic, riparian, and terrestrial habitats and recreational opportunities, and will benefit local businesses and residents. This alternative anticipates the formation of partnerships and coalitions among the many governmental and non-governmental stakeholders to plan, prioritize and implement specific restoration elements. This alternative provides a foundation of information and guidelines for designing, permitting, and estimating costs for individual projects in combination with the Salmon Habitat Restoration Plan for the Upper Quinault River (QIN 2008).

An initial scoping of the combination of the ELJ placement criteria and restorative planting within the Upper Quinault River has been articulated through the introduction of river reaches, their priority, and potential project implementation. A discussion of these concepts is provided in Appendix E: Restoration Areas and shown graphically in area maps (Figure 61). Examples of typical site plans combining ELJs and restorative planting within the Upper Quinault River, based on conditions existing in 2009, are presented in Section 12, Appendix F: Typical Site Plans (ELJ & Planting). These examples give the reader the graphic images of the designs developed to integrate ELJ placement and restorative planting within the context of the meandering Quinault River.

Best Management Practices would be utilized to ensure that these projects minimize any potential adverse impacts to the environment. During the evaluation and approval process for each project, separate clearance procedures required by the Clean Water Act and National Historic Preservation Act (NHPA) will be undertaken, in consultation with the Army Corps of Engineers specialists, the State Historic Preservation Office, and Tribal Culture Office. All state and federal permits will be acquired as necessary and appropriate. Although the technical characteristics of the Preferred Alternative limit the exposure to environmentally negative effects, mitigation measures have been summarized (Section 5, Mitigation Measures) to document the collection of Best Management Practices applicable to this series of activities.

Some short-term negative impacts could occur because of the projects authorized by the Preferred Alternative, but these would be offset by the expected long-term beneficial results to water quality and aquatic habitat conditions. The Preferred Alternative is not expected to have a significant negative impact when compared to the loss of riparian, wetland, and salmon spawning and rearing habitat functionality that has occurred in the watershed to date and is expected to continue under the No Action Alternative. Impacts that do occur would be of a cumulatively beneficial nature.

2.2.3. Action Alternative 2

Action Alternative 2 involves the practice of identifying sites denuded of vegetation, and located within river bank edges, and terrace islands, and planting them manually with red alder, black cottonwood, Douglas-fir, Sitka spruce, and other native species to establish the native forest vegetation cycle that has been interrupted. In this alternative, the establishment of tree species in those areas that have experienced large woody material removal would be replanted although the establishment of ELJs would not be made. The reforestation plantings are designed for either active floodplain or terrace terrain and existing vegetation conditions. The variety of planting conditions include 1) floodplain meadow, shrub, and alder forest vegetation, or 2) terrace meadow, shrub, and forest vegetation.

This alternative incorporates the restorative planting components of the Preferred Alternative (Section 2.2.2.1) with the exception of the reforestation in that alternative associated with ELJ plantings. This alternative incorporates none of the ELJ design detailed in the Preferred Alternative, thus there would be no planting of ELJ sites.

The goal of considering this alternative is to consider whether the initiation of the restorative planting in the Upper Quinault River would substantially, or partially, accomplish the restoration goals identified in the Desired Future Condition (Section 1.3). It is recognized that this alternative would place the seedlings located within the active channel migration zone without the benefits of ELJs to provide protection, thus placing the seedlings at increased risk to river water scouring during high water events, especially due to the river avulsion during and after high-water events.

The fundamentals of this alternative can be successfully applied within a limited number of sites. Successful sites would be limited to areas where current, or near-term, meandering of the river would not place the young trees at risk until they reach a physical size such that they could provide a hard point to resist the avulsive forces of the meandering river and ultimately become substantial components of large wood debris in the river.

This alternative to the Proposed Action was determined to not satisfy the urgency component to restore the Blueback salmon habitat while its populations continue to decline. It has been determined that this alternative would not meet the purpose and need of the project and have meaningful difference in environmental benefits. This alternative is not considered further.

2.2.4. Action Alternative 3

Action Alternative 3 focuses on the establishment of ELJs and ELJ Revetment structures within terrace islands and adjacent to the stream channel. This alternative incorporates the ELJ design and placement components of the Preferred Alternative (Section 2.2.2, Action Alternative 1 (Preferred Alternative)) without the reforestation in that alternative associated with ELJ plantings. Long-term improvements to the large woody material inventory of the sites would rely on natural seeding to establish the large organic materials for future logjams and organic hard points to the river.

The authors of this assessment recognize that this alternative would result in a modest amount of successful seedling propagation (primarily black cottonwood and red alder). The ELJs will recruit large wood debris transported from upstream sources to make leading edge (upstream supplied) barriers where they are installed. The large wood debris recruitment will be structurally oriented primarily along the upstream face of each logjam assembly (Figure 9). In-situ recruitment of large wood where provided, interior to the logjam structures, would provide a depth to the structures that would not be guaranteed through this Alternative. This alternative is similar to an engineered river where structures are built but the natural habitat forming processes dependent upon mature conifer forests and large wood debris recruitment are not restored.

This alternative to the Proposed Action, being costly in long-term perspective, was determined to not satisfy the <u>longevity</u> component to restore the Blueback salmon habitat. It was determined that it would not meet the ultimate purpose and need of the project and have meaningful difference in environmental effects. This alternative is not considered further.

3. Description of Affected Environment

The Quinault River is a coastal stream located on the west side of the Olympic Peninsula in the state of Washington. The river flows approximately 110 km (68 miles) from the western slopes of the Olympic Mountains to the Pacific Ocean at Taholah, and drains an area of about 1,130 sq. km (436 square miles) of mostly forested lands. Interactions between geologic formations and geomorphic processes are variable within the watershed, however, much of the variation is systematic and typical for coastal streams of the Northwest (Naiman, et al. 1992).

The general condition of the Quinault River is important to the Quinault Indian Nation for several reasons. Many of its cultural and economic features are tied to the watershed and the state of its aquatic health. The river is an important landscape presence bringing into focus local ecosystem characteristics and functions. It is also a major source of riparian forest habitat and the main corridor for movement of aquatic and riparian species across the watershed, and it contains critical habitats for all life stages of anadromous salmonids and other aquatic species and wildlife (QIN 2008).

The Quinault River basin extends from its headwaters in the Olympic Mountains where historically glaciers have fed the headwaters of the river. Two main channels, the North Fork and the East Fork converge to form the mainstem of the Quinault River, and several tributaries join the river before it enters Lake Quinault; downstream of the lake more tributaries converge with this channel.

3.1. Land Resources

The Quinault River is located in western Washington State (Figure 14). The Upper Quinault River (Figure 15) as described in this report extends from the upstream end of Lake Quinault eastward within this geologic floodplain to the confluence of the North Fork and the East Fork of the Quinault River, then upstream within this geologic floodplain to above the confluence of Graves Creek and Litchy Creek, and within the North Fork to above the confluence of Wild Rose Creek and Rustler Creek.

3.1.1. Geologic Setting

Two basic rock formation types are common within the Olympic Mountains; sedimentary and volcanic. Sedimentary rocks are found in the central portions and western portions of the peninsula, while volcanic rocks are arranged in a crescent formation circumventing the northern, eastern, and southern periphery of the peninsula. All of the volcanic and many of the sedimentary materials are Oligocene (36-25 million years before present) and Miocene (25-13 million years before present) age (Tabor and Cady 1978). The crescent of volcanic materials overlie the sedimentary core materials, however, fossil evidence concludes that the sedimentary core materials pre-date the volcanic materials. The sedimentary core materials have been thrust under the layer of older volcanic rocks through the process of tectonic faults and Subduction Zone processes (Moore 1965).

The Quinault River Valley was formed by major glacial advances that occurred during the Late Pleistocene era (140,000 to 10,000 years ago). Two major glacial advances have been defined as the

Humptulips and Chow Chow glaciations (Moore 1965). The Humptulips glacier was the most extensive advancing to within 4 km of the Pacific Ocean. Following the retreat of the Humptulips glacier, lacustrine environments developed as interglacial conditions persisted downstream of current day Lake Quinault. After the interglacial period, glacial ice again advanced to within 12 km of the Pacific Ocean during the Chow Chow glaciations where it constructed broad arcuate moraines. As the glacier retreated, it either re-advanced or stagnated near the foot of the Olympic Mountains constructing the terminal moraine that impounds Quinault Lake today (BOR 2005).

The most important geologic controls of the Upper Quinault River are Quinault Lake, the bedrock outcrops, alluvial fans, and debris flow deposits. Lake Quinault forms a base level for the Upper Quinault River. Receding of the Lake during the last 10,000 years suggests that the Quinault River has been incising through the terminal moraine into its floodplain (BOR 2005).

Today, the Quinault River basin occupies approximately 1,124 square kilometers (277,934 acres) from the headwater contribution area, to its pour point at Taholah into the Pacific Ocean. This watershed includes approximately 687 square kilometers (169,762 acres) above the point where the river exits Lake Quinault, and 584 square kilometers (144,257 acres) above the point where the river enters Lake Quinault. Lake Quinault occupies approximately 15.1 square kilometers (3,730 acres) while at full-pool. The area of the watershed above the bridge located near the confluence of the forks is approximately 442 square kilometers (109,228 acres). The Quinault River hosts no impoundment devices such as a dam.

The geologic processes that created the geologic substrate of the Olympic Mountains has been formed and shaped by the glaciation and normal weather patterns of the region revealing an extensive glaci al outwash, glacial till, and alluvium matrix (Tabor and Cady 1978). The overburden of sedimentary rock and glacial outwash over volcanic materials within the Upper Quinault River defines the response of this region to vegetative changes and river geomorphology responses. The responses of this river system to changes in substantial component alterations can be extreme.

The bedrock in the Upper Quinault River Valley is comprised of predominantly metasedimentary rocks that are very resistant to fluvial erosion. The bedrock affects the river in two ways: (a) by deflecting the river's flow direction and (b) by forming a valley width constriction that narrows the river's floodplain and channel migration zone (BOR 2005).

3.1.2. Climate

The climate of the Upper Quinault River valley is characterized as a temperate rain forest where rains are observed during every month of the year and temperatures are moderate during all seasons (Section 3.1.2.3, Precipitation and Ecosystems).

3.1.2.1. Global Climate Change

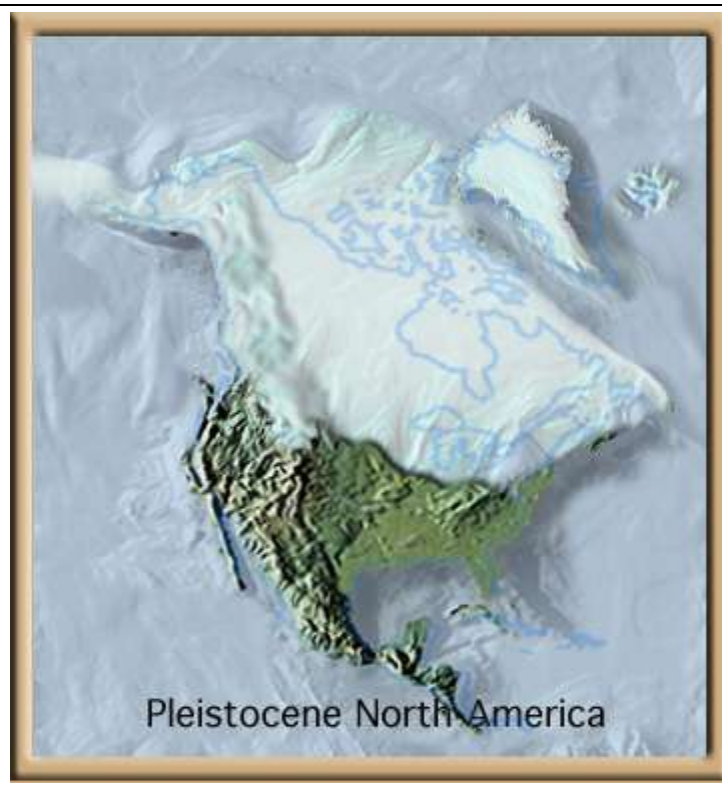
About 12,000 years ago vast continental glaciers were in retreat (Figure 10), leaving behind rounded valley walls and basins and marshy meadows. There were no dense forests during the glaciation. Elk, bison, wolves and mastodons roamed the land, and humans roamed with them (NPS 2009).

American mastodon (*Mammut americanum*) lived in this region of North America. Mastodons are thought to have first appeared almost four million years ago and became extinct about 10,000 years ago, at the same time as most other Pleistocene megafauna. Though their habitat spanned a large territory, mastodons were most common in ice age spruce forests within and around the area of the Upper Quinault River (Crystal 2010). During the Pleistocene Epoch, 1.6 million to 10,000 years ago, much of North America was covered by great sheets of ice (Scotese 2002) (Figure 10).

A partial skeleton of a mastodon was recovered from shorelines within a thick deposit of "blue" lake clays along the lower Quinault River. Current research into the date of these and similar clay units along the outer Washington coast suggests a non-glacial interval age (~20,000–60,000 years before present) for this find (Thackray 1996).

On August 22, 1928, a woolly mammoth (*Mammuthus primigenius*), tusk was found on the Quinault River. Then on January 17, 1929, a woolly mammoth fossil was found 3½ miles below Lake Quinault on the Quinault River (L. Workman 1997 - 2010). By February, 1930, more bones were unearthed in an ancient woolly mammoth wallow on the lower Quinault River. Again, on January 21, 1956, a six-foot long pre-historic woolly mammoth tusk was found north of Hoquiam, on the west side of US 101. On January 12, 1992, mastadon ivory was unearthed by a big landslide along the Quinault River (L. Workman 1997 - 2010).

Figure 10. Paleogeography based on The Evolution of North America (Scotese 2003) showing the glacial ice cap over North America during the last ice age.



In 1977 a farmer near Sequim, WA, digging a pond, unearthed remains of a mammoth. Embedded in one of the animal's ribs was a broken piece of antler or bone resembling a spear point. The spear point, and other signs of human occupation, are the earliest evidence of human presence in this region, and proof that residents 12,000 years ago were hunters (NPS 2009).

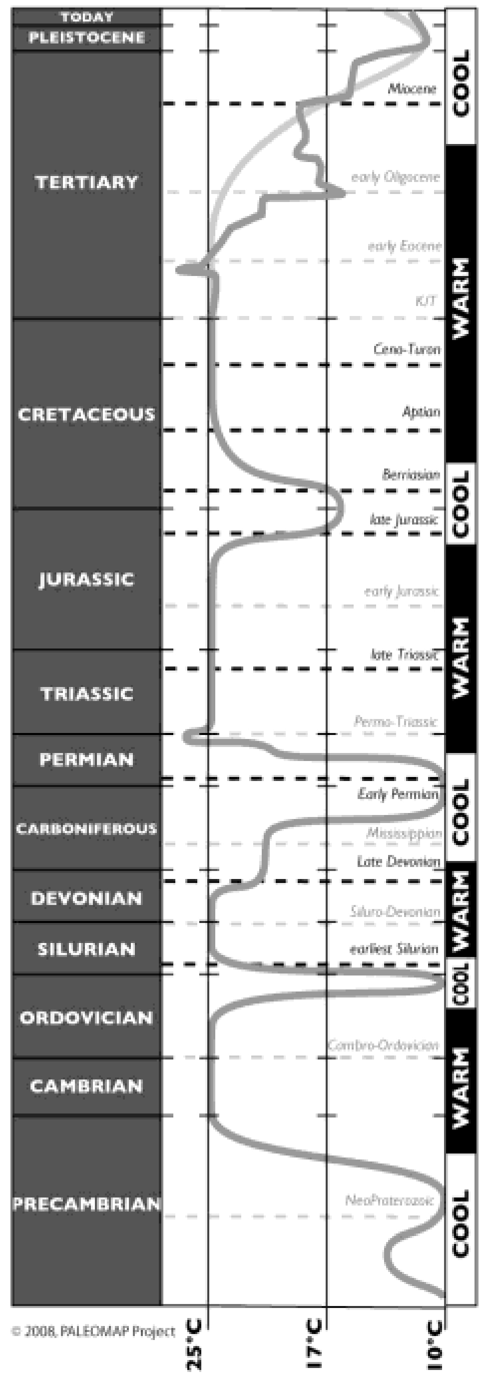
By about 3,000 years ago, the aboriginal human population increased and early inhabitants shifted their focus to lowland rivers and lakes. Fishing, gathering shellfish, hunting sea mammals and land mammals formed the foundation of a rich and complex culture for which the Pacific Northwest is known (NPS 2009).

Global climate is highly variable and currently it is in a cycle of warming because we are still leaving the last Ice Age (Figure 11) and because we are adding greenhouse gases to the atmosphere (Scotese 2002).

Global warming causes sea levels to rise as oceans expand, while making storm patterns more energetic (FMI 2008). Consequently it affects most of the world's coastlines through inundation and increased shoreline erosion.

Understanding coastal and river morphological response to climate change and sea level rise is quite underdeveloped (FMI 2008). This is partly because the timescales over which concern of its effects are greatest (annual to centennial) falls between the small scales addressed by most numerical models and the large scales described in the conceptual models of geomorphologists (Figure 11). An additional problem is that the type of models often used to bridge this gap are based on the extrapolation of historic behavior and is not precise as the climates change.

Figure 11. Earth's climate has alternated between a frigid "Ice House", and a steaming "Hot House"(Scotese 2002).



3.1.2.2. Post-Glaciation Climate Change

Residing at the headwaters of the Quinault River is the Anderson Glacier. The "Death of a Glacier" has been photographically documented by Quinault Indian Nation staff member Larry Workman. Much of the information contained in this analysis, including photographs and documentation, has been contributed by him (L. Workman 2009).

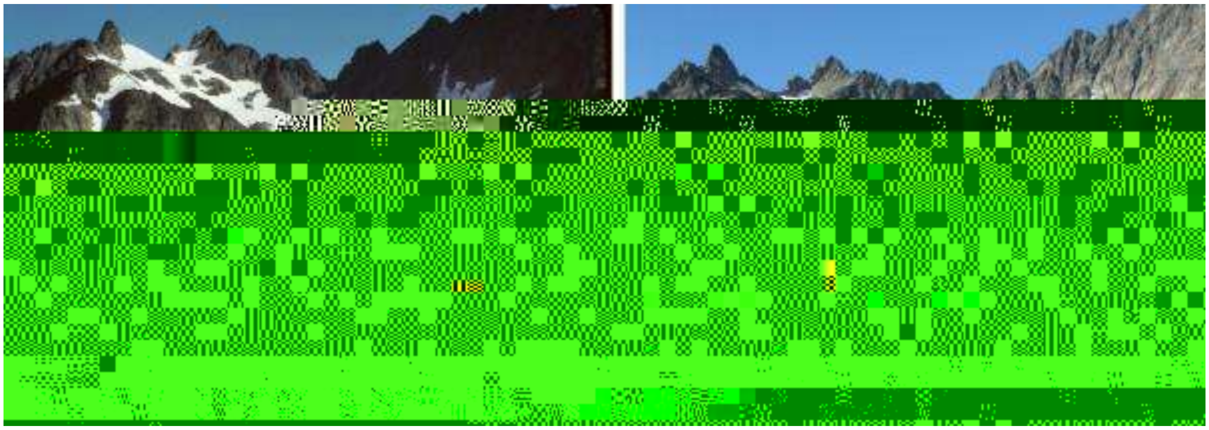
Records of the Anderson Glacier recession have been made since 1927. Photographic evidence has captured the geologically rapid rate at which it succumbed to increasing temperatures. "Once the glacier had lost much of its mass by 1974, its passing was quick in coming" (L. Workman 2009) (Figure 12).

As recently as in 1927, the glacier still filled the entire basin to the brim. As it receded over the years, it exposed a lake that became known as Valkyrie Lake. By the mid 1970's the glacier had receded to the rocks just beyond the lake (Figure 12).

Workman documents that the glacier has waxed and waned over thousands of years since the last ice age when it and the other glaciers had joined to form the Quinault Glacier. That glacier flowed out of the Quinault Valley forming a piedmont glacier which graded most of the land that was to become the Quinault River. This glacier was also responsible for the formation of Lake Quinault and the vast gravel deposit that are found from Grays Harbor north to the Olympic Mountains.

The Quinault and Queets rivers receive much of their water in the summer from the glaciers, highland snowfields, and springs in the mountains (L. Workman 2009). In terms of the impact these glaciers of the Olympic Mountains have on the rivers feeding from them, the impact is potentially high. Although the Olympic Rain Forest that the Quinault River flows through is thought to be abundant in precipitation, the basin witnesses a period of low precipitation in the months of July through August annually (PRISM Climate Group 2004) (Figure 13). It is during these summer months that temperatures reach their highest levels and the basins that are arranged to face westerly receive the highest annual solar radiation.

Figure 12. Anderson Glacier, photographed by L. Workman, upper-left 1977, upper-right 2006, and lower-center October 2009.



When the terminal headwater glaciers were at their zenith, they released water from the leading edges (glacial terminal moraines) into the semi-parched soils feeding the river's water through the hyporheic zone. The hyporheic zone is a region beneath and lateral to a stream bed, where there is mixing of shallow groundwater and surface water. The flow dynamics and behavior in this zone (termed hyporheic flow) is recognized to be important for surface water/groundwater interactions, as well as fish spawning, among other processes (Orghidan 1959).

The flow dynamics in the Quinault River are controlled by the pressure variabilities arising on the stream-bed when the flowing water is diverted by stream-bed irregularities created by benthic fauna, moving sand dunes and other obstacles. The mechanism of hyporheic flow can be triggered also by groundwater upwelling seepage beneath the stream-bed and alongside the stream banks.

These glacial water contributions were released into the soils and ultimately into the streams through hyporheic flow mechanisms. These contributions kept the rivers flowing year-round with a low

in the glaciers. A material called boulder clay was deposited on the floor of the valley. As the ice melted in retreat, the valley was left with very steep sides and a wide, flat floor.

The Quinault River remains in the valley and replaces the original pre-glaciation river and is known as a misfit stream because it is smaller than one would expect given the size of its valley (USGS 2004).

The Upper Quinault River basin at Lake Quinault has an elevation of approximately 56 m (184 feet) and climbs gradually over 18 km (11 miles) to the forks where the elevation is 113 m (371 feet), and to the heights of the geological floodplain at 225 m (803 feet). The glacial river valley allows extensive river structure as it moves within this glacially formed valley bottom. Once out of the glacial valley, the slopes of the basin climb steep valley walls to the headwaters where elevations can reach 1,900 m (6,200 feet) at Anderson Glacier.

3.1.4. Soil Resources

The United States Department of Agriculture, National Resources Conservation Service (NRCS) 2009 Soil Survey Geographic (SSURGO), provides soils information for some of the project area, but not all of it. Within the Quinault Indian Reservation, the NRCS has completed soils mapping (wa728) and has determined the soil types downstream of Lake Quinault within the Quinault Indian Reservation, which have characteristics similar to those found upstream of the lake. The soil survey for the Olympic National Forest (wa632) has been completed for some of the Upper Quinault River. Although initial mapping of the Olympic National Park has been started (wa730), the attributes of the soil types in the Park have not been determined and published.

The NRCS - National Cartography and Geospatial Center (NCGC) previously archived and distributed the State Soil Geographic (STATSGO) Database. The STATSGO spatial and tabular data were revised and updated in 2006 to form SSURGO. STATSGO has been renamed to the U.S. General Soil Map (STATSGO2).

The more general soil survey STATSGO predates the SSURGO soil survey and has coverage for sites across Washington State. The STATSGO soil survey lacks the specificity of the SSURGO soil survey, but general soil characteristics can be ascertained from it, and in the absence of the more detailed analysis of the NRCS SSURGO soil survey within the Olympic National Park (Wa730) forces assessments within the jurisdictional boundaries of the Olympic National Park to use the STATSGO soil survey data.

Soil characteristic analyses from both the SATSGO and SSURGO soil surveys were evaluated within the Quinault River basin using the NRCS Soil Data Viewer (ver 5.2) (NRCS 2010). The remainder of the analyses presented in this sub-section rely on the soils present within the three SSURGO soil surveys labeled wa728, wa632, and wa730, and the STATSGO soil survey “gsmsoilmu_a_wa” using the NRCS Soil Data Viewer analysis results. These areas were selected based on the soil complexes located within the project area, and are graphically presented in Figure 17 through Figure 22.

3.1.4.1. General Soil Characteristics

Within the more general soil survey (STATSGO) of the Quinault River Basin, soils are classified as "Andic Haplumbrets, Medial, Mesic", soils from to the pourpoint of the Quinault River at the Pacific Ocean to upstream of the confluence of the North Fork and the East Fork (main fork). Above this upstream location on the North Fork, and within the geologic floodplain, soils are classified as "Typic Haplorthods, Coarse-loamy, mixed, frigid, ortstein" soils (NRCS Soil Survey Staff 1999, NRCS Soil Survey Staff 2006).

The soil textures within the basin are classified as silty loam soils in the lower reaches of the Upper Quinault River, and coarse silty and gravelly loam soils in the upland areas of the North Fork.

A. Hydrologic Soil Groups

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms (NRCS 2010)

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

> **Group A**. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
>
> **Group B**. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
>
> **Group C**. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
>
> **Group D**. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The soils within and adjacent to the Upper Quinault River basin are Groups B and C (Figure 17).

B. Surface Texture

The soil surface texture displays the representative texture class and modifier of the surface horizon. Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

The majority of the Upper Quinault River basin is represented by silt loam soils. The upper reaches of the North Fork are classified as gravelly silt loam (Figure 18).

3.1.4.2. Detailed Soil Characteristics

Detailed soil characteristics have been determined using the NRCS SURGO soil survey data and are reported here as represented by the soil and complex names (Figure 19).

The river channels and side channels are classified as Riverwash-Water-Udifluvents complex, 0 to 5 percent slopes. The lands immediately adjacent to the river channel are classified as Hoh medial fine sandy loam, 0 to 2 percent slopes; these soils are the most common within the current areas where the river is currently avulsing. The terrace islands within the floodplain are Chitwhin medial silt loam, 0 to 2 percent slopes. These areas account for a portion of the current stream meander sites and the terrace islands. Inclusions of the soil type Chowchow-Water complex, 0 to 2 percent slopes, are seen throughout the basin in slightly elevated side terraces. The upper channel margins are classified as Donkeycreek medial loam, 0 to 5 percent slopes.

A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. This term is part of the legal definition of a wetland included in the US Food Security Act of 1985 (P.L. 99-198). The US Natural Resources Conservation Service maintains the official list of hydric soils. The status of hydric soil classification is provided within each soil complex.

A. Riverwash-Water-Udifluvents complex

Component: Riverwash (60%)

Generated brief soil descriptions are created for major soil components. The Riverwash is a miscellaneous area.

Component: Udifluvents (30%)

The Udifluvents component makes up 30 percent of the map unit. Slopes are 1 to 5 percent. This component is on flood plains and fluvial terraces. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 18 inches during January, February, March, April, May, November, and December. Organic matter content in the surface horizon is about 7 percent. This soil does not meet hydric criteria.

B. Hoh sandy loam

The Hoh component makes up 100 percent of the map unit. Slopes are 0 to 2 percent. This component is on terraces. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 15 percent. This soil does not meet hydric criteria.

C. Queets silt loam

The Queets component makes up 100 percent of the map unit. Slopes are 0 to 5 percent. This component is on flood plains and fluvial terraces. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 15 percent. This soil does not meet hydric criteria.

D. Donkeycreek silt loam

The Donkeycreek component makes up 90 percent of the map unit. Slopes are 1 to 8 percent. This component is on outwash plains. The parent material consists of outwash. Depth to a root restrictive layer is in the form of an abrupt textural change, and is found within 14 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 17 percent. This soil does not meet hydric criteria.

E. Chitwhin medial silt loam

Component: Chitwhin (90%)

The Chitwhin component makes up 90 percent of the map unit. Slopes are 0 to 2 percent. This component is on fluvial terraces on flood plains, river valleys. The parent material consists of silty alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very high. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. A seasonal zone of water saturation is at 21 inches during January, February, March, December. Organic matter content in the surface horizon is about 85 percent. This soil does not meet hydric criteria.

F. *Mudcreek-Kalaloch complex*

Component: Mudcreek (70%)

The Mudcreek component makes up 70 percent of the map unit. Slopes are 5 to 35 percent. This component is on ground moraines and till plains. The parent material consists of colluvium from alpine glacial till deposits. Depth to a root restrictive layer is 23 to 43 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 23 inches during January, February. Organic matter content in the surface horizon is about 75 percent. This soil does not meet hydric criteria.

Component: Kalaloch (15%)

The Kalaloch component makes up 15 percent of the map unit. Slopes are 5 to 35 percent. This component is on ground moraines and till plains. The parent material consists of silty alluvium over glacial outwash. Depth to a root restrictive layer, strongly contrasting textural stratification, is 21 to 37 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. This soil does not meet hydric criteria.

3.1.4.3. Soil Rutting Hazard

The ratings in this interpretation indicate the hazard of surface rut formation through the operation of forestland or excavation equipment. Soil displacement, hyper-compaction, and puddling (soil deformation and compaction) may occur simultaneously with rutting.

Ratings are based on depth to a water table, rock fragments on or below the surface, the Unified classification of the soil, depth to a restrictive layer, and slope. The hazard is described as slight, moderate, or severe. A rating of "slight" indicates that the soil is subject to little or no rutting. "Moderate" indicates that rutting is likely without mitigation measures. "Severe" indicates that ruts form readily unless specific tactics are used to minimize the risk (Figure 20). Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site and apply appropriate mitigation measures as needed.

3.1.4.4. Potential Seedling Mortality

Potential tree seedling mortality ratings indicate the likelihood of death of naturally or artificially propagated tree seedlings, as influenced by soil characteristics, physiographic features, and climatic conditions. Considered in the ratings are flooding, ponding, depth to a water table, content of lime, reaction, available water capacity, soil moisture regime, soil temperature regime, aspect, and slope.

The potential for seedling mortality has been estimated for each of the soil conditions existing within the Quinault River basin. The soils are described as having a "low," "moderate," or "high" potential for seedling mortality. "Low" indicates that seedling mortality is unlikely. Good performance can be expected, and little or no maintenance is needed. "Moderate" indicates that seedling mortality can occur because one or more soil properties are less than desirable. Fair performance can be expected, and some maintenance is needed. "High" indicates that seedling mortality can occur because of one or more soil properties and that overcoming the unfavorable properties requires special design, extra maintenance, and site alteration. All of the channel migration zone of the Upper Quinault River is rated within the Low Risk category for potential of seedling mortality due to the conditions defined here. (Figure 21).

3.1.4.5. Potential for Hand Planting

Ratings for suitability for hand planting interpretation indicate the expected difficulty of hand planting of forestland plants. The ratings are based on slope, depth to a restrictive layer, content of sand, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. It is assumed that necessary site preparation is completed before seedlings are planted.

Rating class terms indicate the degree to which the soils are suited to this aspect of site management. "Well suited" indicates that the soil has features that are favorable for the specified management aspect and has no limitations. Good performance can be expected, and little or no maintenance is needed. "Moderately suited" indicates that the soil has features that are moderately favorable for the specified management aspect. One or more soil properties are less than desirable, and fair performance can be expected. Some maintenance is needed. "Poorly suited" indicates that the soil has one or more properties that are unfavorable for the specified management aspect. Overcoming the unfavorable properties requires special soil supplementation, extra maintenance, and intensive site alteration. "Unsuited" indicates that the expected performance of the soil is unacceptable for the specified management aspect or that extreme measures are needed to overcome the undesirable soil properties.

Within the Upper Quinault River channel migration zone all riparian sites are rated as “Well Suited” with some of the adjacent areas to the river rated as “Moderately Suited” (Figure 22).

Figure 14. Regional Locator Map of the Quinault Indian Reservation and the Upper Quinault River, NAIP Aerial Imagery (2009).

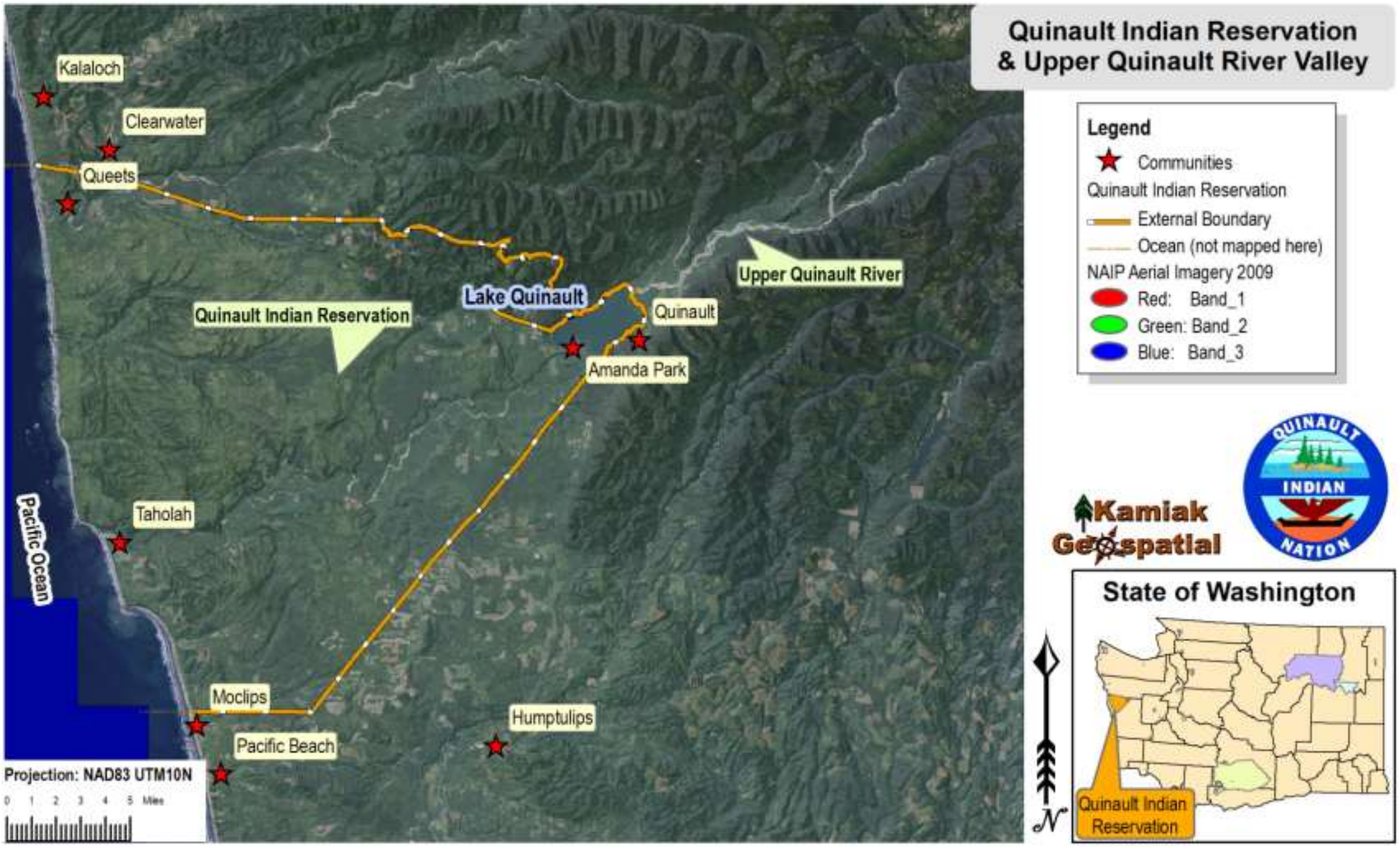


Figure 15. Upper Quinault River aerial imagery (2009).

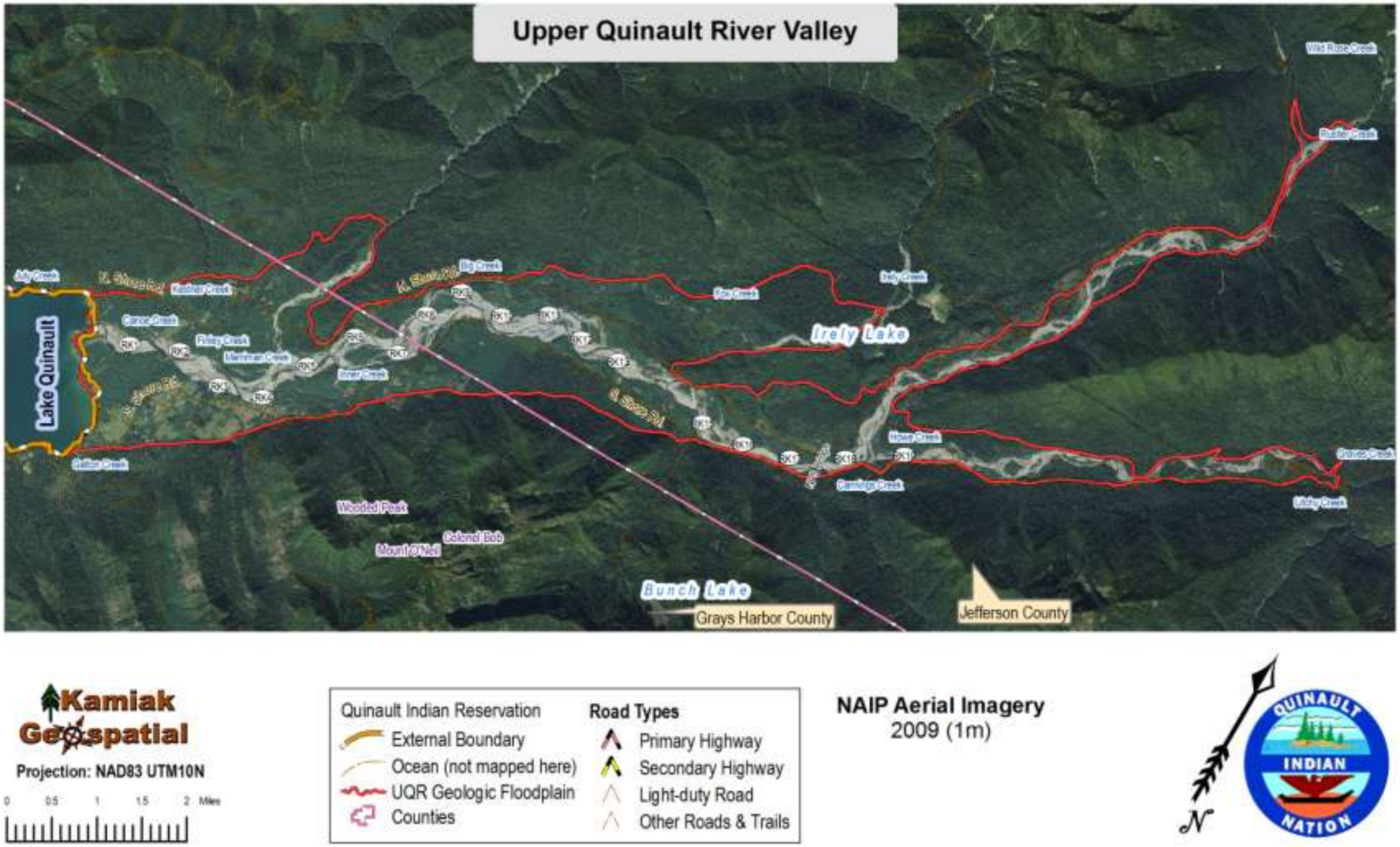


Figure 16. Land Ownership and Land Management within the Upper Quinault River Drainage.

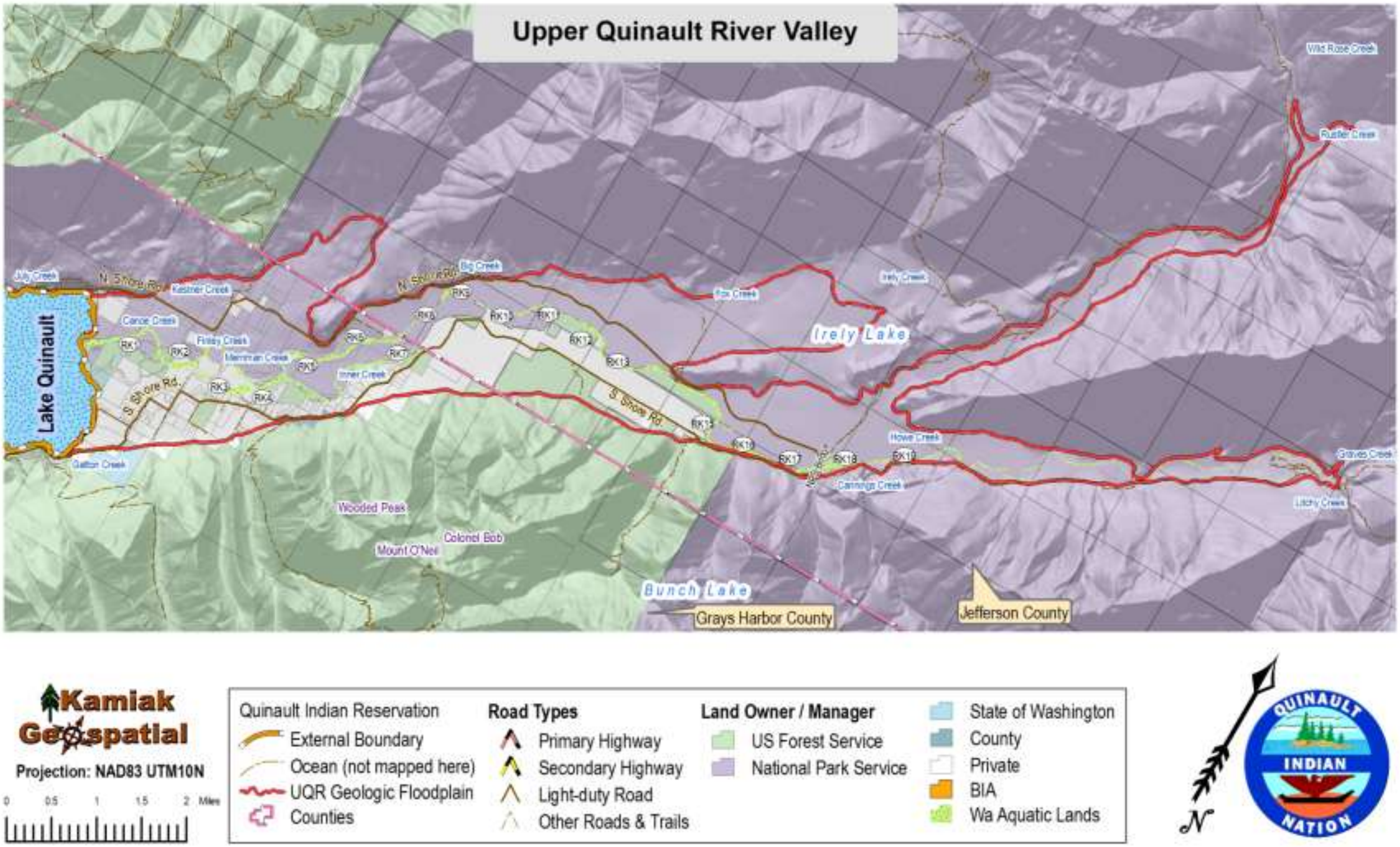


Figure 17. STATSGO Soil Survey Showing Hydrologic Groups.

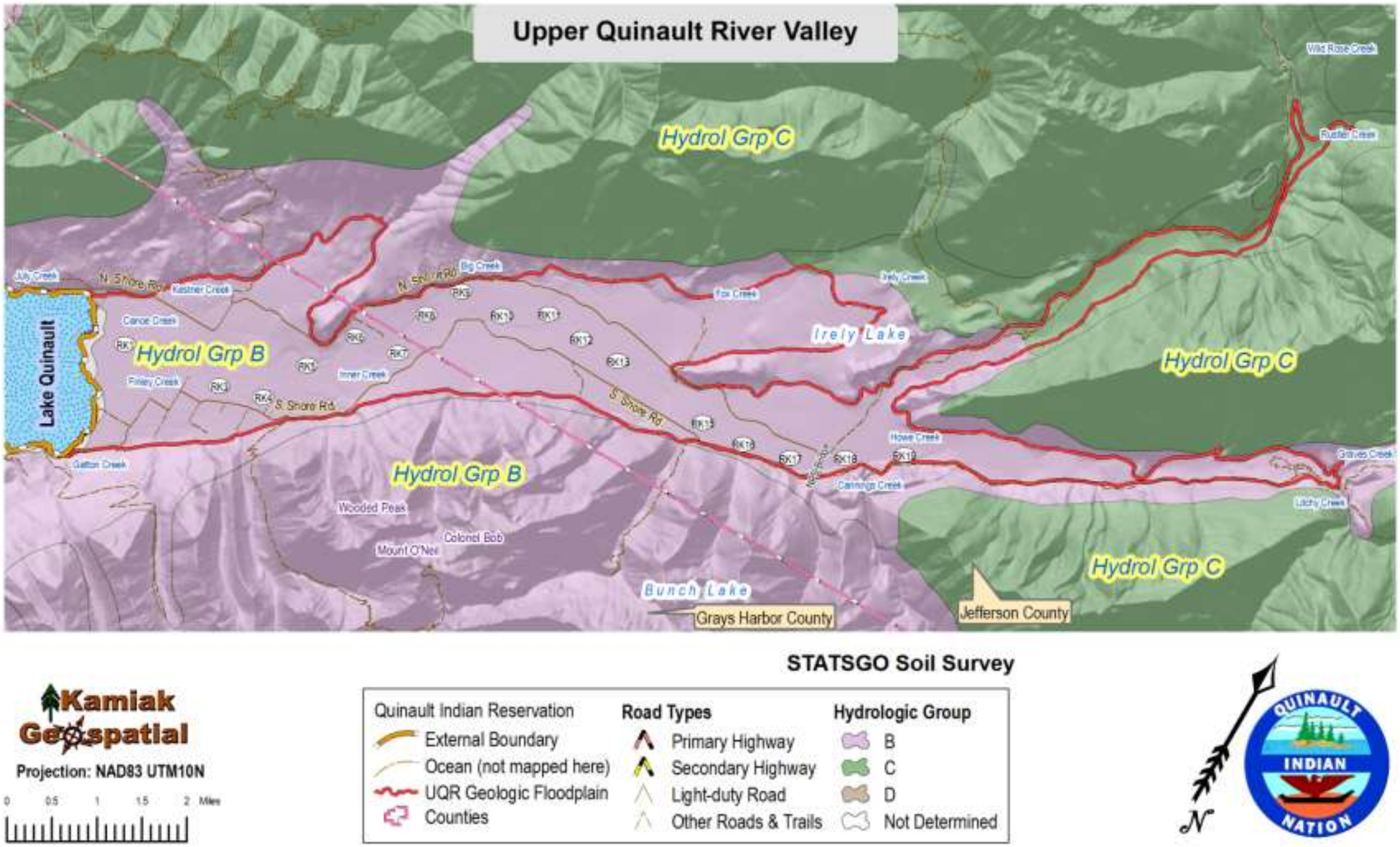


Figure 18. STATSGO Soil Survey Showing Surface Texture.

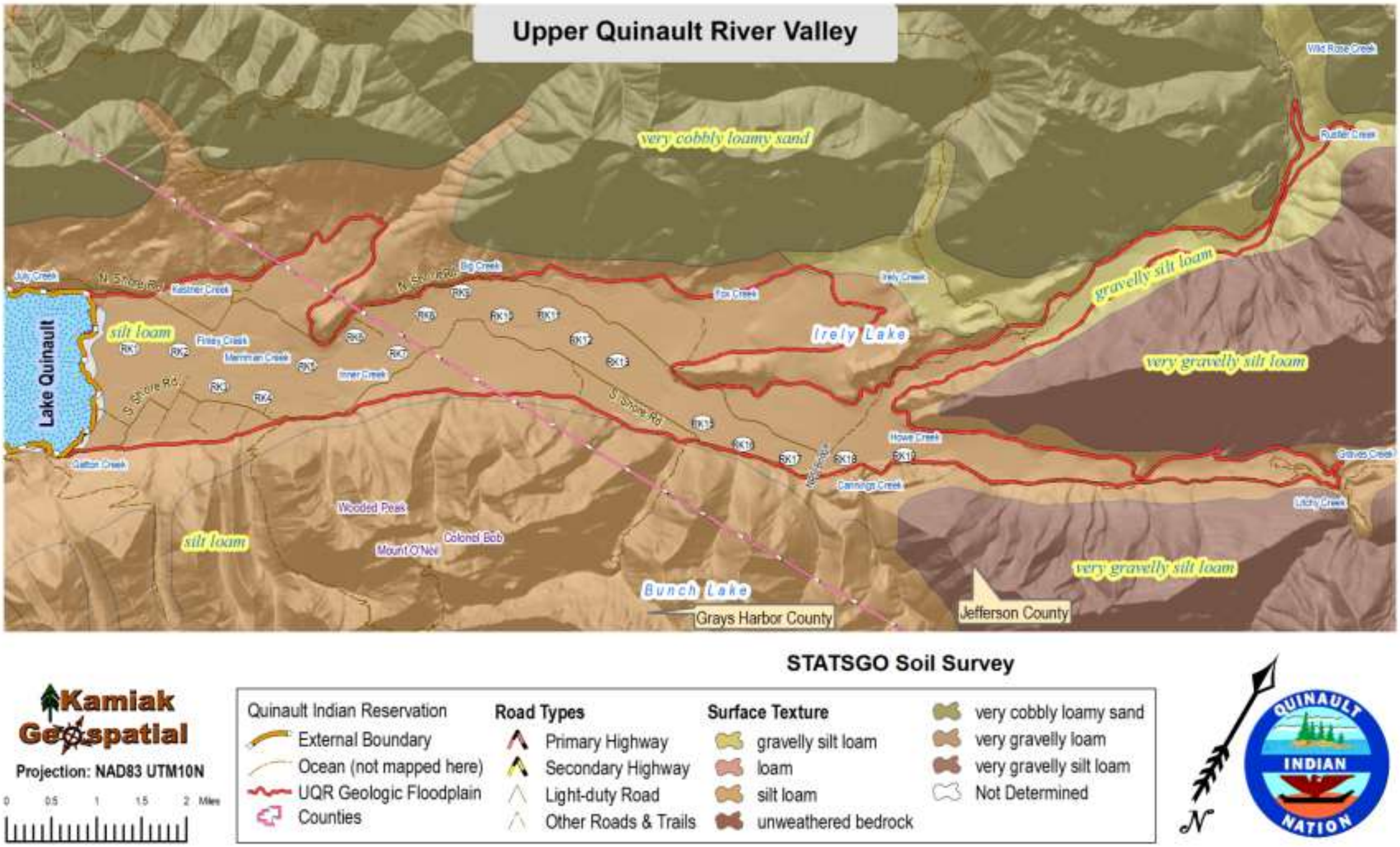


Figure 19. SSURGO Soil Names and Types.

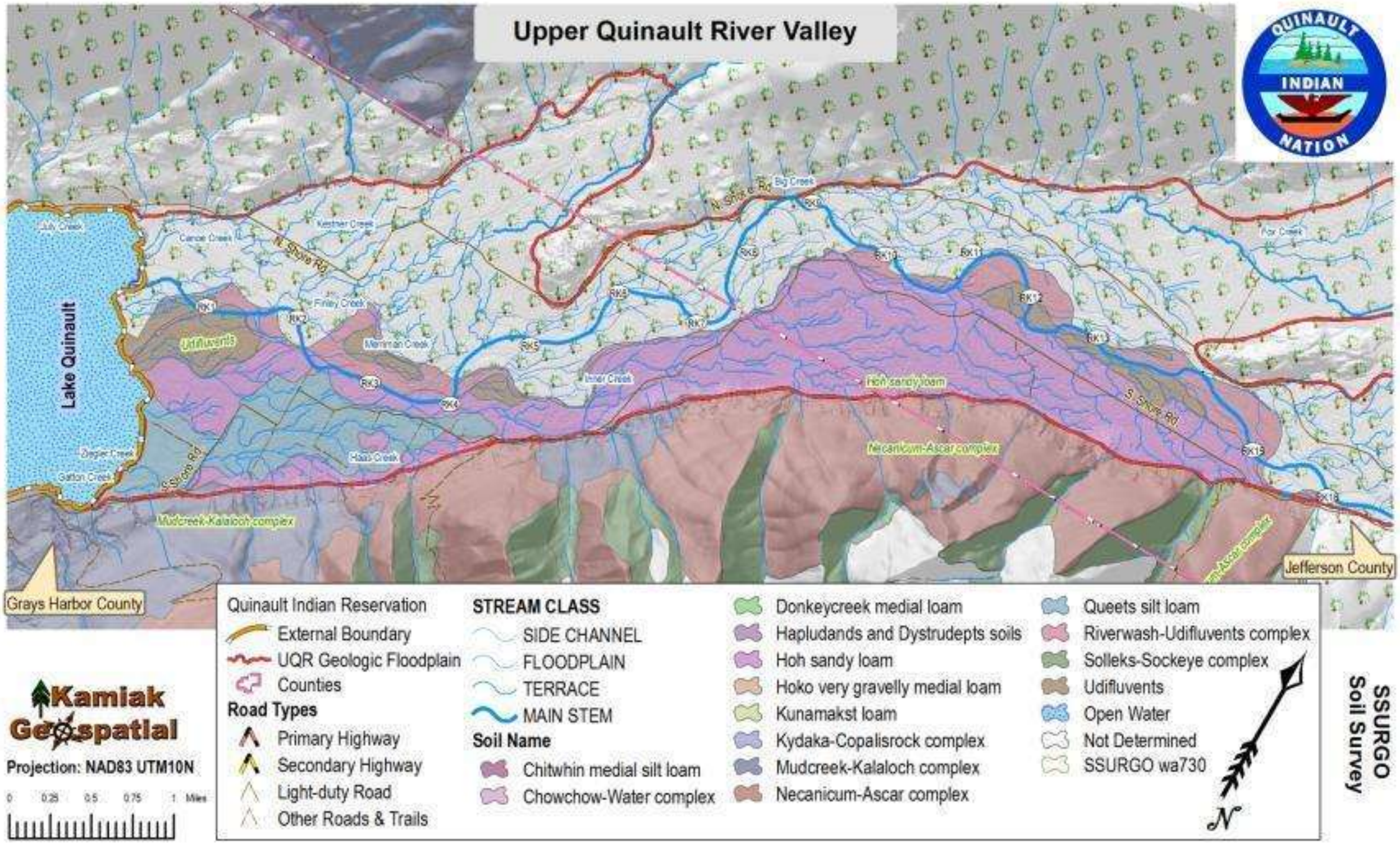


Figure 20. SSURGO Soil Rutting Hazard.

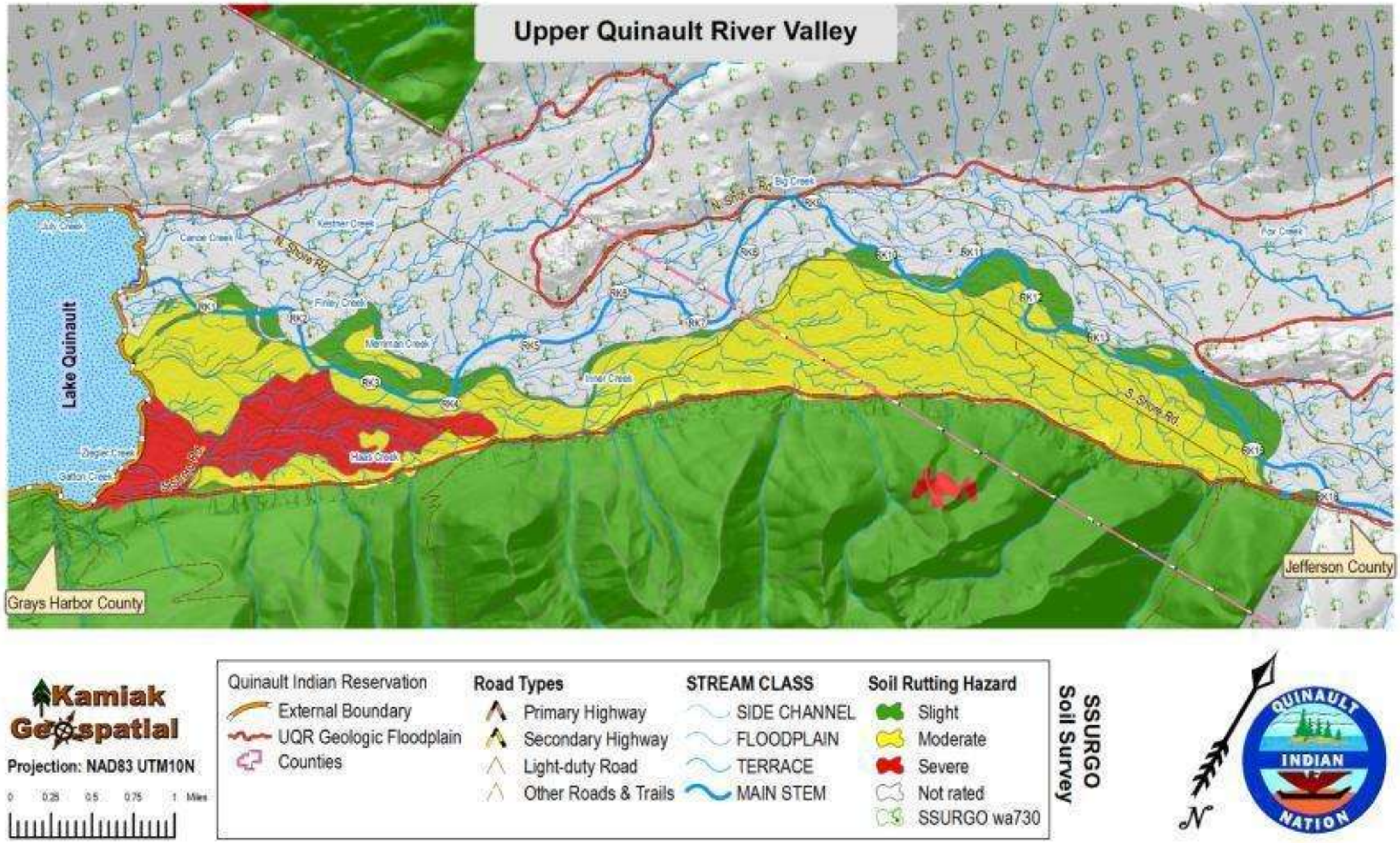


Figure 21. SSURGO Potential Seedling Mortality.

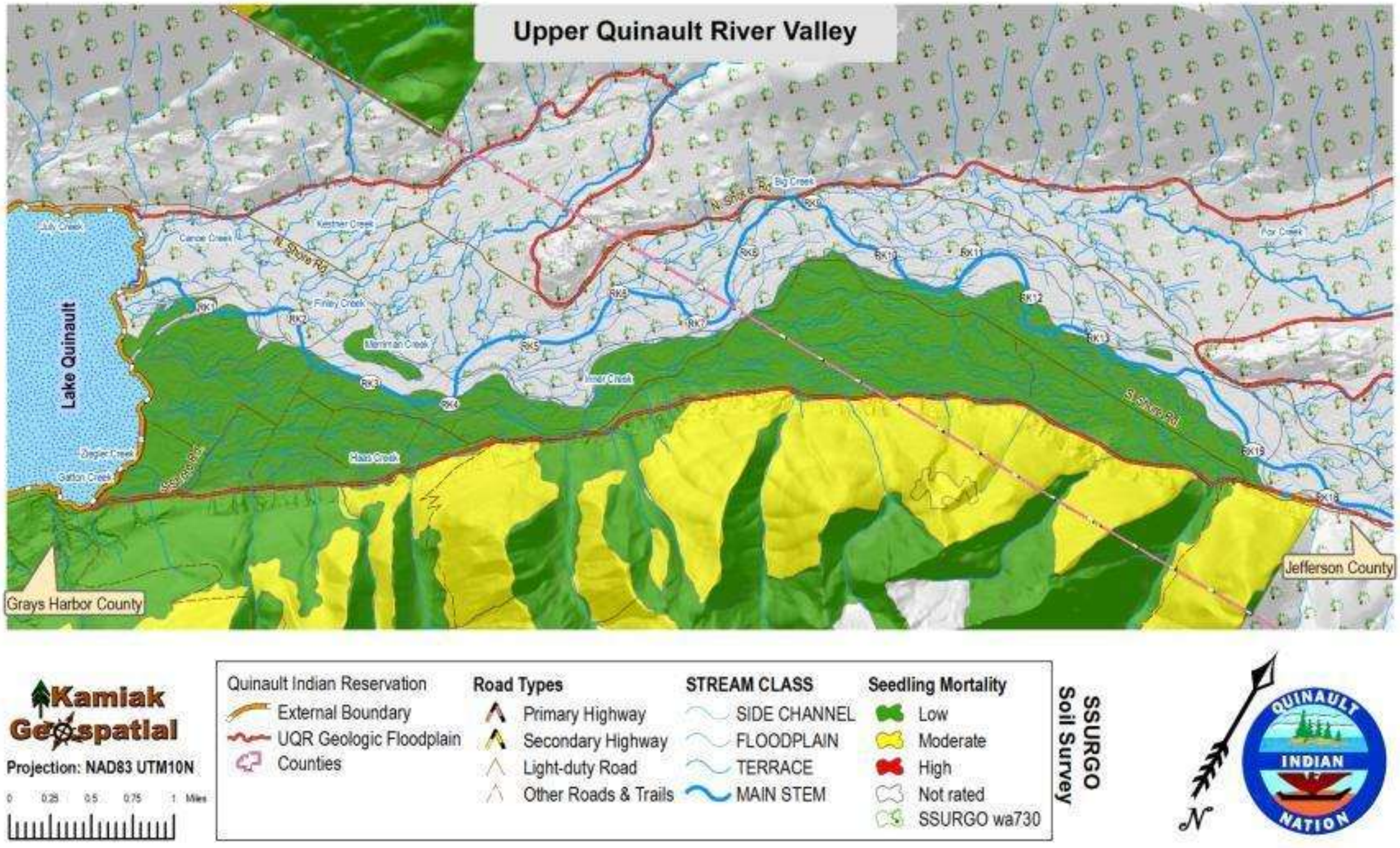


Figure 22. Hand Planting Suitability of Sites for Regeneration.

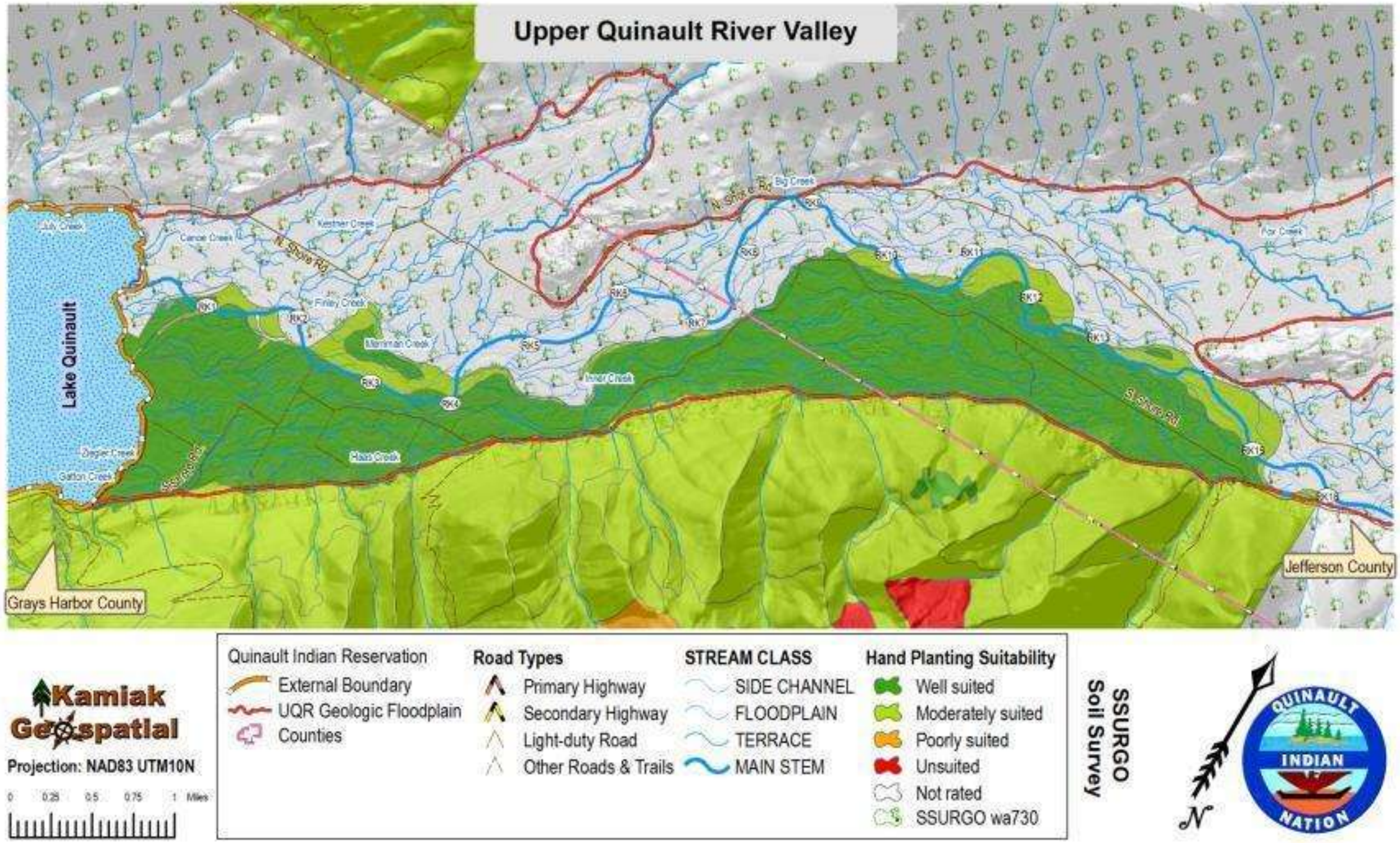


Figure 23. Project area matching the Geologic Floodplain Boundary.

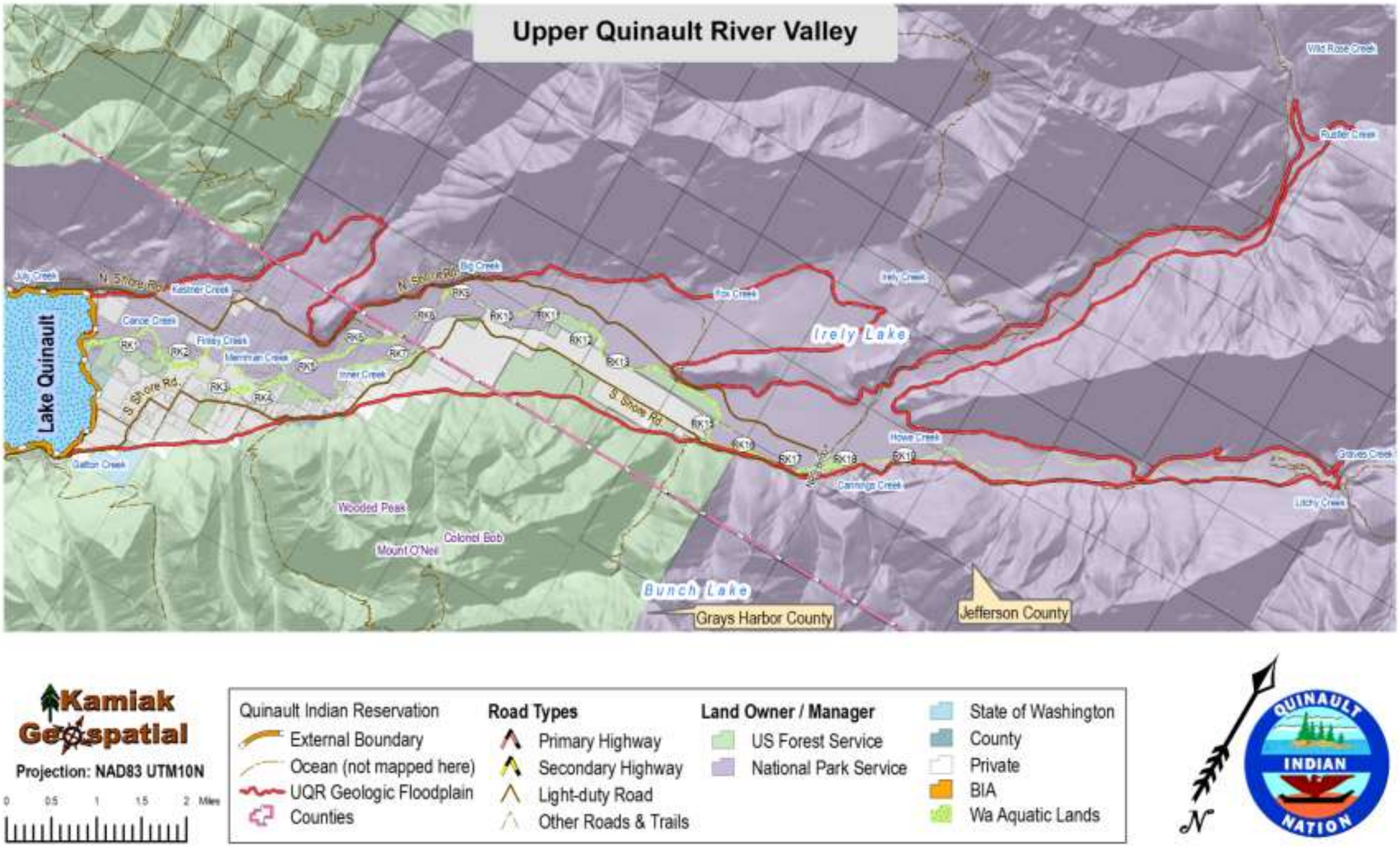
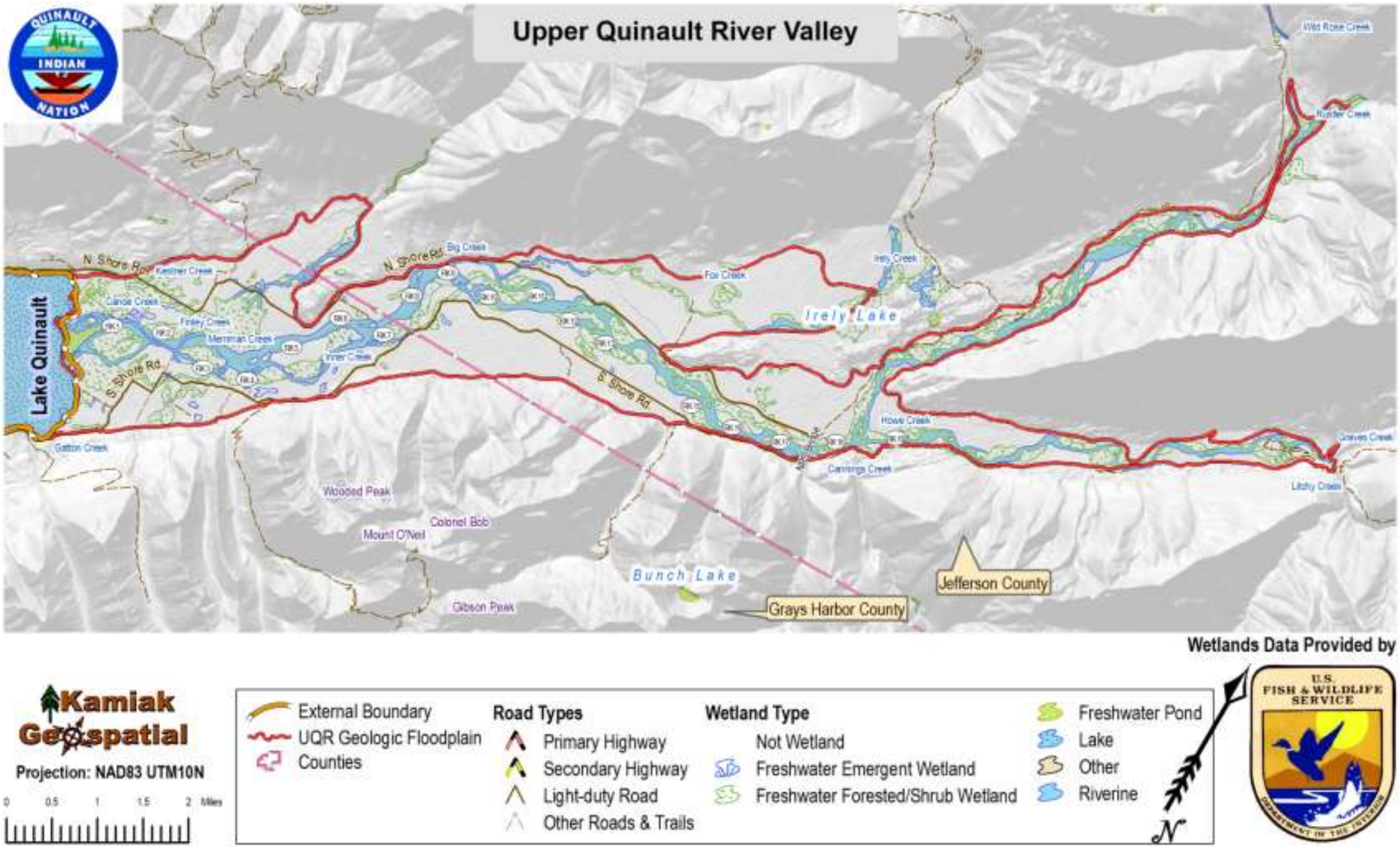


Figure 24. Wetlands within the Upper Quinault River Basin (USFWS 2011).



3.2. Water Resources

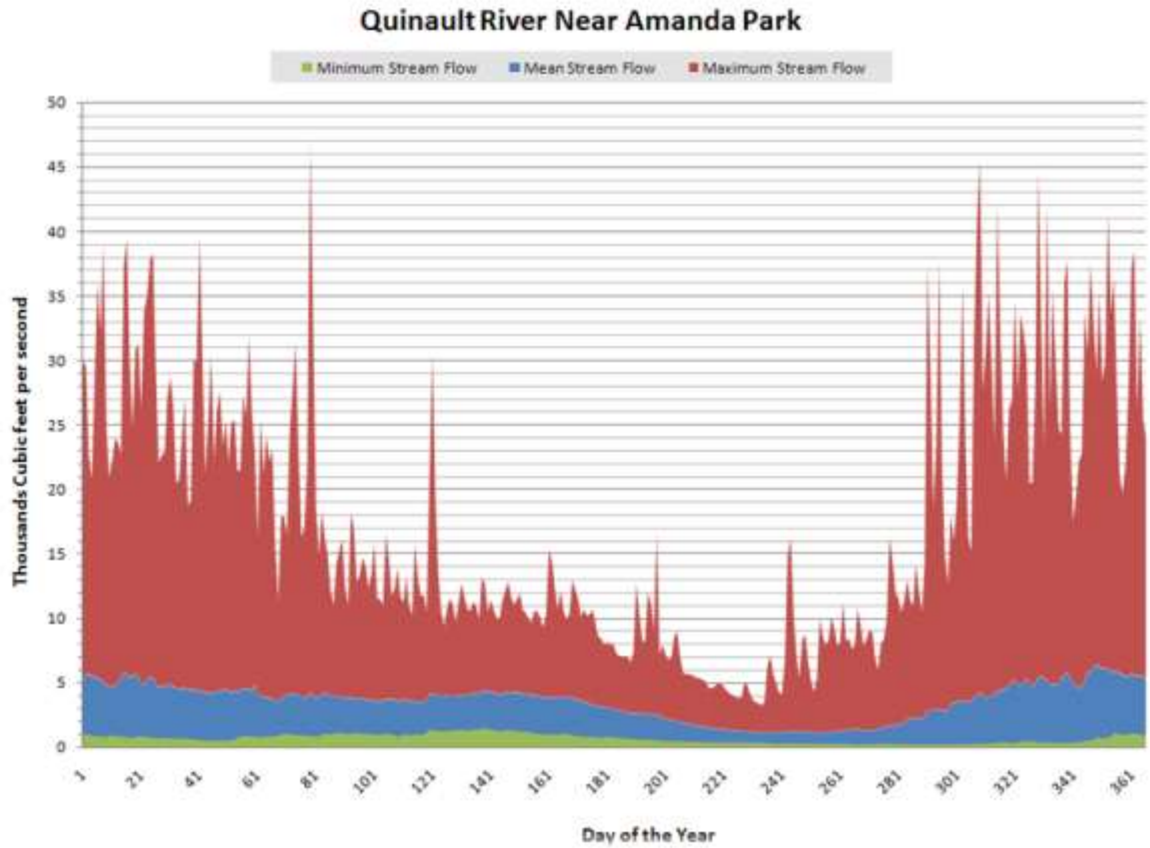
Much of this section has been summarized from Salmon Habitat Restoration Plan; Upper Quinault River (QIN 2008) and Geomorphic Investigation of Quinault River, Washington; 18 Km Reach of Quinault River Upstream from Lake Quinault (BOR 2005).

Data regarding water quality, nutrient loading, and the biological community of Lake Quinault were compiled and analyzed by the Quinault Division of Natural Resources. In addition, a sediment core taken from the lake bottom in 2000, was processed using paleolimnological methods to characterize system productivity over the past approximately 150 years. The data showed that Lake Quinault is extremely nutrient poor (Stockner 2000) which limits primary productivity and carrying capacity of the sockeye juveniles in its present state. Analysis of sediment cores taken from Lake Quinault indicated historic patterns of variation in nutrient levels and trophic dynamics suggest general productivity of the lake is responsive to the influence of external sources of nutrient; e.g., large pulses of marine-derived nutrients from large salmon escapements (Stockner, Bos and Leavitt, et al. 2003). Based on this information, Quinault Indian Nation is fertilizing Lake Quinault with liquid nutrients to improve trophic level productivity and lake rearing conditions for juvenile sockeye salmon.

River flow rates (cubic feet per second; cfs) are monitored from a USGS gauging station at the outlet of Lake Quinault near Amanda Park (1910-2010). Based on these data (Figure 25) the average flow is between 2,000 cfs and 7,000 cfs with seasonal increases in the winter and spring, with a decrease in the summer, then increasing again in the fall. Although the USGS river gauge is located at the head of the Lake and includes terrain outside of the project area, and the effect of the lake serves to buffer the annual maximum and minimum flow rates of the river, it does demonstrate the annual cycles of precipitation converted to overland flow in the Quinault River.

There are no domestic surface water rights on the Upper Quinault River, nor in Lake Quinault waters. There are no irrigation use water rights in this drainage. Ground water recharge supplies the domestic water wells in the area and based on geologic formations, these wells are supplied by a combination of contribution areas in the Colonel Bob Wilderness and other sites located within the basin.

Figure 25. Quinault River Flow at Amanda Park; 1910-2009.



3.2.1. Wetlands

The U.S. Fish and Wildlife Service (the National Wetlands Inventory) is federally responsible for mapping and delineating wetlands within the US. The dataset obtained for consideration, from the USF&WS was last updated on February 4, 2011 (USFWS 2011) This data set represents the extent, approximate location and type of wetlands and deepwater habitats in the conterminous United States. These data delineate the areal extent of wetlands and surface waters as defined by Cowardin et al. (1985)

The present goal of the Service is to provide the citizens of the United States and its Trust Territories with current geospatially referenced information on the status, extent, characteristics and functions of wetlands, riparian, deepwater and related aquatic habitats in priority areas to promote the understanding and conservation of these resources.

Wetlands or other mapped features may have changed since the date of the imagery and/or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

3.2.1.1. Wetlands Extent

The extent of wetlands within the Upper Quinault River has been mapped by the USFWS (Figure 24, Table 1) to represent approximately 3,505 ha (8,661 ac). These categories of wetlands are defined by the USFWS to include current wetlands, active river channels, and emergent wetlands. All of the project area includes the fundamental footprint of the wetlands for this region.

Because the meandering of the active river channel has been rapidly expanding within the floodplain over the course of the past century, the current mapping of the wetlands within this basin is not consistent with the most recent changes observed in this area. The result is that several locations within the basin show active river channels that are currently accurately described as Freshwater Ponds, Shrub Wetlands, or even as a non-wetland category. Conversely, other areas not mapped as wetland are currently converting to active channel (riverine) or other active wetland categories.

Table 1. Wetlands Extent in Upper Quinault River Basin.

Wetland Type	Acres	Hectares
Freshwater Emergent Wetland	94.54	38.26
Freshwater Forested / Shrub Wetland	2,939.43	1,189.54
Pond	182.53	73.87
Lake	3,623.10	1,466.22
Other	0.10	.04
Riverine	1,821.65	737.19
All	8,661.34	3,505.12

3.3. Air Quality

The Upper Quinault River project area has clean air and substantial daily air circulation. The air quality of this area is extremely high. There are no industrial facilities in this area, and it is surrounded on two sides by the Colonel Bob Wilderness, Southern Quinault Inventoried Roadless Areas, and the Olympic National Park. Agriculture in this area is minimal, but a minor amount of farm machinery and homestead farming does occur seasonally.

Recreational uses focus on walking trails in the Park and Wilderness, and hospitality sites at the nearby Quinault Lodge, with some use on the lake.

Regionally, air circulation comes about because the water of the Pacific Ocean has a higher specific heat capacity than land and thereby absorbs and releases more heat, but the temperature changes less than over land. This effect is noticeable in the areas surrounding Lake Quinault, as its juxtaposition to the Pacific Ocean witnesses sea breeze, air cooled by the water, ashore in the day, and carries the land breeze, air cooled by contact with the ground, out to sea during the night. This effect is termed as the diurnal (daily) wind change between day and night. The result is a daily “freshening” of the Upper Quinault Basin airshed.

The Federal Clean Air Act (CAA) was enacted in 1969. The CAA established the National Ambient Air Quality Standards (NAAQS) and delegated primary enforcement of the CAA to the states and tribes within reservations. The NAAQS established the air quality levels. The Federal Environmental Protection Agency (EPA) is the Federal agency responsible for establishing the air pollution thresholds for the U.S. The majority of air quality law enforcement is delegated to the individual states and tribes (EPA 2008)

Emissions for fugitive dust can be included in the area-source contribution estimates in the Upper Quinault Valley, and adjacent properties (EPA 2005) "Fugitive dust" means a particulate emission made airborne by human activity, forces of wind, or both, and which do not pass through a stack, chimney, vent, or other functionally equivalent opening. The Washington State General Standards for Maximum Emissions (WAC 173-400-040 & 113) establish responsibilities to the owner or operator of a source or activity that generates fugitive dust to take reasonable precautions to prevent that fugitive dust from becoming airborne and must maintain and operate the source to minimize emissions. Airborne fugitive dust is measured through measurement of particulate matter designated PM-10 for the larger component and PM-2.5 for the smaller component. Emphasis is now placed on the PM-2.5 as it has been more closely tied to human health. The owner or operator of any existing source or activity that generates fugitive dust that has been identified as a significant contributor to a PM-10 or PM-2.5 nonattainment area is required to use reasonably available control technology to control emissions (WAC 2011).

Contributions to fugitive dust in the area include vehicles (personal and commercial) driving along unpaved roads in the area, residential operations of machinery and farm equipment in the area, and other sources. Fugitive dust emissions in this region are not uncommon, but they are not in excess of the PM-10 or PM-2.5 standards.

3.4. Living Resources

3.4.1. Vegetative Plant Communities

During, and after, the last glacial period of the Olympic Mountains (12,000 to 13,500 years before present), many studies reveal that the low-land forests of the region were dominated by lodgepole pine (*Pinus contorta*), true fir (*Abies* spp.), and spruce (*Picea* spp.) (ONF 1989). Following the last major retreat of the glaciers in the Olympic Mountains, the forests became dominated by western hemlock, spruce, Douglas-fir, true fir species, and red alder. The species conversion of the western sides of the Olympic Peninsula was delayed in comparison to the eastern expanses of the peninsula. During this time, the forests of the western side of the peninsula resembled the forests that exist today further east that are dominated by lodgepole pine, Douglas-fir, western hemlock, and spruce (ONF 1989)

Around 4,000 years before present, several climatological changes occurred in the region, and a forest species conversion occurred. Douglas-fir dominance reduced significantly, while spruce, hemlock, red alder, and western redcedar became the dominate forest association components. This species mix is still seen today (ONF 1989). Currently, the forest plant associations of much of the low-lands of the

Upper Quinault River are classified as Sitka spruce/swordfern-oxalis habitat type and western hemlock/Alaska huckleberry/oxalis habitat types (NRCS SSURGO 2006, ONF 1989).

Since homesteading established a vegetative species conversion favoring cleared sites for homestead style farming, housing developments, and other low-density population uses, accompanied by large tree removal, the areas within and surrounding the Upper Quinault River have taken on a substantial change from historic characteristics. Currently, the area within the 4,289 ha (10,598 ac.) Upper Quinault River geologic floodplain is dominated by young evergreen forests (36%) and woody wetlands (38%) (Table 2).

Table 2. Landcover within the Upper Quinault River Geological Floodplain (USGS 2003).

Landcover Category	Hectares	Acres
Barren Land (Rock/sand/clay)	404.6	999.7
Deciduous Forest	33.3	82.3
Developed low intensity	7.7	19.1
Developed medium intensity	1.0	2.4
Developed open space	118.3	292.2
Emergent Herbaceous Wetlands	56.7	140.1
Evergreen Forest	1,556.8	3,847.0
Grassland/Herbaceous	59.8	147.7
Mixed Forest	78.0	192.8
Open Water	112.6	278.2
Pasture / Hay	96.5	238.4
Shrub/Scrub	136.2	336.5
Woody Wetlands	1,627.6	4,021.8
Total	**4,289.0**	**10,598.2**

3.4.2. Wildlife

Several salmon species can be found in the Quinault River system including sockeye (Blueback) salmon, chinook salmon, coho salmon, chum salmon (*O. keta*), pink salmon (*O. gorbuscha*), steelhead, cutthroat (*O. clarkia*) salmon, and native char (QIN 2008). Other anadromous fish species of note include Pacific lamprey (*Entosphenus tridentatus*, formerly *Lampetra tridentata*), and river lamprey (*L. ayersi*). Another aquatic species of special note is the bull trout, listed by the US Fish & Wildlife Service as a threatened species under the U.S. Endangered Species Act.

The Roosevelt elk (*Cervus elaphus roosevelti*), also known as Olympic elk, is the largest of the four surviving subspecies of elk in North America (Robb 2001). The Roosevelt elk is a unique variety of North American elk (*C. elaphus*) found throughout coastal regions of the Pacific Northwest from northern California to British Columbia's Vancouver Island. By the turn of the 20th century, Roosevelt elk herds were depleted or eliminated in many areas by unregulated market hunting for meat, hides, and teeth (which were valued as ornamental accessories in the early 1900's). Political pressures to protect the largest population stronghold of Roosevelt elk resulted in the establishment of the Mount Olympus National Monument in 1909 and Olympic National Park in 1938 in the Olympic Peninsula. Today, after more than 60 years of complete protection, Olympic National Park is home to the largest population of Roosevelt elk that remains relatively undisturbed in its natural forest environment (Houston and Jenkins 2003).

The black-tailed deer or blacktail deer (*Odocoileus hemionus columbianus*) is subspecies of the mule deer (*O. hemionus*) found in western North America, specifically in the Pacific Northwest and Northern California regions. It has been treated as a species, but virtually all recent authorities maintain mule deer and black-tailed deer as conspecific (Geist 1998). The Olympic Peninsula has large herds of the black-tailed deer. This species thrives on the edge of the forest/meadow interface, as the dark forest lacks the underbrush and grasslands that the deer prefer as food, and completely open areas lack the hiding cover it prefers during harsh weather periods.

The American black bear (*Ursus americanus*) is North America's smallest and most common species of bear and is found throughout the Olympic Peninsula. Black bears are omnivores, with their diets varying greatly depending on the season. Black bears typically live in largely forested areas, but generally do leave forests in search of food. Sometimes they become attracted to human communities and camp sites because of the immediate availability of food. The American black bear has a widespread distribution and a large global population estimated to be twice that of all other bear species combined (Garshelis, Crider and Manen 2008).

Beyond these species listed here, the abundance of wildlife within the rain forest ecosystem is wide-ranging. Notable species living in the reach of the project area and identified by the US Fish and Wildlife Service as Threatened, Endangered, or Sensitive (TES) include the Northern Spotted Owl (*Strix occidentalis caurina*) and Marbled Murrelet (*Brachyramphus marmoratus*).

Animals of the region have evolved to exploit these habitats. Native species fill niches of the environment where they eat and reproduce, seek thermal cover and hiding cover. The Olympic National Forest (1989) has documented 63 unique mammals living within the Olympic National Forest, although field crew recordings of these findings noted that several other species were not directly observed although evidence of their presence was seen. Aviary species within the Olympic National Forest was similarly documented with a total of 183 different species recorded. A cursory review of the bird species sampled for, reveals that additional species of note (listed above as TES) were not directly documented.

The Olympic National Forest (1989) has also documented the existence of 23 species of amphibians and reptiles (herptiles) within the Olympic National Forest. These herptiles often fill the unique niche within and adjacent to the rainforest ecosystems.

The species identified by the Olympic National Forest samples are considered to be representative of the breadth of animal species using habitat within the Upper Quinault River watershed.

3.4.2.1. Beaver in the Quinault River Ecosystem

An important biological factor that can have profound effects on aquatic habitats is North American Beaver (*Castor canadensis*) activities. Beaver are important members of floodplain communities and their activities interact with physical and other biological processes to create and maintain aquatic habitats (QIN 2008). The beaver is considered a keystone species by many wildlife biologists, endowed with the ability to increase biodiversity through the creation of beaver ponds and wetlands (Wright, Jones and Flecker 2002). These riparian habitats enlarge the perimeter of the un-dammed two bank profile of a stream allowing aquatic plants to colonize newly available habitat. Insect, invertebrate, fish, mammal, and bird diversity are also expanded by the creation of these beaver dams (Rosell, et al. 2005). Beavers perform a key role in ecosystem processes, because their foraging has a considerable impact on the course of forest succession, species composition and the structure of plant communities.

The presence of beaver dams in streams creates flood conditions behind the dam structure (Pollock, Pess and Beechie 2004). The North American Beaver builds lodges along rivers, streams, lakes, and ponds in order to insure water around their lodges that is deep enough to prevent the freezing of the site during the cold winter months. Beavers dam streams to create a pond where their lodge can be located. During this process of damming the stream, the beaver dams flood areas of surrounding forest and fields, giving the beaver safe water access to leaves, buds, and inner bark of growing trees for food (Rosell, et al. 2005). Beaver typically prefer hardwoods (Figure 26) but will feed on softwood cambium as well and will also eat cattails, water lilies and other aquatic vegetation, especially in the early spring. In areas where their pond freezes in winter, beavers will collect food supplies (tree branches) in late fall, to store them underwater (usually by sticking the sharp chewed base of the branches into the mud on the pond's bottom), where they can be accessed throughout the winter. Often the stockpile of branches will project above the pond and collect snow. This insulates the water below it and keeps the pond open at that location (Rosell, et al. 2005).

Figure 26. Beaver dam within a side channel of the Upper Quinault River (QIN 2008).

Although a single beaver dam may have little influence on stream flow quantity, a series of dams can have significant results (Grasse 1951) by moderating the peaks and troughs of the annual discharge patterns. During low flow periods of the year, Duncan (1984), working in an Oregon watershed, determined that up to 30% of the stream network's water was retained in beaver ponds. The general hydrologic pattern of the Quinault River, and western Washington generally, is peak rainfall and stream flows during the winter and spring months with decreasing flows in the late summer and early fall pending the arrival of rains (Figure 13). By increasing storage capacity in the form of beaver ponds, it has been suggested that large numbers of beaver dams can lead to greater stream flows during late summer during this low precipitation period (Parker 1986), which may result in continual flows in previously intermittent streams (Yeager and Hill 1954, Rutherford 1955). Beaver dams, depending on their number and location, may decrease peak river discharge and stream velocity during high water flows, thereby reducing scour and erosion potential associated with the high flow event (Parker 1986).

Within the historic Upper Quinault River drainage, the gradual channel migration and occasional shifting, amid dense, mature forests and ample supplies of large woody debris, resulted in a continual cycle of erosion of older surfaces while at the same time building of new surfaces. The river consisted of one or two relatively narrow, deep main channels with many side channels, terrace channels, and tributary channels winding across a forested floodplain (BOR 2005). Within this river ecosystem the beaver excelled at den and dam building taking advantage of the side and terrace channels. The externality of their presence was an increased recapture of sediment loads from the channels, the addition of small diameter but wide distribution of woody organic matter, and reduced stream velocities. The reduction of stream velocities within the river channel resulting from the location of beaver dams and dens, would have reduced the propensity of the river to avulse into lower geologic layers of the stream bed.

Beginning in the 18th century, European explorers and settlers began to trap the beaver and otter to collect hides for sale into the Asian and European markets. The extent of the trapping effort in the western portions of the continent were especially severe (Dolin 2010).

The effects of beaver activity on the pre-settlement landscape in the Quinault River valley are speculated. Currently, beaver play an important role in managing and maintaining side channel habitat areas on the floodplain. Beaver have significantly modified stream morphology and hydrology in many side channel habitat areas that provide opportunity for diverse habitat types (such as off channel ponds) to develop (QIN 2008).

Some of the benefits from beaver activities in the upper river valley include increased riparian succession, increased water storage, reduced sedimentation, reduced water velocities, increased fish habitat (spawning and rearing), and waterfowl nesting and feeding areas. Beavers are active in Straughn Slough and have had a beneficial effect on fish habitat formation (QIN 2008). A large dam and pond store fine sediments, effectively regulate stream flow during both winter and summer periods, and provide a consistent water supply to salmon spawning and rearing areas. The benefits that beavers provide are expected to complement and speed habitat recovery efforts in the Upper Quinault River valley.

Today, beaver populations in the Lower Quinault River basin (below Lake Quinault) have started to make a comeback, much to the concern of forestland managers of the Quinault Indian Reservation as road/stream crossing are frequently compromised by beaver dam activity that establishes barriers at culverts and bridges (pers. correspondence with Stamon 2010). The suitable habitat currently existing within the floodplain of the Upper Quinault River basin is limited in extent. The potential extent of suitable beaver habitat in the Upper Quinault River ecosystem is substantial and advantageous to salmon restoration efforts.

3.4.2.2. Extirpation of Native Wolf Populations

In 1885, Lieutenant J.P. O'Neil led a military expedition of the Olympic Mountains. During this mission he and his team explored parts of the Dungeness River, Hurricane Ridge, and the Elwha River. They reported shooting a large wolf during that expedition (ONF 1989). Five years later, in 1890, Lieutenant O'Neil once again led an expedition up the Skokomish River and extended their journey to travel down the Quinault River to Lake Quinault (ONF 1989).

The gray wolf or grey wolf (*Canis lupus*), often known simply as the wolf, is the largest extant wild member of the Canidae family. Though once abundant over much of Eurasia, North Africa and North America, the gray wolf inhabits a reduced portion of its former range due to widespread destruction of its territory, human encroachment, and the resulting human-wolf encounters that sparked broad extirpation. Today, wolves are protected in some areas, hunted for sport in others, or may be subject to population control or extermination as threats to livestock, people, and pets.

The extermination of wolves within the Olympic Peninsula in the early 1900s set off a "trophic cascade" of environmental changes that appear to have affected forest vegetation and stream dynamics, with impacts on fisheries, birds, and insects (Ripple, Rooney and Beschta 2009). Members of the Press Expedition, hiking in 1890 through what is now Olympic National Park, found the banks of the Upper

Quinault River "so dense with underbrush as to be almost impenetrable," they wrote at the time. Logs jammed the rivers, dense tree canopies shaded and cooled the streams, and trout and salmon thrived along with hundreds of species of plants and animals (Wood 1989).

Hunting wolves in North America was practiced only as a population control method by indigenous tribes before the settlement of Euro-Americans. After the European colonization of the Americas, the first American wolf bounty was passed by the Massachusetts Bay Colony on November 9, 1630 (Lopez 1978).

It is estimated that by the 1870s, approximately 100,000 wolves were killed annually in America. Between 1916 and 1926 the National Park Service predator control program resulted in the extirpation of substantial packs of wolves in Yellowstone National Park (Weaver 1996). During the decades of the 1920s-30s American wolf hunts annually killed about 21,000 wolves (Mech and Boitani 2001). After World War II, wolves were seen less as varmints and more as big game trophy animals (Lopez 1978).

The Olympic Mountains impressed then-President Theodore Roosevelt to the point that he designated it as the Mount Olympus National Monument in 1909 – in large part to help protect elk herds that had been decimated by hunting. The Roosevelt elk now bears his name as a testimony to the area's designation that became the Olympic National Park.

With protection from hunters and extermination of wolves not long after that, elk populations in the Olympic Peninsula surged, and during the intervening decades the very nature of Olympic National Park changed dramatically (Ripple, Rooney and Beschta 2009). "Our study shows that there has been almost no recruitment of new cottonwood and bigleaf maple (*Acer macrophyllum*) trees since the wolves disappeared, and also likely impacts on streamside shrubs, which are very important for river stability," said Robert Beschta, co-author of the study and professor emeritus of forest hydrology at Oregon State University (Beschta 2008). Herbivore populations feed on deciduous vegetation, such as young maple, cottonwood, and alder, and on succulent annual growth of some conifer seedlings such as Douglas-fir and spruce. With their primary predator, the wolf, exterminated herbivores like elk and deer are able to access young and succulent vegetation within the river's valley. In some cases, the extent of the browsing has delayed revegetation for years, decades, or indefinitely. Vegetation dynamics play an important role in influencing the river's migration characteristics.

The study showed that river dynamics are quite different than they were historically. Streams that once were held together in tight channels by heavy bank vegetation are now wider and braided, with exposed gravel bars a common feature. The water is open to the warming sun and less enriched by plants and insects. Nearly half of the terraces along the Queets River have disappeared because of accelerated erosion over a period of multiple decades (Beschta 2008).

3.4.2.3. Threatened, Endangered, and Sensitive Species

Two wildlife species listed by the Fish and Wildlife Service under the Endangered Species Act are found within the areas of this project. Listed as threatened are the marbled murrelet, and northern spotted owl. Critical habitat for both species has been designated on the Olympic National Forest Lands (outside designated wilderness areas).

Additionally, the following federally listed threatened or endangered wildlife species may be found near the pourpoint of the Quinault River into the Pacific Ocean: brown pelicans (*Pelecanus occidentalis*), the short-tailed albatross (*Phoebastris albatrus*), and the western snowy plover (*Charadrius alexandrinus nivosus*). These bird species do not use the Upper Quinault River habitat directly.

Breeding bird distribution models for Washington State were created as part of the Washington State Gap Analysis Project (WAGAP). WAGAP is part of the national Gap Analysis Project, funded by the US Geological Survey-Biological Resources Division. Bird habitat models were based on a 1991 land cover classification with a minimum mapping unit of 100 hectares (247 acres). Information on species range limits and habitat associations was based on location data (mostly breeding bird records for 1987-1996), information about current distribution, literature review, and expert opinion (Smith, Mattocks and Cassidy 1997).

Models were created as part of a larger study (the Washington State Gap Analysis Project) to establish conservation priorities in Washington State. Conservation priorities were based on land cover and breeding terrestrial vertebrate distributions (Smith, Mattocks and Cassidy 1997). Habitat suitability has been used in this analysis and for mapping purposes.

A. Special Status Birds

Northern Spotted Owls (federally threatened; critical habitat). Northern spotted owls have large home ranges containing extensive old-growth forest areas to meet their habitat needs. There is extensive suitable habitat for spotted owls in the Olympic National Park and Olympic National Forest, primarily in lower elevations of major drainages (Figure 27). The Olympic Peninsula, containing the Park and the Forest, represent the largest contiguous block of suitable nesting habitat remaining within the listed range of northern spotted owl. One concern is the trend of lower elevation areas increasingly being used by barred owls (*Strix varia*) rather than spotted owls (ONP 2010).

NatureServe (NatureServe 2010) has compiled extensive data on Threatened, Endangered, and Sensitive species and those data are summarized here. Courtship behavior of the Northern Spotted Owl usually begins in February or March, and females typically lay eggs in late March or April. The timing of nesting and fledging varies with latitude and elevation. Breeding females lay 1-4 four eggs per clutch, with the average clutch size being two eggs; however, most pairs do not nest every year, nor are nesting pairs successful every year. Renesting (in different nest) after nest failure is infrequent. Incubation, by the female (fed by male), lasts about 30 days. Young leave the nest at about 5 weeks, fly at about 6 weeks. After they leave the nest in late May or June, juveniles depend on their parents until they are able to fly and hunt on their own. Parental care continues after fledging into September. During the first few weeks after the young leave the nest, the adults often roost with them during the day. By late summer, the adults are rarely found roosting with their young and usually only visit the juveniles to feed them at night. Spotted owls are sexually mature at 1 year of age, but rarely breed until they are 2 to 5 years of age (USFWS 2007).

On the Olympic Peninsula northern spotted owls primary prey on flying squirrels, woodrats, and snowshoe hares (Carey, Horton and Biswell 1992).

Suitable habitat has been defined within the Upper Quinault River basin, although not a significant amount has been identified within the floodplain (Figure 27) (Smith, Mattocks and Cassidy 1997). In a major range-wide analysis the US Forest Service (2005) concluded that presence of barred owls, weather, past and present harvest of habitat, and wildfire and insect infestations that alter habitat are all possible contributors to declines in northern spotted owl populations. It was determined that barred owls, West Nile virus (*Flavivirus* sp.), and management of owl habitat in high-fire-risk areas are topics for future management consideration.

Habitat continues to be lost or degraded by logging and/or forest fragmentation, but the rate of loss has slowed. A perhaps conservative estimate is that habitat has been reduced by about 60% since 1800; habitat loss (including that due to fragmentation) has been due primarily to logging with site conversion to non-forestry or high intensity forest management uses (Thomas, et al. 1990).

Marbled Murrelets (federally threatened; critical habitat). The marbled murrelet was listed under the Endangered Species Act as a **threatened species** in Washington on September 28, 1992 (USFWS 2011). It is a seabird that lives primarily in the near-shore marine environment but nests in old-growth forests up to 50 or more miles inland. Suitable nesting habitat for marbled murrelet consists of old-growth coniferous stands that are multilayered with moderate to high canopy closure. The marbled murrelet has highly specific nesting requirements generally associated with old growth. Potential habitat of this type occurs along the major drainages in lower elevations (Figure 28). Murrelets will occasionally nest in younger stands if remnant large trees or deformities provide large enough limbs (USFWS 2011).

Marbled murrelet occur within all the major drainages within the Washington coastline below about 900 meters (3,000 feet) in elevation. They are long-lived seabirds that spend most of their life in the marine environment, but use - forests for nesting. Courtship, foraging, loafing, molting, and preening occur in near-shore marine waters. Throughout their range, marbled murrelets are opportunistic feeders and utilize prey of diverse sizes and species. They feed primarily on fish and invertebrates in near-shore marine waters although they have also been detected on rivers and inland lakes (USFWS 2011).

For purposes of analysis, the marbled murrelet breeding season in Washington is broken into two periods: early breeding season is April 1 through August 5, and late breeding season is August 6 to September 15 (ONP 2010).

Marbled murrelets produce one egg per nest and usually only nest once a year, however re-nesting is documented. Nests are not built, but rather the egg is placed in a small depression or cup made in moss or other debris on the limb. Incubation lasts about 30 days, and chicks fledge after about 28 days after hatching. Both sexes incubate the egg in alternating 24-hour shifts. The chick is fed up to eight times daily, and is usually fed only one fish at a time. The young are semiprecocial, capable of walking but not leaving the nest. Fledglings fly directly from the nest to the ocean (USFWS 2011).

NatureServe (2010) has compiled extensive data on Threatened, Endangered, and Sensitive species and those data are summarized here. Management and protection needs include protection of critical old-growth nesting and feeding areas; increase response capability against oil spills; monitor gill net takes and regulate harvests to minimize murrelet mortality; prevent pollution of feeding areas; prevent displacement of murrelets from historic foraging areas by disturbance and development.

Most populations are dependent on large trees in old-growth forests for nest sites. Continued harvest of old-growth and mature coastal coniferous forest that reduces critical nesting habitat is a major concern throughout most of the range (Sealy 1984, Marshall 1988, Leschner 1992). Marbled murrelets have lost about 15 percent of their suitable nesting habitat in Southeast Alaska, and 33 to 49 percent in British Columbia, from industrial-scale logging within the past half century (Piatt, et al. 2007). Ralph (1994) estimated that 80 percent of the old-growth forests within the range of this species in the Pacific Northwest had been removed over the last 150 years.

Listed populations are currently experiencing very low recruitment rates, due at least in part to nest predation (by edge species, such as bald eagle, common raven, and Steller's jay, that are now more abundant due to forest fragmentation) and probably high mortality in young prior to reaching the ocean (USFWS 1994, 1996).

Finally, nesting habitat losses cannot explain the declines observed in areas where industrial logging has not occurred on a large scale (e.g., Prince William Sound) or at all (Glacier Bay) (Piatt, et al. 2007). Those declines probably are related to combined and cumulative effects from climate-related changes in the marine ecosystem and human activities (logging, gillnet bycatch, oil pollution) (Piatt, et al. 2007).

Suitable habitat has been defined within the Upper Quinault River basin, although not a significant amount has been identified within the floodplain (Figure 28) (Smith, Mattocks and Cassidy 1997).

B. Special Status Fish

Bull Trout (federally threatened; critical habitat): The US Fish and Wildlife Service has designated **threatened status** for all populations of bull trout. Critical habitat for bull trout was designated for the Coastal-Puget Sound population on the Olympic Peninsula and is included within the Quinault River system.

Bull trout are members of the family Salmonidae and are char native to Washington, Oregon, Idaho, Nevada, Montana and western Canada. Compared to other salmonids, bull trout have more specific habitat requirements that appear to influence their distribution and abundance. They need cold water to survive, so they are seldom found in waters where temperatures exceed 15 to 18 degrees Celsius (59 to 64 degrees Fahrenheit). They also require stable stream channels, clean spawning and rearing gravel, complex and diverse cover, and unblocked migratory corridors. Bull trout exhibit two forms: resident and migratory (USFWS 2011) and both forms exist within the Quinault River.

Resident bull trout spend their entire lives in the same stream. Migratory bull trout move to larger bodies of water to overwinter (such as Lake Quinault) and then migrate back to smaller waters to reproduce. An anadromous form of bull trout also exists in the Quinault River, which spawns in rivers and streams but rears young in the ocean. Resident and juvenile bull trout prey on invertebrates and small fish. Adult migratory bull trout primarily eat fish. Resident bull trout range up to 25 cm (10 in) long and migratory forms may range up to 89 cm (35 in) and up to 14.5 kg (32 lbs). Both anadromous and resident Bull trout are currently listed coterminously as a threatened species (USFWS 2011).

Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors. Maintaining bull trout habitat requires stream channel and flow stability (USFWS 2011).

The NMFS and USF&WS have conducted an analysis of the Upper Quinault River in relation to bull trout (NMFS & USF&WS 2008), and is summarized here.

> The Quinault River Core Area is comprised of two local populations: the North Fork Quinault River and upper mainstem Quinault River. These two local populations occur entirely within the Olympic National Park, and are well connected. Fluvial, adfluvial, anadromous and, possibly, resident life history forms of bull trout are present. Dolly Varden trout coexist with bull trout in the Upper Quinault River basin. Bull trout occur from the headwaters to the estuary and in numerous tributaries above Lake Quinault. Although bull trout spawning sites have not been located in the Quinault Core Area, the presence of multiple age classes of bull trout in both local populations indicates spawning and rearing does occur. No population estimates or redd counts are available for these two local populations. Snorkel surveys conducted in three miles of the Quinault River above Lake Quinault resulted in 77 bull trout observed in 2003 and 105 bull trout observed in 2004. Tributary habitats outside of Olympic National Park have been altered by logging and associated road construction. The Quinault River and tributaries below Lake Quinault are significantly impacted by logging and associated road construction. Critical habitat has been designated in Big Creek, Rustler Creek, Irely Creek, Quinault Lake, Quinault River, and North Fork Quinault River.

Dolly Varden (*Salvelinus malma*) (Listing Status: USFWS Proposed Similarity of Appearance (Threatened)): USFWS (2001) proposed that this species be listed as threatened in Washington due to similarity of appearance to coexisting bull trout (currently listed as threatened). Previously, bull trout was considered a subspecies of *S. alpinus* by some authors but recently has been treated as a distinct species. Recent genetic work indicates that *Salvelinus malma* may not warrant species status (NatureServe 2010).

Salvelinus confluentus (Bull Trout) was long confused with look-alike *Salvelinus malma* (Dolly Varden), especially where the ranges overlap on the Pacific slope (Lee, et al. 1980). Redenbach and Taylor (2002) identified two major Dolly Varden mtDNA clades. Clade N is distributed across much of the species' range from southern British Columbia to the Kuril Islands in Asia. Clade S extends from Washington to the middle of Vancouver Island. This suggests that Dolly Varden survived the Wisconsinan glaciation in a previously unsuspected refuge south of the ice sheet and that Dolly Varden and bull trout probably were in continuous contact over most of the last 100,000 years (NatureServe 2010).

Life history pattern varies with location and between anadromous and non-anadromous populations. In different areas spawns September-early November. Eggs hatch usually in spring, 4.5 months after spawning. Young emerge late April to mid-May after about 18 days in gravel. Sexually mature usually in 3-6 years, lives maximum of probably 10-12 years. Some adults do not breed annually. Can experience high post-spawning mortality (Stearley 1992).

The Washington State Habitat Conservation Plan (WDNR 2006) has identified forest management activities as potentially effecting this and other salmonid species in the state's Environmental Impact Statement.

C. *Special Status Plants*

Special Status Species listed in Washington State (9 species) are listed in Table 3. These plant species are not known to be found within the Quinault River drainage .

Table 3. Special Status Plants (USF&WS) in Washington State.

Status	Common Name	Latin Name
T	Spalding's Catchfly	*(Silene spaldingii)*
T	Nelson's Checker-mallow	*(Sidalcea nelsoniana)*
E	Wenatchee Mountains Checkermallow	*(Sidalcea oregana var. calva)*
E	Bradshaw's Desert-parsley	*(Lomatium bradshawii)*
T	water Howellia	*(Howellia aquatilis)*
T	Ute Ladies'-tresses	*(Spiranthes diluvialis)*
T	Kincaid's Lupine	*(Lupinus sulphureus (=oreganus) ssp. kincaidii (=var. kincaidii))*
T	golden Paintbrush	*(Castilleja levisecta)*
E	showy Stickseed	*(Hackelia venusta)*
S	Tetraphis moss	(*Tetraphis geniculata)*

The Washington Natural Heritage Program maintains a database of rare and imperiled species and plant communities for the state. The Element Occurrence (EO) records that form the core of the Natural Heritage database include information on the location, status, characteristics, numbers, condition, and distribution of elements of biological diversity using established Natural Heritage Methodology developed by NatureServe and The Nature Conservancy (TNC). An Element Occurrence (EO) is an area of land and/or water in which a species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historical) presence and/or regular recurrence at a given location. For species Elements, the EO often corresponds with the local population, but when appropriate may be a portion of a population or a group of nearby populations (e.g., metapopulation). For community Elements, the EO may represent a stand or patch of a natural community, or a cluster of stands or patches of a natural community. Because they are defined on the basis of biological information, EOs may cross jurisdictional boundaries. An Element Occurrence record is a data management tool that has both spatial and tabular components including a mappable feature and its supporting database. EOs are typically represented by bounded, mapped areas of land and/or water or, at small scales, the centroid point of this area. EO records are most commonly created for current or historically known occurrences of natural communities or native species of conservation interest. They may also be created, in some cases, for extirpated occurrences (WSNHP 2010).

One Washington State special status plant is documented to occur in the Upper Quinault River drainage, and within the proposed project area: Tetraphis moss (*Tetraphis geniculata*). Tetraphis moss forms small green to reddish-brown tufts that become slightly contorted when dry (WSNHP 2010).

Management recommendations for this species include maintaining moist microsite characteristics at the site, including high moisture levels, cool temperatures and shade. Provide appropriate canopy structure to maintain microclimate of known sites. Specifically, maintain greater than 70 percent closed-canopy forest habitats to provide shade (USFS, BLM 2001). Further, provide for input and maintenance of a continuous supply of large woody debris in various decay classes and diameters over time and avoid disturbance of coarse woody debris substrate. Avoid direct and indirect impacts to the population associated with recreation-related activities (USFS, BLM 2001).

Threats and Management Concerns: Tetraphis moss is considered a Survey and Manage Category A species under the Northwest Forest Plan (USFS, BLM 2001). This classification carries the need to manage known sites and survey prior to habitat disturbing activities on USDA Forest Service and USDI Bureau of Land Management land. The removal and disturbance of large coarse woody debris could eliminate suitable habitat for this species. Although it is not a “target” special forest products species, collection of moss from rotten logs could lead to the incidental removal of this species (WSNHP 2010).

Figure 27. Northern Spotted Owl Habitat Suitability (Smith, Mattocks and Cassidy 1997).

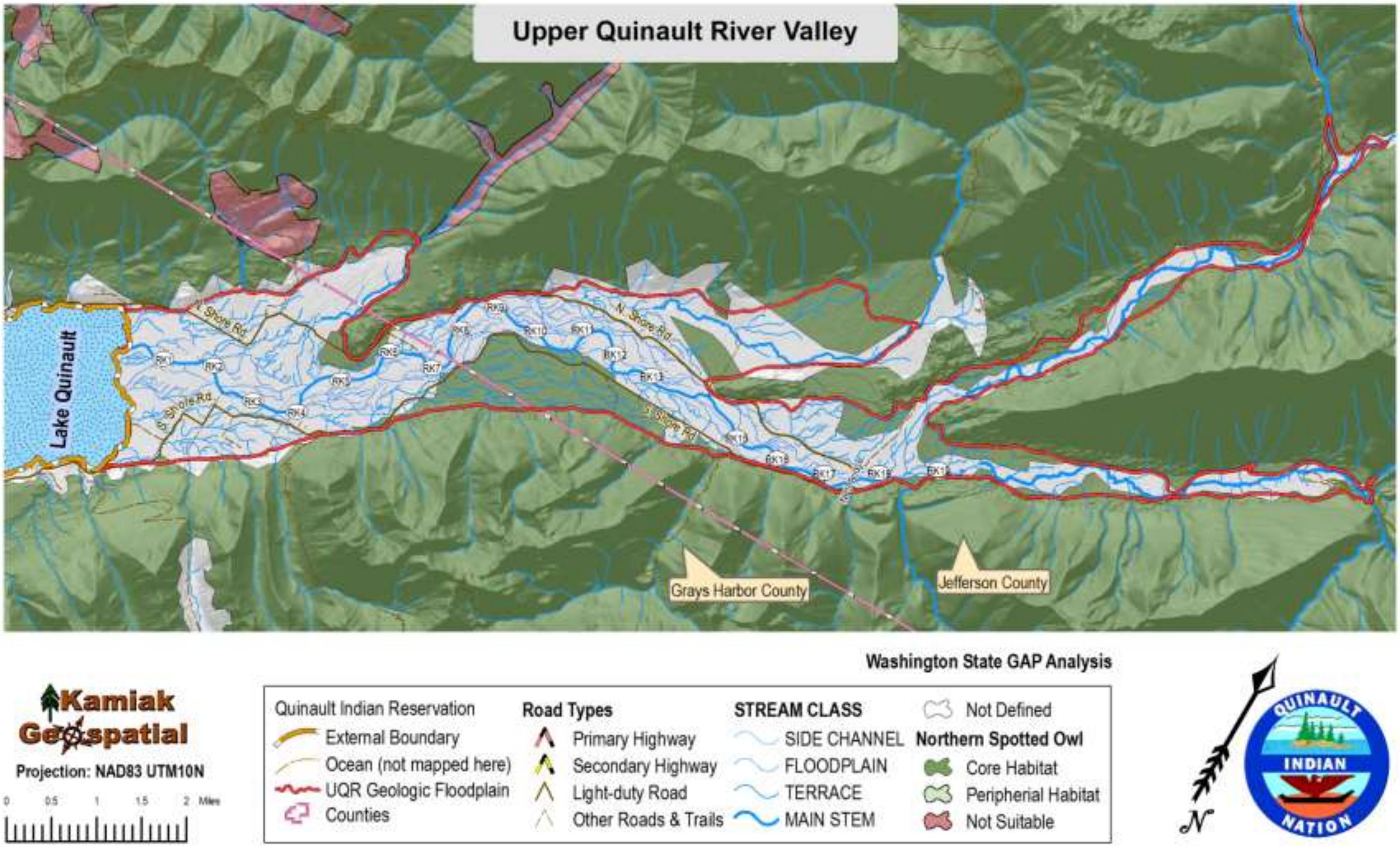
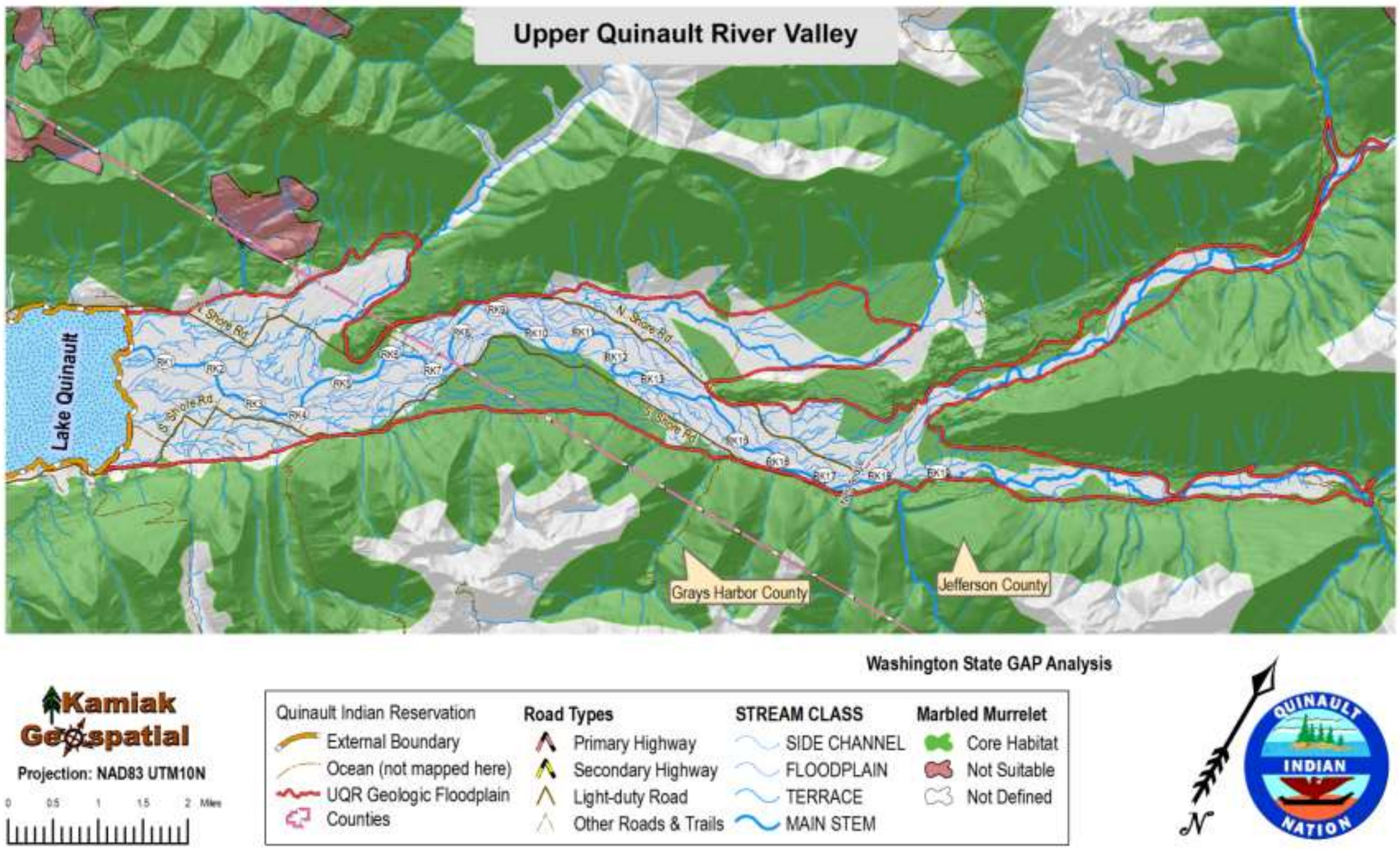


Figure 28. Marbled Murrelet Habitat Suitability (Smith, Mattocks and Cassidy 1997).



3.5. Cultural Resources

The Quinault Nation Cultural Affairs Office has articulated the Quinault Nation's Policy concerning ancestral areas and their belongings that remain. That document is an attempt to put in writing a longstanding verbal policy of the Quinault Indian Nation concerning ancestors' living places and their belongings that still remain (Chubby 2010).

Concisely stated, it directs:

1) It is based in the spiritual views of our elders as passed down.
2) Our Ancestors base it on their concerns for ownership of those belongings.
3) It is based in our respect for our Ancestors, their resting places and the sacredness of such places, our respect for the ownership of their personnel belongings.
4) When the belongings or remains of our ancestors are threatened by natural or made elements we will make effort to secure their remains or the belongings and remove them to a safe place.
5) Time dims the memories of our past and it may be necessary for future generations of Quinaults to rediscover their heritage from the belongings of our elders. It is for this reason and the others stated above that we are diligently protecting them and all that belongs to them. They can still teach us!

Our policy is simple and it has been honored for seven generations since the treaty with the Whiteman.

(Revised May 2003)

3.5.1. Historic and Traditional Cultural Properties

The National Historic Preservation Act (NHPA) as amended in 1992 allowed for the designation of property type known as the Traditional Cultural Property (TCP). The amendments established that properties affiliated with traditional religious and cultural importance to a distinct cultural group, such as a Native American tribe or Native Hawaiian groups were eligible for the National Register. It established a definition of "properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization" (Section 101(d)(6)). TCPs include built or natural locations, areas, or features considered sacred or culturally significant by a group or people (Ferguson 1996).

A cultural property within the context of the Quinault Indian Nation and the Upper Quinault River includes objects of artistic, archaeological, ethnological or historical interest. It includes components of a common human culture, whatever their places of origin or present location, independent of property rights or national jurisdiction. For the Quinault Indian Nation's people, the Blueback salmon is as much a cultural resource (property) as could be mountains, lakes, graves, or ceremonial sites.

Vine Deloria, Jr., was born of the Standing Rock Sioux (South Dakota). Vine Deloria, Jr.'s notion of seven generations, as explained to him by a Dakota elder, signifies that at all times and in every place each of us is a unique expression of the seventh generation of our families and, more broadly our people (Wildcat 2009).

> "In our lives each of us constitutes the seventh generation in the sense that our actions ought to represent what we learned from the three previous generations: parents, grandparents, great-grandparents, and simultaneously we must be mindful of how our present actions will influence the lives of the three future generations: our children, grandchildren, and great-grandchildren.
>
> "Each of us, in our respective places in the space-time of the universe we inhabit, constitute the seventh generation at the center of the three generations that came before us and the three generations that will come after us. As the seventh generation, we are the existential center of life processes that embody nonlinear relationships and complex processes… (citation of Vine Deloria, Jr. in Wildcat (Red Alert!—Saving the Planet with Indigenous Knowledge 2009))

Cultural heritage for the Quinault Indian Nation is the legacy of physical artifacts and intangible attributes of the Quinault people that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations. Often though, what is considered cultural heritage by one generation may be rejected by the next generation, only to be revived by a succeeding generation. It is not the intention of the Quinault Indian Nation to create a publically viewable database of culturally sensitive, or culturally significant places within or adjacent to the Quinault Indian Reservation. Quite often the religious and spiritual practices of a tribe are maintained through the activities of specialists who hold, sustain, and preserve extensive and specialized information about the tribe's religious practices and beliefs. Documentation of such cultural domains requires the release of confidential and culturally sensitive information to outsiders, and also might mean that the information is subject to the Freedom of Information Act. While there are certain protections available to the National Register, this topic continues to be a concern to tribal groups generally, and to the Quinault Indian Nation specifically (p. c. James 2011).

It is not the objective of the Quinault Indian Nation to educate construction personnel of the cultural resources of the Quinault Indian Nation and their known locations. It is the intent that personnel living and working with the Quinault Indian Nation and adjacent to the Quinault Indian Reservation sustain the objectives defined within this river restoration plan to be sensitive to culturally significant locations when encountered, while placing emphasis on the protection of people and restoration of salmon habitat. When there is opportunity to preserve culturally identified locations while also protecting those current goals, it will be carried out to the extent it can be realistically accomplished. The cultural resources staff of the Quinault Indian Nation will review work and activity proposals, especially if there is ground disturbance or excavating to ensure that they will not disturb known sites, and they will provide an overview to construction workers to recognize and appropriately respond to culturally sensitive physical artifacts and intangible attributes (p. c. James 2011).

Physical or "tangible cultural heritage" includes buildings and historic places, monuments, artifacts, and like features, that are considered worthy of preservation for the future (Lowenthal 1985). The Quinault Indian Nation has determined that a hierarchy of potential assets is not within the scope of current generations to decide. The Quinault Indian Nation desires to maintain what is possible for the current and future generations to discover and use in the definition of life. This tangible cultural heritage includes objects significant to the religion, life, archaeology, architecture, science or technology. This heritage can also include cultural landscapes (natural features that may have cultural attributes). Recently, heritage practitioners from around the globe have moved away from classifying heritage as "natural", as man has intervened in the shaping of nature, it is meaningless to create artificial definitions (Lowenthal 1985).

Cultural resources include artifacts, land use practices, traditions, language and more. Impacts to these that involve federal triggers (e.g. federal grant or agency money, permits, lands, etc.) require Tribal involvement per Section 106 of the National Historic Preservation Act, 36 CFR 800, http://www.achp.gov/nhpa.html. For other projects, it is prudent to involve the tribes and/or cultural resource program early in the process to avoid potential costly delays in implementation. Removing or disturbing cultural resources prior to planning or designing or implementing or funding a project in order to circumvent cultural resource law is illegal (Chubby 2010).

For projects with design and/or planning stages:

- Contact Tribal Historic Liaison early in the process. Ground disturbance, changes to structures, and even priorities planning can have cultural resources impacts.
- Information helpful to the cultural resource assessment:
  - maps, design plans, proposed areas for materials staging, depth of ground disturbance, planned changes to structures (e.g. weatherization, fire proofing, etc), proposed work schedule, reference any federal money, permit, license, or land that may possibly be involved, contact person for the project.
- If there is federal money, permit, license, etc., involved with the project, the lead federal agency will do the consultation or delegate it to the Tribe.
- Include inadvertent discoveries plans in the project plans and contracts.

For projects with no design or planning stage (e.g. emergency response):

- Contact Tribal Historic Liaison or designee as soon as possible.
- Cultural resources do not take precedence over immediate threats to life.
- Involve Tribal Historic Liaison or designee in clean up or other post-crisis planning.

For Inadvertent Discoveries of Cultural Resources:

- Contact Tribal Historic Liaison or designee immediately.
- Do not move, photograph, or discuss the items with anyone other than cultural resource staff.

- Stop work in immediate area, generally considered to be a 100 foot radius, and remove staff/contractors from that area.
- Tribal Historic Liaison or designee will come as soon as possible. Usually within the hour.

For Inadvertent Discoveries of Possible Human Remains:

- Contact Tribal Historic Liaison or designee immediately.
- Remember that this could be a crime scene. If it obviously is, contact Tribal law enforcement.
- Absolutely no photography (no cell phone photos, no cameras, etc).
- Cover the suspected remains with soil, plain cloth, or similar.
- Stop work and remove staff/contractors in a 100 foot radius around the remains.
- Inform those present about the confidential nature of the issue.
- Provide security by having a senior staff/contractor stay with the remains, at the edge of the 100 foot radius until Tribal Historic Liaison or cultural resource staff arrive.

Generally speaking, construction, land excavation, floods, river meandering, and landslides can exert the greatest potential impact on site-based sacred sites where the site is partially defined through the physical presence of past activities such as burial sites, sites with signs of past habitation, or those sites that bear witness to pictographs or other markings. While the event causing damage may destroy or alter the characteristics of the site, the importance of the site is not diminished.

Vandalism, theft, and artificial concealment of a site's physical attributes of cultural significance or sacred nature cannot be tolerated. This form of destruction breaks the natural cycle of earthly changes and leaves scars to the cultural tapestry of the Quinault Indian Nation's people.

The cultural and traditional importance of the Upper Quinault River area to the Quinault Indian Nation cannot be overstated. Various areas of the Upper Quinault River basin hold traditional values for various members of the Nation, mainly from the standpoint of biological and natural resource collection and utilization (for food, medicine, and other purposes), and long-term occupation and use of certain locations. It is widely acknowledged that the Upper Quinault River has been used for traditional practices for generations and is still held in high regard by the Nation. On the basis of documented past and present use of the Upper Quinault River by members of the Nation, lands in the vicinity of and encompassing the Upper Quinault River would appear to meet the criteria for a Traditional Cultural Property. The traditional, spiritual and religious pursuits within the region of the Upper Quinault watershed have been recognized as unique to the Quinault Indian Nation's people and heritage (p. c. James 2011).

3.5.2. Sacred Sites

Federal responsibility for Indian sacred sites is defined in Executive Order (EO) 13007. Indian sacred sites are defined as "any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian Tribe, or an Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion...". Under EO 13007, Federal land managing agencies must accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and avoid adversely affecting the physical integrity of such sacred sites.

Although the entire Upper Quinault River is considered within the definition of a Traditional Cultural Property, there are no published lists of sacred sites within this watershed. However, its cultural importance transcends the physical presence of this area and touches onto the realm of a revered location. Cleansing in streams, rivers, and lakes is paramount to religious and spirituality obtainment. Quinault Indian Nation members would follow these waterways to obtain their "powers" and it was dependent upon the type of power, the strength/intensity of power that determined how far up the waterway they went. Some would just go a few miles, some would go to a particular feature such as prairie, specific feature in a stream, river or lake. It is known that the mountainous regions were regularly visited by Quinault power seekers (p. c. James 2011).

Because the placement of ELJs within the geologic floodplain will work within the zone of natural geologic avulsion and erosion, it is not anticipated that work crews would unearth human skeletal remains or expose other sacred sites or materials. In addition, ELJ placement essentially leaves the area above the banks free of physical and visual disturbances, therefore, the character, feeling, and association of any sacred sites would be retained. Accessing the river channel could be considered a visual intrusion, therefore, the "sacredness" and importance of the general area as a religious or sacred area could be diminished.

Because disturbance at each ELJ placement would occur only at the work areas, burials or other sacred places within the geologic floodplain would not be affected because of site activities. ELJ construction as proposed in the Preferred Alternative, would cause minimal soil disturbance due to ground vibration and it lessens the possibility that human skeletal remains or other sacred sites or materials would become exposed.

3.5.3. Archeological Resources

Archeological resources are the remains of past human activity and records documenting the scientific analysis of these remains. Archeological resources are often buried but may extend aboveground. Prehistoric archeological resources refers to archeological resources associated with Native Americans, particularly before contact with European Americans. Prehistoric archeological resources also means cultural resources that predate the beginning of written records and includes isolated artifacts, petroglyphs, pictographs, and shell middens. Prehistoric archeological resources may be terrestrial or submerged (ONP 2010).

3.5.4. National Register of Historic Places

The National Register of Historic Places database, maintained by the National Park Service, has documented two sites within the area of the Upper Quinault River as bearing the designation of a National Historic Place (NPS 2011) (Table 4).

The first site listed is the Lake Quinault Lodge located on the southern shorelines of Lake Quinault. The Lake Quinault Lodge was built in 1926 in Olympic National Forest. The hotel was designed by Robert Reamer, a Seattle architect, in a rustic style reminiscent of Reamer's work at the Old Faithful Inn in Yellowstone National Park. It is a notable example of a rustic wilderness lodging, suited to its woodland environment on the southern side of the Olympic Mountains. It was added to the National Register on July 9, 1998.

The second feature on the National Register of Historic Places in this area is the Ole Mickelson Cabin. The cabin is located at Lot 46, along the south shore of Lake Quinault, between Willaby Cr. and Falls Cr., at Quinault.

Table 4. National Register of Historic Places within and near the Upper Quinault River basin.

Ref. num	Name	Address	Place Name	County	State	Cert. date
98000846	Lake Quinault Lodge	South Shore Rd.	Lake Quinault	Grays Harbor	WA	July 9, 1998
92001291	Mickelson, Ole, Cabin	Lot 46, S shore Lake Quinault, between Willaby Cr. and Falls Cr.	Quinault	Grays Harbor	WA	May 6, 1993

Neither of the listed historic places are within an area that would be potentially impacted (directly or indirectly) by the activities associated with the activities of this proposed action.

3.6. Socioeconomic Conditions

3.6.1. Anthropogenic Changes to the Environment

The earliest known people to inhibit the Olympic Peninsula were the native peoples of several tribes, including the Quinault Indian Nation. These people lived in this region since time immemorial and hunted, fished, collected forest found foods, and established communities and territories throughout the region. Trade and commerce between the Quinault People and other tribes was common.

By about 3,000 years ago, as the human population of the Northwest coastlines increased, early inhabitants shifted their focus to lowland rivers and lakes. Almost all coastal Tribes of Washington lived along the rivers, which is easily explained by dependence of lifestyles on plentiful salmon runs. The brilliant and vigorous cultures of the Northwest coast have always revolved around fish, and technologies and social organization designed for this purpose by thousands of people over thousands of years (Storm, et al. 1990)(Storm, et al. 1990)(Storm, et al. 1990).

Lewis & Clark Expedition (1804-06) followed by the opening of the Oregon Trail (1841), opened this region to new European settlers from the east who sought property to settle in and start farming. In the 1820s, Euro-American trappers, traders and settlers began to homestead the Quinault River Basin and other Olympic Peninsula Tribal homelands. Industry followed homesteading as Euro-Americans began to tap into the area's natural resources. Fishing and lumber communities mushroomed and dotted the region (USH 2010, Stumpff 2007).

Grays Harbor was explored by David Douglas in 1825. Euro-American settlements were established about this time. A sawmill was established along the Chehalis River to cut timber, mill it, and export it to San Francisco via the port at Grays Harbor (ONF 1989). Other lumber mills were established in Grays Harbor to take advantage of the sea port export potential.

After the US Congress established the Washington Territory on March 2, 1853, Territorial Governor and Indian Agent, Isaac I. Stevens began acquiring title to lands held by native peoples to make it “available to white settlers” (Neumann, Thomsen and Schuttler 1997). To accommodate land-hungry Euro-American settlers, Territorial Governor Isaac Stevens drew up a treaty for the Indians to sign, which said Indian Tribes would relinquish almost all the coastal area. At the first meeting with the coastal Tribes that occurred at the Chehalis River from February 20 to March 2, 1855, Stevens said that they would all be moved to a reservation intended to be the Quinault Reservation of a smaller size than it is today. Stevens and his advisors had decreed this forest covered land was “unsuitable for white farmers, therefore highly suitable for a common reserve”. However, most Tribes did not want to retreat to the land of the Quinaults as they traditionally shared enmity with the Quinault Tribe’s large and rich reputation. Indian leaders balked at these terms and the 1855 treaty was never signed by either side (Storm, et al. 1990)(Storm, et al. 1990)(Storm, et al. 1990).

One year later, a new treaty was drafted that the Quinault Indians did sign on July 1, 1855, at the mouth of the Quinault River and on January 25, 1856, by Territorial Governor Stevens in Olympia (Treaty of Olympia 1856). A 10,000-acre reservation around the village of current day Taholah resulted from the Treaty. In exchange, the Quileute, Queets, Hoh, and Quinault Tribes ceded lands north of Grays Harbor, all the way to the homeland of the Makah Tribe. The Quinaults, Queets, Quileutes and Hohs agreed to cede their aboriginal lands in exchange for a reserved homeland, and for the right to fish in their usual and accustomed locations and to hunt and gather (Neumann, Thomsen and Schuttler 1997).

An Office of Indian Affairs (OIA), Indian Agent Report in 1860 documented (L. Workman 1997 - 2010):

> Indian Agent recommends “land between Point Granville (Grenville) and Qui-nai-elt river” be set aside as their reservation. He encourages Indians to begin trade with their salmon saying that the “salmon that run up the Qui-nai-elt river, in great numbers, are considered the fattest and best flavored of any taken on the coast” (his use of Granville instead of Grenville was applied to the village at the mouth of the Quinault River which would be renamed Taholah.)

The treaty commission's intent was to concentrate numerous coastal Tribes onto this reservation. To accommodate that many additional Indians, the reservation was expanded to nearly 189,621 acres (first expansion of the Quinault Reservation) by an order of President Ulysses S. Grant on November 4, 1873 (USH 2010). In 1988, the “North Boundary” area of about 12,000 acres was returned to the Quinault Indian Nation – Public Law 100-638.

The Homestead Act, enacted during the Civil War in 1862, provided that any adult citizen, or intended citizen, who had never borne arms against the U.S. government could claim 160 acres of surveyed government land (one-quarter of a section). Claimants were required to "improve" the plot by building a dwelling and cultivating the land. After 5 years on the land, the original filer was entitled to the property, free and clear, except for a small registration fee. Title could also be acquired after only a 6-month residency and trivial improvements, provided the claimant paid the government $1.25 per acre. After the Civil War, Union soldiers could deduct the time they had served from the residency requirements (National Archives and Records Administration 1998).

Anyone who had never taken up arms against the U.S. government, including freed slaves, could file an application to claim a federal land grant. The occupant also had to be 21 or older, had to live on the land for five years and show evidence of having made improvements. The original Homestead Act was signed into law by President Abraham Lincoln on May 20, 1862.

Because much of the prime low-lying alluvial land along rivers had been homesteaded by the turn of the twentieth century, a major update called the Enlarged Homestead Act was passed in 1909. It targeted land suitable for dryland farming, increasing the number of acres to 320. In 1916, the Stock-Raising Homestead Act targeted settlers seeking 640 acres of public land for ranching purposes (National Archives and Records Administration 1998).

Only about 40 percent of the applicants who started the process were able to complete it and obtain title to their homestead land. Nationwide, approximately 1.6 million homesteads were granted and 270 million acres (420,000 sq mi) of federal land were privatized between 1862 and 1934; a total of 10% of all lands in the United States. Homesteading was discontinued in 1976, except in Alaska, where it continued until 1986 (Johnson 1979).

Within Grays Harbor and Jefferson County, homesteading became a widespread practice beginning in 1862 and continuing through the first half of the 20th century. Parcels were homesteaded within the major river drainages such as the Quinault and Queets Rivers (Brown 1990), and within Grays Harbor reaching all lands where settlement could take place, or where timber harvesting proved to be profitable (Storm, et al. 1990)

Once homesteaded, large expanses of these lands were cleared of old growth timber from highlands to the shores of rivers. Timber syndicates worked the system to acquire title to lands and harvest rights within the region (Brown 1990). Railroads were built throughout the territory to move round log harvests from the forests to mills. Timber mills established at Aberdeen and Hoquiam converted the round logs to lumber where they were then shipped via steam ship to ports such as San Francisco and other points outside the region (Brown 1990, ONF 1989).

As a result of the General Allotment Act (GAA) of February 8, 1887, whose spirit was to encourage an agrarian life among Indians, allotments of land to individual Indians were made across the nation, beginning in 1905 (Pevar 2002), and on the Quinault Indian Reservation in about 1907 (Ullman, Lane and

Smith 1977). The first Allotment lands on the Quinault Indian Reservation were located along the Quinault River. By about 1912, all land within the Reservation considered “suitable for agriculture or grazing” had been allotted and the Allotment process was stopped. Efforts by a Quileute Indian seeking his allotment on the Quinault Indian Reservation took the matter to the Supreme Court (Ullman, Lane and Smith 1977) (Payne vs. US) where claims were substantiated and the allotment process on timbered lands on the Quinault Indian Reservation was again started. Through the process of the GAA, individual recipients of allotment land were given title/deed to the land after a 25 year Trust period. Those individual recipients of allotment land were allowed to sell those lands to other Indians or non-Indians (Pevar 2002).

It was during the Termination period in the 1950’s that much of the land on the Quinault Indian Reservation went out of Indian ownership. It was possible to change Trust land to fee land at this time and timber companies advised Indian owners (particularly in the ‘Queets Unit’) to do this. Much of the land was purchased by timber companies at tax delinquent sales.

The Upper Quinault River valley was rapidly settled between 1900 and 1920, with the river beginning its response to human disturbances by the time of the earliest (1939) aerial photographs (BOR 2005). Human disturbances that have most directly changed river processes include clearing of riparian vegetation in, and adjacent to, the historic channel migration zone, and, to a lesser degree, maintenance of infrastructure (roads, bridges, levees) along the river corridor. For most of the first half of the twentieth century, documentation of human disturbances is limited to anecdotal information and observations on aerial photographs. During the second half of the century, a number of environmental policies were put in place (beginning with the National Environmental Policy Act of 1969) that required permits and analysis before major structures such as roads, bridges, or levees could be installed (BOR 2005).

Within the homesteaded areas and some of the Olympic National Forest lands within the Upper Quinault River basin, over 90% of the historic river channel was cleared of old growth forests by 1975 with only remnant and scattered enclaves remaining as hard points for the river to form (Storm, et al. 1990). The area was characterized historically as heavily forested with a narrow river channel and a complex network of side and terrace tributary channels that paralleled the river (BOR 2005). This historic side channel habitat network was bound by a mixture of successional and mature riparian forest vegetation that stabilized floodplain islands and terraces and provided the spawning and rearing habitat complexity that produced exceptional runs of salmon and steelhead (QIN 2008).

Above the forks in the Quinault River, where the Olympic National Park was formed (1938), the historic stands of old growth timber still stand from the river valley to the headwaters providing a core of protection to the Quinault River ecosystem.

3.6.1.1. Large Tree Removal

The forests of the Olympic Peninsula supported a variety of tree species that faced significant timber harvesting pressures at the end of the 19th century and after the turn of the 20th century. Clearing the land for farming was the first "logging" completed in the area of the Upper Quinault River as homesteads were established. The First World War witnessed railroads crossing the region and the rush for the lush old growth timber was initiated. The war effort brought a high demand for Sitka spruce old growth timber. The timber was used in the construction of airplanes during and after the war effort (Storm, et al. 1990). The frenzy to collect the logs exceeded the ability to transport the product out of the woods, and in January 1933 cut logs were allowed to rot as a result.

Most of the forest products shipped out of Grays Harbor from the late nineteenth century until the mid to late twentieth century were lumber, shakes, and other processed products. This slowly changed to the export of raw logs, combined with milled products primarily targeted for domestic consumption. By the 1970s the round log export out of Grays Harbor ports was destined mainly for Japanese buyers and it was exported mostly as round logs. By 1978, the export of round logs accounted for nearly one-third of the regional industry's business, within Grays Harbor, the leading sea port in the state, the sales of these round logs to the Orient accounted for 90% of timber shipments (Brown 1990).

Within the Upper Quinault River, the arrival of logging railroads heightened the harvest of timber from the region. Initial sales were large blocks of timber or land, and large timber blocks were offered for the economic viability of logging by railroad. These initial logging activities removed all merchantable trees within the cutting block with no provision for future land uses. These lands often retained non-merchantable trees as well as large amounts of logging waste. The waste products included many logs that were deemed unsuitable resulting in major fire danger across the landscape.

Extensive contentions were made that only "large clearcuts" were economical for loggers to recapture the expenses of road building and logging site setup. When these large clearcuts were implemented, the timber was removed from riparian areas and hillsides alike. Logging slash was left on site during the early years. Sometimes the slash depth was so extreme that wildlife could not access the ground in some places (Storm, et al. 1990), and when fires ignited, the result was a massive inferno that carried with it hydrophobic soil results that still linger now, more than a century later. Even as more modern forest management methods began to predominate, large clearcuts were the most economical and were the easiest to regenerate timber for future forest management, thus, these large harvest units continued until fairly recently. Slash removal and forest regeneration have been the standard for the last forty or fifty years with smaller harvest units with riparian protection beginning only about twenty years ago (Storm, et al. 1990, Fetherston 2005, Neumann, Thomsen and Schuttler 1997).

3.6.1.2. Roads

Logging railroad construction began in the late 19th century as did the initial homesteading in the Quinault River valley. Road construction began early in the 20th century, with the road network to Grays Harbor cities completed in the 1920s and 1930s. Road building for logging and other activities continued through the 1930s accelerating dramatically during WW II and into the 1970s. Prior to the logging and homesteading of the region, the Quinault people used a network of trails and rivers to cross through the Olympic Mountains and canoes along the coastline when participating in exploration, hunting, fishing, or commerce with other tribes.

The area of the watershed above Lake Quinault to the headwaters of the basin encompasses approximately 68,700 Ha (169,762 acres) of surface area. Within this basin, approximately 224 km (139 miles) of roadway (US Census 2010) provide access to properties, homes, forestlands, and recreational destination points (within the Olympic National Park). When considering only those roads within the basin of Lake Quinault, upstream to the confluence of the two forks, there are approximately 116 km (72 miles) of improved roads.

The South Shore Road and the North Shore Road connect the respective cardinal sides of Lake Quinault west of the lake from US101 and then meander along, adjacent to, and within the historic channel migration zones of the Upper Quinault River. The two roads join again at the Olympic National Park Bridge (RK 18, mile 11.2). Emergency recovery of these two roads is conducted when high water events in the river valley cause erosion and complete washout of road segments where the road fill are as are sites of active river scouring. Common revetment materials have included riprap.

The Quinault North Shore Road extends eastward from US101 around the north side of Lake Quinault and the Quinault River valley (Figure 16). The road provides access to three primary Olympic National Park areas (ONP 2010).

The first area encompasses Big Cedar trail and the July Creek picnic area close to the lake, and the Quinault River ranger station, which is just east of the lake and open in the summer months. Trails in this area include Maple Glade and Kestner Homestead. The two-lane road in this section is paved in Grays Harbor County to the Jefferson County line (a distance of 7.8 miles). North Shore Road continues as an unpaved road for another 5.2 miles where it continues for 1 mile as a paved road, and connects with South Shore Road at the Quinault River Bridge (A.K.A. “NPS Bridge”). The South Shore Road also extends from US101 but follows the south side of Lake Quinault, which traverses Olympic National Forest, Quinault Indian Reservation, state, and private lands (Figure 16). Like the North Shore Road, the South Shore Road is paved as far as the Jefferson County-Grays Harbor County line (ONP 2010).

The second area encompasses the junction point at the Quinault River Bridge, where Graves Creek Road extends for 6 miles along the East Fork of the river to a seasonal ranger station and campground, and the East Fork Quinault and Graves Creek trailheads. Access points to trails from this location lead to the Enchanted Valley and on to Staircase and Dosewallips. Graves Creek Road is a two-lane unpaved road and is unsuitable for trailers and RVs (ONP 2010).

The third area encompasses the North Fork area, which is accessed by a two lane unpaved North Fork Road that runs 4 miles from just north of the junction of North Shore and South Shore roads, along the North Fork of Quinault River. The North Fork area includes a seasonal ranger station, a campground, the

Irely Lake trail, and the North Fork trailhead. The North Fork trail is the cross-park trail from Quinault to the Elwha area (ONP 2010).

Within the Upper Quinault River project are, cabled logs were observed along the 2002 historic channel migration zone during the Bureau of Reclamation (2005) investigation. They reported that along the South Shore Road, repeated erosion has occurred between river kilometer 2.5 to 3.0. Some cabled logs were still intact on portions of the present bank, but much of the bank is still actively eroding when the river runs against it. They reported that the practice of cabling logs to the banks as a means of bank protection may, in some cases, have accelerated bank erosion processes. A few landowners have begun to plant trees in the last decade that, if not eroded by the river and allowed to mature, may provide some line of defense to help slow river migration.

3.6.1.3. Bridge and Levee Impacts

The north side of the Historic Channel Migration Zone (HCMZ) of the Upper Quinault River boundary is terrace and has had some measurable expansion, but since 1973 the channel has remained mostly on the south side of the active channel (BOR 2005). This resulted from a constriction (beyond natural influences) imposed by the National Park Service Bridge (RK 18, Mile 11.2) and a levee constructed downstream of the bridge between 1952 and 1958 (QIN 2008). This narrowing of the channel and floodplain area has increased sediment transport capacity and resulted in incision at the constriction, but has also likely resulted in sediment deposition and aggradation upstream (as a result of backwatering during freshets) and downstream of the site (as a result of decreased energy)..

Evidence of incision was found in the Bureau of Reclamation (2005) report analysis by:

1) the comparison of the 1929 to 2002 profile showing the main channel lower today than in 1929;
2) cross-section comparisons showing the present main channel about 1 m lower than adjacent side channels (which is not typical in braided, aggrading channels);
3) unit stream power computations that show a higher transport capacity in this section than all other areas of the study reach; and
4) river substrate analysis indicate the coarsest-size particles are present in this section.

The embankment for the bridge (located just downstream of the confluence of the two forks) constructed in the 1950s also constricts the natural active floodplain width on the north side of the river, thereby cutting off an old channel path. The channel appears to have incised due to the high transport capacity below the bridge (BOR 2005).

The bridge crossing the Upper Quinault River within the Olympic National Park caused a major constriction of the river and has significantly altered river morphology, fluvial processes, and habitats (QIN 2008). Bridge removal or improvements, particularly increasing the bridge length and conveyance capacity, would significantly enhance conditions within the Upper Quinault River and relieve pressure on the South Shore Road, which has experienced chronic erosion problems. A long-term strategy would be to restore the historic meandering channel processes by establishing a late-successional stage coniferous forest along the north side of the historic channel migration zone. This could be done prior to the levee removal to allow time for the forest to mature. The forest would also provide recruitment sources of large woody debris over several decades timeframe once the channel is allowed to reoccupy the north side of the historic channel migration zone (BOR 2005).

3.6.2. Employment, Income, and Demographics

According to the US Census Bureau, the Census tract for Lake Quinault CCD, Grays Harbor County, Washington, includes approximately 174 families living in the community. Of these households, approximately 12 are American Indian or Alaska Native households, and the remaining 162 reporte d to be white households. Approximately 87 of these households received support from Social Security (50%), and 55 (31%) were of the age of 65 years old, or older. The median household has only 2 people (119 homes), 60 households have 3 or 4 people, and only 4 households have 5 or 6 people (Table 5) (Census 2011).

The US Census estimates that the poverty status for families in the Lake Quinault community is 29.3%. Approximately 2.6% of the households report working in the home.

Table 5. Employment and Income, 2009 Census Projections.

Subject	Total	Male	Female	Median earnings (dollars)	Median earnings (dollars) for male	Median earnings (dollars) for female
Civilian employed population 16 years and over	**232**	**62.5%**	**37.5%**	**21,250**	**26,563**	**15,938**
Private for-profit wage and salary workers:	130	73.1%	26.9%	19,554	21,563	17,917
Employee of private company workers	128	72.7%	27.3%	19,464	20,938	17,917
Self-employed in own incorporated business workers	2	100.0%	0.0%	-	-	-
Private not-for-profit wage and salary workers	16	0.0%	100.0%	4,038	-	4,038
Local government workers	20	20.0%	80.0%	29,643	-	28,929
State government workers	7	100.0%	0.0%	102,813	102,813	-
Federal government workers	48	58.3%	41.7%	33,750	39,167	6,923
Self-employed in own not incorporated business workers and unpaid family workers	11	100.0%	0.0%	4,219	4,219	-

Source: U.S. Census Bureau, 2005-2009 American Community Survey (Census 2011).

Within the Lake Quinault population census block, the number of men is estimated to be 168, and women 159. Of these people, the unemployment rate of men is estimated to be 5.5% and of women 3.5%. Conversely, approximately 75.5% of the men are employed and 52.2% of the women are. About 41.1% of the married couples are both working in the labor force, in 14.6% of the families the husband is in the labor force while the wife is not. Conversely, in 7.9% of the families the wife is working while the husband does not. In the remaining 36.4% of the families, neither the husband nor the wife are gainfully employed (Census 2011).

The majority of households (55.2%) report employment through for-profit private companies, 6.9% from private not-for-profit companies, 32.3% for local, state and federal government employment, and 4.7% report employment through non-incorporated personally owned ventures. Only 3 households report employment through farming, fishing, and forestry occupations. The largest single category of employment was 70 households gainfully employed through service occupations (30.2% of the total). This latter occupation group is most likely owing to the presence of the Quinault Lodge on the shores of Lake Quinault with 51.4% of the respondents reporting they work for a private company (Census 2011).

3.7. Resource Use Patterns

There are approximately 119 homes from the community of Quinault and upstream along the Quinault River, and approximately 70 structures located in the area of the Upper Quinault River within the project area. These homes include a mix of domiciles and vacation or infrequent use homes. Employment in the area generally comes from off-site jobs in Amanda Park, Quinault, and points south such as Aberdeen or Hoquiam. There are some residents relying on home-based business income and revenue from small scale farming.

The Upper Quinault River populated area is reported in the 2010 Census as 763 in occupied housing units (Census 2011).

3.7.1. Hunting, Fishing, Gathering

Traditionally, Blueback salmon and other salmon species were the most important food sources for the people of the Quinault Indian Nation, and as such, played an important role in tribal culture. The Tribe also supplemented their diet by harvesting shellfish and other near-shore resources, and hunting whales, elk, deer, and other terrestrial and marine mammals. Fishing was a year-round activity for the Tribe, but different types of fish were caught in particular seasons. Some fish were caught in the ocean, but much of the salmon fishing was done in the Quinault and Queets Rivers. Salmon were caught using a variety of methods: river traps, trolling, line fishing, nets, and spearing (Gunter 1927).

Today, the Upper Quinault River is a part of the traditional cultural properties of the Quinault Indian Nation, but the lands are outside of the exterior boundaries of the Quinault Indian Reservation (Figure 23). A mixture of lands managed by the Olympic National Forest, Olympic National Park, Washington State Department of Natural Resources, and lands owned by private landowners blanket this area. Hunting is carried out on the lands outside the Olympic National Park. Hunting is prohibited within the Park boundaries, but fishing the rivers is allowed, although access may be limited in some areas (ONP 2011). Sport fishing within the entire Upper Quinault River Basin (State, Olympic National Park, and Olympic National Forest managed lands) is permitted and anglers must seek private landowner permission to cross private lands in order to gain access to the river. Several points along the Upper

Quinault River provide anglers direct access to the river from public roads where seeking private landowner permission is not required.

The State of Washington administers fishing regulations for non-Indian sport fishermen outside of the Quinault Indian Reservation (WDFW 2011). Currently (2011) sport fishing regulation allow the taking of trout (June-April), wild steelhead salmon (Feb 16 – April 15), Jack Salmon (Silver jacks or Coho jacks (12 to less than 20 inches)) on barbless hooks (July 1 – Sept 30), and Chinook and Coho Salmon Oct 1 – Oct 31. State rules require all sockeye and chum salmon be released by the fisherman (WDFW 2011).

The Quinault Indian Nation has off-Reservation treaty rights within the Upper Quinault River for the taking of fish and wildlife and for gathering.

3.7.2. Agriculture

The homesteading of the Upper Quinault River Valley brought the initiation of homestead farming that focused on the husbandry of small-scale livestock (cows, horses, goats, sheep) for domestic uses. Many of the homesteads converted forestland into fields of hay and clover without artificial irrigation assistance. These fields have been harvested of trees to convert into hay for livestock or as grazing fields.

All of the private lands within the Upper Quinault River valley are within the geologic flood zone, and this project's focus area. A total of 96.5 ha (238.4 ac) of the Upper Quinault River geologic floodplain is currently supporting pasture and hay lands (Table 2) (USGS 2003). Developed properties (human habitation, businesses, roads) account for approximately 127 ha (314 ac) of the geologic flood zone (Table 2). All of these impacted areas are in the lower reaches of the project area near Lake Quinault.

None of the agricultural lands within the focus area is used for commercial agriculture purposes.

3.7.3. Recreational Golf

Locke's Landing is a 9-hole golf course and driving range, located adjacent to the South Shore Road and Lake Quinault. The course offers visitors to enjoy the scenic beauty of ½ mile of shoreline on Lake Quinault and Zeigler Creek. The course is nestled in the Quinault Valley between the Olympic National Park to the North and the Colonel Bob Wilderness to the South (Quinault Rain Forest 2011).

The property containing the course traverses an area north of South Shore Road, east and adjacent to Lake Quinault, and within the geologic floodplain of the Upper Quinault River. All of this property is within the 1% chance floodplain.

This area is important in terms of its location within the floodplain, potential impact on the lake and river, and it recreational opportunities for local residents and visitors to the area.

3.7.4. Transportation Networks

Transportation networks within the region have been detailed in Section 3.6.1.2 and Section 3.6.1.3.

3.7.5. Noise Pollution

The Upper Quinault River area is noted for its seclusion from industrial centers and as a destination point for many recreation users with a destination of the Quinault Lodge (along the shores of Lake Quinault), the Olympic National Park, and the Colonel Bob Wilderness. Despite this, the juxtaposition of this area to commercial, and residential properties, US101 and the traffic that uses this route to connect the coastal population centers of southwest Washington to the northwestern sections of the state is significant. Large truck commercial traffic along this route is common. When combined, these noise sources slightly distract from the pristine nature of this area.

3.7.6. Aesthetic and Visual Resources

The southern side of Lake Quinault is home to the historic Lake Quinault Lodge and the Rain Forest Resort Village. The north side of the lake is bordered mainly by private homes and some small resorts located in Olympic National Park.

Significant viewsheds within the Upper Quinault River basin include vistas within the Colonel Bob Wilderness and the Olympic National Park. Mobile receptors that traverse the South Shore and North Shore Roads have several locations along the route that seek views of the river and waterfalls. Along these routes are several other aesthetically pleasing viewsheds and sights of significance. These other sites include wildlife viewing (ungulates and avian species), geologically significant locations, and vegetative collections of substance.

While this region is aesthetically attractive from the standpoint of Quinault culture, unique ecosystems, geology and hydrologic significance, it is also populated with homes, farms, and forest land. Both the South Shore and North Shore Roads provide access to homes and farms where people live, work and recreate. The landscape is a mix of houses, roads, forests, fields, and destination resort facilities.

3.7.7. Land Use Plans

Land use plans have been developed and adopted by the Olympic National Forest and the Olympic National Park for the lands administered by both organizations within the Olympic Mountains generally, and this project area specifically. While the Olympic National Park manages a significant amount of the lands within this watershed, the Olympic National Forest also manages critical lowland and upland resources.

3.7.7.1. Olympic National Forest

Management of Olympic National Forest involves a wide range of activities. These activities include: (1) operation and maintenance of structures, roads, bridges, trails and recreation sites and facilities; (2) construction of new sites and facilities; and (3) management practices designed to (a) maintain or enhance habitat for late successional and old-growth forest related species; and (b) to protect and enhance watershed and aquatic habitat conditions (ONF 2011).

The Olympic National Forest was designated a Forest Reserve in February 1897. President Cleveland signed the proclamation, which included 1,500,000 acres of public land on the Olympic Peninsula. On three separate occasions between 1897 and 1909, proclamations added or subtracted land from the Reserve. In 1905, the name Olympic Forest Reserve was changed to Olympic National Forest. The core of the Olympic National Forest was proclaimed Mount Olympus National Monument by President Theodore Roosevelt in 1909. The Monument was transferred from the jurisdiction of the Forest Service, Department of Agriculture, to the Park Service, Department of Interior in 1933, and became Olympic National Park in 1938. Since 1909, there have been several land transfers between the Forest and the Park (ONF 2011).

The Olympic National Forest operates within the scope of the 1990 Land and Resource Management Plan for the Olympic National Forest.

3.7.7.2. Olympic National Park

In accordance with NPS management policies, cultural resources that have been included in wilderness would be protected and maintained according to the pertinent laws and policies governing cultural resources, using management methods that are consistent with the preservation of wilderness character and values. These laws include the National Historic Preservation Act, the Archeological Resources Protection Act, the American Indian Religious Freedom Act, the Native American Graves Protection and Repatriation Act, and Executive Order 13007 that addresses government-to-government consultation.

The General Management Plan for the Olympic National Park provides an overview of the Park's management plan during the period from 2010 through 2025 (ONP 2010). This comprehensive management plan includes an assessment of several critical wildlife habitats, cultural resources, and cooperative policies of the park with tribes, visitors, and adjacent jurisdictions.

ONP "goals" specifically in the GMP as they pertain to floodplains are listed (ONP 2010):

- Protect and preserve natural resources and functions of floodplains
- Avoid the long- and short-term environmental effects associated with the occupancy and modification of floodplains
- Avoid direct and indirect support of floodplain development and actions that could adversely affect the natural resources and functions of floodplains or increase flood risks
- Restore, when practicable, natural floodplain values previously affected by land use activities within floodplains

Further discussion within the General Management Plan is given to the Upper Quinault River and proposed directives for management (FUTURE STUDIES AND IMPLEMENTATION PLANS NEEDED, page 91 (ONP 2011)) (Table 6).

Table 6. Olympic National Park General Management Plan Summary, details for Upper Quinault River activities.

Plan Topic	Examples and/or What Plan Will Address
Land protection plan	This plan will address the specifics related to the proposed boundary adjustments and land protection.
Road management and/or river restoration plans	These plans will focus on the restoration of rivers within the park, including the Quinault, Hoh, and Queets rivers, and determine the feasibility of road relocations to protect floodplain values and resources.

These management plan principals and intentions are compatible with the findings presented in this Environmental Assessment for the restoration of the Upper Quinault River and the rehabilitation of salmon habitat within this river.

3.8. Other Values

3.8.1. Wilderness

Colonel Bob Wilderness is a 4,830 ha (11,935 ac) protected area located on Olympic National Forest lands south of the Quinault River above Lake Quinault (Figure 29). It is named after a 19th century orator Robert Green Ingersoll. At the closest points, Lake Quinault rests only about 1 mile to the west of the wilderness area. Elevations in the wilderness vary from about 100 meters (300 feet) to 1,375 meters (4,500 feet) above sea level. The highest elevation is an unnamed peak; the second-highest elevation is Colonel Bob Mountain at 1,370 meters (4,492 feet).

Access by road is provided by the South Shore Road to the north, and FS Road 2204 to the south. Access by trail is by Colonel Bob Trail #851, Pete's Creek Trail #858 and Fletcher Canyon Trail #857. Several creeks run off the crest of the ridge either north to meet the Upper Quinault River or south to meet the Humptulips River (Wilderness.net 2011).

The United States Congress designated the Colonel Bob Wilderness in 1984, through the Wilderness Act of 1964. The wilderness is managed by the US Forest Service.

3.8.2. Inventoried Roadless Areas

Inventoried Roadless Areas (IRA) are a group of United States Forest Service lands that have been identified by government reviews as lands without existing roads that could be suitable for roadless area conservation as wilderness or other non-standard protections (USFS 2011). The inventoried roadless areas range from large unroaded areas with wilderness characteristics to small tracts of land that are immediately adjacent to wilderness areas, parks and other protected lands (USFS 2011).

The area named South Quinault IRA (Figure 29) includes 22 related parcels totaling 4,481 ha (11,073 ac.). These lands are all either adjacent to the Colonel Bob Wilderness or in close proximity to it. Two IRA parcels are located within the project area and total 77.2 ha (381.5 ac). Both are locations on the eastern side of IRA properties in this area. These parcels are bounded on their northeastern sides by the South Shore Road.

3.8.3. Quinault Research Natural Area

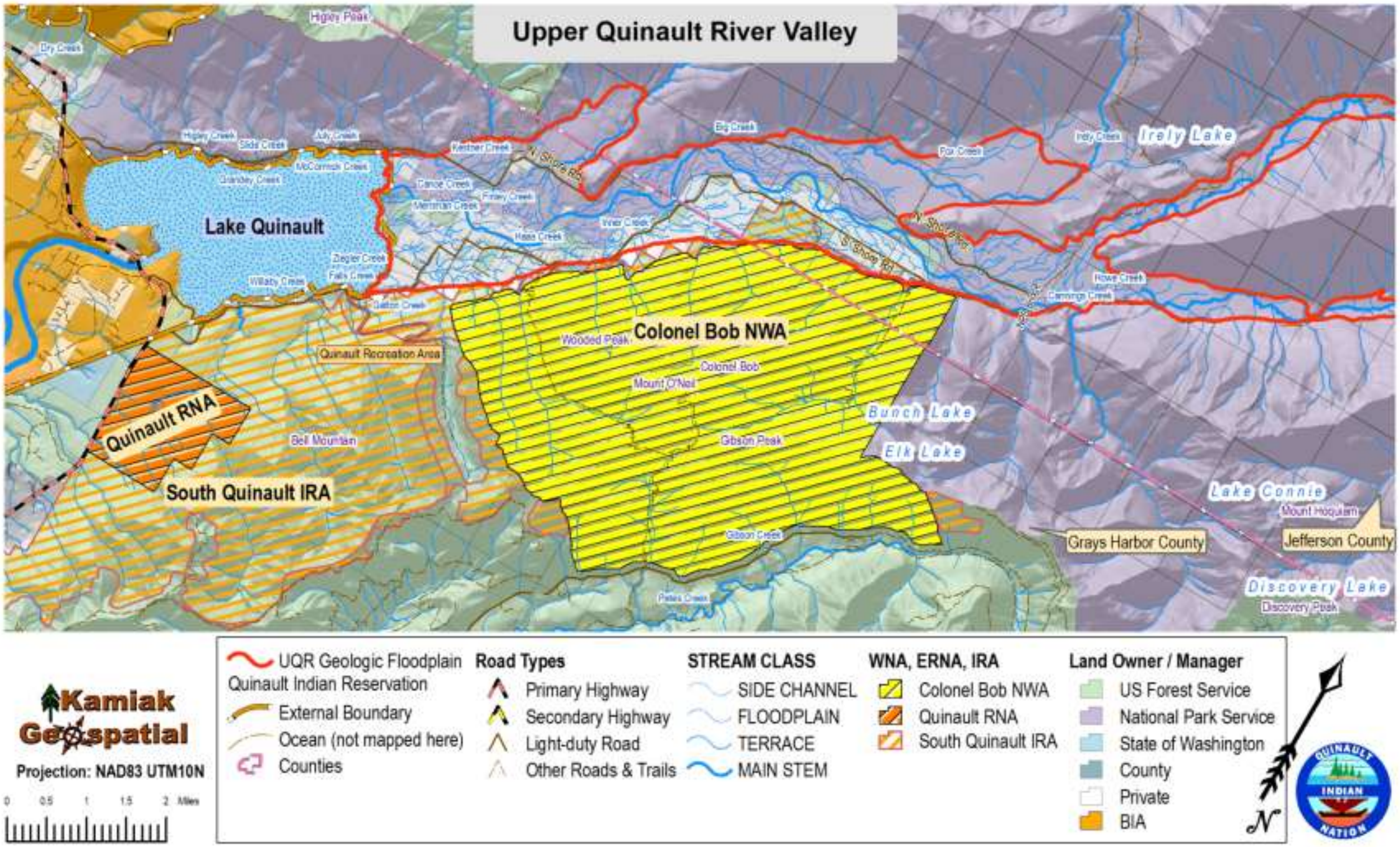
Research Natural Areas (RNAs) are tracts of wildlands set aside for research, education, and conservation purposes. RNAs help protect biological diversity at genetic, species, and ecosystem scales. As ecosystems in relatively pristine condition, they are managed primarily for their natural ecological processes, and in some cases, to help protect rare or threatened species. Natural areas range in size from tens of acres to several thousand acres. Collectively, they represent a wide gradient of ecosystems found across the Pacific Northwest (OSU 2011).

The Quinault RNA is located in the Olympic National Forest, south of Lake Quinault (Figure 29). The topography of the 506 ha (1,250 ac) tract is flat to gently rolling, except on steeper slopes of Quinault Ridge along the eastern boundary. Elevations range from 122 m (400 feet) to 366 m (1,200 feet). Two creeks and several smaller tributaries flow through the tract. Western hemlock, Sitka spruce, Douglas-fir, and western redcedar dominate the entire natural area. Tree size and age vary widely throughout the natural area; the oldest and largest trees are 400 year old Douglas-fir, the smallest and youngest trees are western hemlocks (USFS 2011).

Most tree reproduction in the RNA is found on rotting "nurse" logs, which is evident in the lines of mature trees growing along the remains of the original nurse logs. Red huckleberry (*Vaccinium parvifolium*), ferns (*Nephrolepis & Polystichum* spp.), and redwood sorrel (*Oxalis oregana*) dominate the lush understory. Elk use the tract as wintering ground, which has affected understory composition. The area is bisected by US101 and windthrow is common along this boundary (USFS 2011).

In the Research Natural Area, there is direction from the 1990 Forest Plan that applies and since this area is also designated as Late-Successional Reserve in the 1994 Northwest Forest Plan amendment, that direction applies as well. Both sets of direction apply and which direction is applicable usually is dependent on the proposed activity (Davis 2011).

Figure 29. Wilderness, Research Natural Area, and Inventoried Roadless Areas adjacent to and near the Upper Quinault River project area.



4. Environmental Consequences

The overall goal of the salmon habitat restoration plan is to restore the historical, natural habitat forming processes of the Upper Quinault River. By achieving this goal, the quality and quantity of side channel habitat preferred by sockeye salmon, particularly old side channels found within mature riparian forests will be increased. Without changes to current land management and infrastructure maintenance practices within the floodplain, the historical loss of habitat areas and ongoing habitat degradation will continue. Implementation of this habitat restoration plan will deter further degradation and begin to restore productive salmon habitats.

Restoration of the entire reach beginning at the entry of the Quinault River into Lake Quinault and upstream through the geologic floodplain will likely occur incrementally over 20 to 100 years, depending on available funding, project permitting, and possible logistical constraints. Restoration actions will take advantage of local conditions, such as accumulations of unstable woody debris that can be used to create stable engineered logjams, which in turn will help control channel migration and promote development of stable side channel habitats. Actions laid out in this plan provide low-impact means for meeting long-term restoration objectives. This restoration plan also lays out methods and alternatives for infrastructure and property protection measures that avoid or minimize adverse environmental impacts. These alternatives offer stakeholders cost-effective methods to incrementally restore productive salmon habitat within the Upper Quinault River floodplain.

Salmon habitat restoration will be achieved over several decades through implementation of the plan elements. Once the conifer forests reach maturity within the geological floodplain, the natural cycle of large wood recruitment and conifer forest regeneration will be self-sustaining. At that point, the channel and floodplain-forming processes that are generated by large woody debris will occur naturally. The establishment of a mature conifer forest will take approximately 100 years, if the preferred alternative is implemented.

Table 7. Comparison of No Action Alternative to the Preferred Alternative.

Attribute	No Action	Preferred Alternative
Salmon Habitat (all species)	Continued decline in salmonid populations.	Increase in salmonid habitat suitable for spawning and rearing. Target species is sockeye salmon, but all salmonid species will benefit.
Soil Erosion	Maintain Consistent with current trends: higher than historic levels.	Reduction in soil erosion that is attributable to river avulsion through the riverbed without stream side structure that intercepts high velocities, diverts a portion of the energy to side channels, and encourages a anabranching stream network.

Table 7. Comparison of No Action Alternative to the Preferred Alternative.

Attribute	No Action	Preferred Alternative
Turbidity in the River	Maintain Consistent with current trends: higher than historic levels.	Reduction of long distance transport sediment in the river waters because of velocity interception caused by strategically placed structure (ELJs), naturally occurring recruited logjams, and hardpoints of maturing trees within the river network.
Wetlands Function	Maintain Consistent with current trends: short-term and rapid wetlands recruitment and forfeiture.	Improved wetlands function provided by long-term stability of the river network that reduces the rapid avulsion and forfeiture of wetland sites after only short duration conversion.
Air Quality	Maintain Consistent with current trends: generally high quality.	No significant change from current conditions.
Vegetative Plant Communities	Maintain Consistent with current trends; reestablishment of old growth forests within the river basin not forthcoming.	Increase in mature conifer forests, leading to old growth status in the long-term. Will achieve this status sooner than if left in the No Action Alternative.
Wildlife: Beaver	Maintain Consistent with current trends: limited suitable habitat.	Potential increase in the use of river by beaver, leading to increased fish habitat, reduced stream turbidity, and reduced stream velocities due to beaver dams and vegetative responses To the presence and activities of beaver.
Wildlife: Wolves	No Change: extirpation continues.	No Change: expatriation continues.
Wildlife: Ungulate Species (elk and deer)	Maintain Consistent with current trends: favorable browse habitat in river basin.	Forage quality of the river basin will decrease as hardwood and conifer trees are planted, with browse protection devices installed with each tree. Although the ungulates will be able to browse on other forage sources in the short-term, the targeted planting sites will be removed from forage sources. In the long-term, the ungulates will have less browse habitat, and more hiding cover, such as that habitat found along the side hills of the basin. Forage habitat will most likely be displaced to lower elevations where favorable browse habitat is located (near homes).

Table 7. Comparison of No Action Alternative to the Preferred Alternative.

Attribute	No Action	Preferred Alternative
TES Species: Northern Spotted Owl & Marbled Murrelet	Maintain Consistent with current trends: little favorable habitat within the floodplain.	Long-term increase in potential nesting habitat due to the initiation of forest tree species within the river channel that will ultimately provide a continuous nesting and feeding habitat linking the current primary habitat of the adjacent basin lands to the north and south of the river basin.
TES Species: Bull Trout	Continued decline in bull trout populations due to habitat conditions.	Increase in bull trout habitat suitable for spawning, feeding, and rearing.
State Special Status Plants: Tetraphis moss	Maintain Consistent with current trends: one identified occurrence in the river basin.	The state special status plant species that has one documented occurrence in the project area could be expatriated during ELJ installation activities. The habitat created because of the preferred alternative is expected to create increased favorable habitat for this species, in the long-term.
Cultural Resources: TCP (Blueback)	Risk to continued Blueback population decline in response to current conditions.	As one of the most significantly identified TCP resources represented by the Quinault River, the Blueback salmon holds cultural significance for the Quinault Indian Nation and its habitat improvement is expected to increase population numbers.
Cultural Resources: Sacred Sites	Risk to properties and sites within the geologic floodplain to rapid avulsion of the river in response to current conditions.	Reduction expected in the rate at which river meandering occurs, reducing the risk of site destruction without identification of unmapped sites.
Resource Use Patterns	Maintain Consistent with current trends.	General improvement in the long-term to resource uses as the river stabilizes and mature forest tree species increase. In the short-term minor impacts will be seen in aesthetic quality, and minor noise pollution factors (during ELJ establishment).

4.1. Project Monitoring

The project location and structures included in this project shall be monitored at least semi-annually for effectiveness by measuring habitat quality and quantity. Parameters that characterize habitat forming processes in the project area, such as channel geometry, sediment storage, channel depth and velocity, flood inundation, wood accumulation shall be monitored and findings recorded. Monitoring shall also include surveys of the project structures (e.g., logjams) and progress of reforestation to ensure they are performing as designed with the intended effects (Saldi-Caromile, et al. 2004). The Nation will work with the ACOE and adhere to ACOE Programmatic Consultation for fish habitat restoration that requires that applicants monitor project implementation and report on the extent of turbidity plumes, and any changes in project design.

4.2. Short-term, long-term, irreversible and irretrievable impacts

NEPA Compliance requires an assessment of how short-term impacts to resources from a proposed action would compare to or affect the maintenance and enhancement of long-term productivity. Essentially, this is a comparison of the short-term localized impacts with the intended long-term benefits to economic productivity and environmental impacts (positive and negative).

The assessment of the implementation of this preferred alternative will focus only on the ELJ construction activities. The restorative planting activities are anticipated to only involve a miniscule amount of ambient economic activity to a region that has supported a commercial forestry based economy for over a century. That economic activity included logging, log truck traffic, reforestation, and a mobile workforce infrastructure. The partial conversion of this economic activity to a hospitality management and destination recreational infrastructure is completely consistent with reforestation activities. The placement of ELJ structures, movement of logging trucks to transport ELJ logs to the sites, helicopters to deliver some of the materials to the work sites, and heavy machinery equipment working on the sites will be assessed in this section.

4.2.1. Short-term Use and Long-term Benefits

Land use impacts from the construction of the ELJs would occur from direct physical disturbance from the construction activities of ELJs as a result of creating temporary access roads and the physical presence of machinery and equipment (including trucks, helicopters, and tractors). Construction activities would be of short-term nature (2-3 days per site) and would not adversely affect properties by eliminating or limiting existing uses around or within construction sites, or alter the use of land according to existing or approved land management plans, or alter or eliminate dispersed recreation opportunities during or after construction of ELJs or access roads. Disturbance associated with construction will involve areas of temporary and permanent disturbance. Temporary disturbance will be associated with construction work areas of limited size for each site and permanent disturbance in the shape of constructed ELJs introduced into the river floodplain area.

Following are descriptions of fourteen general areas in which this project may incur short-term impacts but should improve long term productivity.

- **Short-Term Use**: Impacts that would potentially occur during project implementation of a project or immediately after the construction activities.
- **Long-Term Productivity**: Refers to economic productivity over the term of the project horizon, or 20 years (or greater).

The long-term effects of the restoration project on the habitat elements include sediment substrate embeddedness, large woody debris, pool frequency, pool quality, off-channel habitat, fish and wildlife refugia, wetted width/depth ratio, stream/riparian condition, and site disturbance frequency. The preferred alternative shall improve aquatic and riparian habitats for terrestrial, avian, fish, and other forms of aquatic life. No adverse long-term impacts to the Quinault River are expected. Over time, the habitat created by the ELJ structures are expected to coalesce into mature forested surfaces, possibly interlaced with side channels and re-establish a riparian buffer, between the river and the existing roads. Riparian habitat quality in the area shall be enhanced and improved over time as the riparian vegetation matures and the modified project area is integrated into the surrounding terrestrial landscape.

4.2.1.1. Transportation

The river restoration project activities would have short-term traffic impacts during construction on either the South Shore Road or the North Shore Road depending on the site location and the access route used. Motorists could expect some travel delays resulting from construction activities that need to temporarily close the road for truck or machinery traffic crossings. In all cases, these activities will be extremely short duration in nature, lasting for less than 5 minutes on average. Construction would require hauling by heavy equipment (short-term) that could require temporary closure of traffic lanes resulting in minor traffic delays along US101 or the access routes mentioned here.

Existing access roads will be used where practicable causing no additional disturbance. Where no roads exist to access a work area, an access approach of 10 feet in width is assumed to be needed from the road to the point of activities, and is considered a permanent disturbance. There will be temporary new “trails” that will not be disturbed or otherwise modified other than compaction and crushing caused by equipment and inconsequential vehicle travel.

Helicopter traffic crossing existing roads to transport large wood debris from staging areas to work sites will necessitate existing road temporary closures while the helicopter crosses over the roadways. Site Safety Officers will monitor helicopter traffic and be in contact with pilots to coordinate road closures and openings to allow traffic to flow without risk. All delays accountable to helicopter traffic will be similar in duration to the delays associated with surface vehicles.

In the long-term, the restoration of Upper Quinault River hydrology could increase destination visitor traffic to the area, as destination visitors to the Lake Quinault Lodge and the Olympic National Park seek to observe salmon restoration efforts along this stretch of the river and watch the process of site reclamation that will span dozens of years.

4.2.1.2. Land Use

Engineered logjam construction would temporarily impact (short-term) residents due to congestion and travel delays, and could result in the temporary loss of land for construction staging. Whenever local sites are utilized for materials staging, equipment storage, or other purposes, the landowners will be contacted first, and agreements for use will be created ahead of any site utilization. Olympic National Forest and Olympic National Park land use plans identify river and riparian restoration as land use management goals and the Preferred Alternative identified here provides a consistent and suitable method of achieving those goals. On a long-term basis, the river restoration project helps the region to meet biological needs, economic development, land use, and salmon restoration goals.

4.2.1.3. Socioeconomic

Potential socioeconomic effects of construction and maintenance of the ELJs during its incremental phases of implementation would arise mostly from logistical requirements for mobilizing and deploying labor, monetary capital and material resources, including timber availability. Construction of a certain number of ELJs under each incremental project will present a relatively small project in terms of socioeconomic requirements and impacts. Direct socioeconomic impacts would take a form of increases in demand for local labor and required accommodations, thus providing a short-term benefit (for the longevity of each phase of the project) for the region.

Short-term impacts during ELJ construction activities could include the following:

- Potential for temporary reduction of income and employment at the Lake Quinault Lodge and other tourist destinations due to traffic congestion;
- Limited or more difficult access to some sites during construction;
- Temporary (and voluntary) use of properties for construction staging areas and the resulting loss of land use income and employment;
- Temporary loss of neighborhood character;
- Potentially increased response times for emergency service providers in some areas.

The ELJ construction activities would improve the long-term character of the Upper Quinault River by establishing resources that increase the creation and management of the river ecosystem for salmon habitat. The ELJ construction activities would reduce river avulsion and rapid compromise of the South Shore Road, the North Shore Road, and home site losses when the river peaks to erode stream banks in these areas. The long-term benefits for the existing public and private infrastructure would be hard to overestimate. The incremental addition to the stability of the unpredictable pattern of the Upper River riverbed meandering, which will be achieved through the comprehensive restoration effort, is expected to stabilize the economic environment of the entire community activities built around the Upper Quinault floodplain.

Because of the interconnectedness of the South Shore and North Shore Roads on the west sides at US101 (Amanda Park) and at the eastern sides (at the NPS bridge crossing the Quinault River), the isolation of destination recreationalists to the Olympic National Park, or landowners / homeowners would be avoided. Any construction that temporarily closes the roads could be bypassed in case of emergency.

In each table-top test[1] of road closures and unanticipated complications to access along the Upper Quinault River associated with construction delays closing a main road, the delay to vehicle transported emergency responders ranged from 1 minute in the least impact scenario (equipment crossing the road to access a construction site) to 1 hour in the maximum impact scenario (equipment breaking down while crossing the road causing a road closure). In the latter scenario, simulated emergency responders were rerouted to their destination using the alternate route (North Shore Road vs. South Shore Road).

4.2.1.4. Noise

The auditory contamination to the river basin contributed by the activities of this proposed action is negligible because the sounds of the river mostly overpower the large truck traffic of US101. The forestlands and topographic shielding within the basin absorb sound. An insignificant amount of noise pollution is contributed by the homestead farming of the area, and vehicular traffic distracts little from its pristine character.

The proposed use on ELJ installation projects of large trucks, excavators, helicopters, and other heavy equipment will introduce increased levels of sound into the project area. The USFWS has previously completed analyses of the potential for noise disturbance to spotted owls and marbled murrelets. In these analyses, the USFWS concluded that nesting behaviors may be disrupted by loud construction noises (≥ 92 dB) that occur in close proximity to an active nest during the early portion of the nesting season.

To minimize the potential for noise disturbance to spotted owls and murrelets, we will comply with seasonal restrictions specified in the USFWS programmatic ESA consultation that covers stream habitat restoration which prohibits heavy equipment use in murrelet nesting habitat during the early murrelet nesting season, and restricts project activities to daylight hours only.

4.2.1.5. Visual Resources

ELJ construction activities would create short-term visual impacts. Construction equipment, staging areas, and construction activities would complicate views of the "natural environment" and create an obstructed landscape. However, the project's potential visual resource mitigation and enhancements would give long-term benefits and mainly retain the existing character of the landscape. The level of change to the characteristic landscape should be low. The construction activities may attract attention but should not dominate the view of the casual observer, but may attract attention for those who wish to understand more. Introduced changes will repeat the basic elements of the predominant natural features of the landscape. Mitigation includes the planting of trees that would have a positive long-term impact on visual character. Viewer sensitivity, which is a degree of public concern toward existing or proposed visual change within a landscape, is expected to be low since the degree of contrast influencing the overall impression of the landscape against the existing disturbance will be minimal.

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[1] A table-top exercise is designed to test scenario, in a hypothetical setting, for responders to situations that are either likely or unanticipated in order to determine personnel training needs, or mitigation measures.

When accompanied by restoration of the river ecosystem, the long-term benefits are substantially more beneficial than the short-term aesthetic costs. When constructed, ELJs will present new visual elements introduced into the environment replicating natural logjams which should be compatible with the overall river landscape perception.

4.2.1.6. Energy

The short-term use of energy resources for construction and the long-term use for vehicle operations should be weighed against the long-term impact on energy supplies. The project would use some non-renewable energy resources (e.g., petroleum). However, the need for river restoration efforts outweighs the use of non-renewable energy resources, and there would be enough energy to meet the overall demand of the regional economy. Therefore, the short-term use of energy resources for development and the long-term use for vehicle operations are consistent with the long-term development and productivity of the region.

4.2.1.7. Grading

Grading would be a short-term activity associated with the construction phase of the project. Grading of the access, staging, and roadway areas may be necessary as part of the site work. The amount of grading would vary with each restoration project and would vary with the size of the project site and access and staging areas. Grading for construction access roads would be necessary for trucks and equipment to reach the project site. Where helicopters are used, the amount of grading required will be substantially less.

4.2.1.8. Temporary Access Road and Bridge Construction

Temporary access road or bridge construction would be a short-term activity associated with the construction phase of the projects. Access road construction would be necessary to enable delivery of material and equipment to the site. Access roads can be located where minimal impacts would occur (i.e., outside critical areas such as wetlands). After construction is complete, access roads can be vacated, graded, and planted with native vegetation. Temporary bridge crossings may be necessary to cross existing channels to access restoration project sites. Temporary bridge crossings would be removed after construction.

The size and capacity of any temporary bridges and access routes will be dependent on if the site will be used to transport LWD to the work site, or if a helicopter will be used to deliver the materials from the staging area to the work site. In either case, equipment will need to access the work sites over the access infrastructure. The cost tradeoff of using a helicopter must be balanced against the increased costs of infrastructure components. This decision will use the benefit/cost analysis approach to select the best combination of resources, while weighing the environmental impacts to the decisions.

4.2.1.9. Staging Area Establishment

Staging areas are locations where materials and equipment can be stored for the duration of project construction. All construction staging areas would be located above the ordinary high water mark of the river or channel and would be active only during project construction. Staging areas cleared during site preparation would be revegetated after project construction is complete. Cleared staging areas would be flagged prior to construction; and where necessary, construction fencing would be placed around the staging area.

These lands will require minor clearing of vegetation and placement of a gravel base as well as construction or improvement of access roads. One long term inventory storage area will also need preparation, which consists of removal of brush and grading. No negative impacts have been identified outside normal set-up activities during logging, staging area construction, and transporting materials to the ELJ sites.

4.2.1.10. In-Water Work Area Isolation

In-water work would be avoided whenever possible. However, some proposed restoration projects may occur within the wetted channel. All non-permanent structures placed during construction (such as sheet pile and H-beam structures) will be removed before completing site activities.

If construction work is proposed within the wetted channel, the work area would be isolated from the rest of the channel so that sediment from the work area does not enter the other channel areas and degrade water quality. Work areas are isolated to protect water quality and aquatic habitat from the adverse effects of construction (e.g., turbid water conditions).

Methods used to isolate work areas within the channel could include one or more of the following methods: bulk bags, silt curtains, sand bags, bladder dams, or other means to establish a physical barrier between the work area and the rest of the water body. The method used would depend on the water depth and flow conditions within the channel. The contractor would determine the best means to isolate the work area for the type of restoration construction necessary.

The Washington Department of Fish and Wildlife currently lists August 1 through August 15 as the season for inwater work in the Quinault River. The ACOE Programmatic Consultation has a list of general conservation measures, including a protocol for dewatering work sites.

4.2.1.11. Excavation of Streambed Gravels

Temporary excavation of the streambed (short-term) may be necessary for placement of habitat structures below the ordinary high water mark. Streambed gravels would be removed to allow for the lower layers of the structure to be placed below and embedded in the streambed. When possible, these lower structure layers would be back filled once the log layers are placed in the excavated pit.

Backfilling the structure allows for better structure stability and would improve the longevity of a structure. The backfilled material acts as ballast for the structure.

4.2.1.12. Temporary Sediment and Erosion Controls

Typical temporary erosion and sedimentation control (TESC) measures (short-term) would be used during the construction of plan elements. All TESC measures would be installed prior to the beginning of construction activities. Project engineers who are onsite during construction would monitor the TESC measures daily to ensure that they are performing as specified.

Reduced water clarity during initial work area inundation by the Upper Quinault River during the first winter flood event is a short-term effect expected to possibly occur. Short-term (hours to 2 days) turbidity plumes will be generated at ELJ in-water construction sites that will be above background levels, and will cause short-term adverse affects to fish and fish habitat, even with the BMPs in place to control sediment. These BMPs significantly reduce the magnitude and duration of turbidity plumes, but do not eliminate the potential for short-term adverse effects to fish and fish habitat. There will also be adverse affects associated with substrate scour and deposition for 1 season associated with each ELJ site.

Sediment control measures may include but are not limited to the following:

- Silt fences will be placed around all work areas.
- Soils will not be left exposed for more than 2 days from October 1 to April 30, and for more than 7 days from May 1 to September 30. Disturbed soils will be stabilized with covering control measures (e.g., mulching, seeding, plastic covering, surface roughening, sod, or jute matting).
- 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.
- Sediment control measures will be inspected and maintained throughout the duration of construction

4.2.1.13. Pile and Sheet Pile Driving

Piles are proposed as structural elements of the engineered logjams to provide stability and to increase the structure's factor of safety. Piles would be installed with a pile driver or with an excavator with a vibratory head. The number of piles and the depth they would be driven depend on the design of the proposed structure. Based on the typical designs presented here, piles would be driven with each structure.

Driving metal sheet piles would be required when shoring is necessary for structure excavation and construction. Sheet piles are used to shore the excavated pits where the engineered logjam structures would be constructed. The use of sheet pile allows the construction footprint to be minimized. Sheet piles are driven into the ground using the same equipment used to drive cylindrical piles. Sheet piles could be installed with the use of H-beams for support. These activities are considered short-term auditory impact activities with long-term benefits for salmon habitat restoration.

4.2.1.14. Short-term Soil Displacement

Environmental consequences of the proposed alternative on the local soils present at the site involve two distinct categories: (1) disturbance and/or removal of the soils during excavations for engineered structures, and (2) disturbance of soils adjacent to excavations due to vehicular traffic and heavy equipment. Soils have developed within the geologic materials over long periods of time and extend to depths of about 5 to 7 feet (Section 3.1.4). Because the soils have developed within and are imprinted on the geologic materials, the discussion on environmental consequences for soils includes estimates for material disturbed or removed from excavations or lost to erosion by natural processes.

Anticipated effects to the soils could include, but are not limited to, compaction under vehicle traffic loads with associated loss of internal soil structure and loss of infiltration capability, winnowing and rutting due to equipment traffic, and loss of soil material in the form of dust as the soil breaks down under traffic pressures. Some disruption of soils should be expected during driving of the log supports in the preferred alternative. The preferred alternative involves excavation of the soils and their parent geologic material and replacement. The amount of excavation and the extent of associated equipment traffic vary by project site. There is anticipated short-term, localized impacts to the soils due to the required construction activity.

When compared to the no action alternative, the soil displacement caused by the preferred alternative would be inconsequential in the long-term as the no action alternative is anticipated to continue to witness river channel erosion, high turbidity, and substantial soil displacement within the river channel and along the river banks.

4.2.2. Irreversible and Irretrievable Commitment of Resources

The construction of projects such as the ELJs invariably requires the commitment of natural, human, and economic resources. Some of the resources needed for construction are non-renewable, such as land and petroleum fuel, making their use “irreversible.” Other resources may be renewable but those used for this project could not be reused and are thus “irretrievable.”

- **Irreversible Commitment of Resources**: The use of non-renewable resources such as fossil fuels and/or materials and the conversion of land for long-term use.
- **Irretrievable Commitment of Resources**: The use of renewable resources such as timber, forestland or habitat, along with the permanent negative disruption of a site.

Irreversible and Irretrievable Commitment of Resources is discussed in the sections following and are summarized in Table 8.

Table 8. Irreversible and Irretrievable Commitment of Resources.

Resource	Type of Commitment Because of ELJ Installation	Extent	Irreversible	Irretrievable
Air Quality	Degradation of Air Quality.	Minimal	No	Yes
Land Use	Sites for ELJ Installation	Site Limited	Yes	Yes
Soil Resources	Soil loss and erosion.	Site Limited	Yes	Yes
	Soil Rutting	Site Limited	Yes	Yes
	Seedling Mortality	Site Limited	No	Yes
	Hand Planting	Site Limited	No	No
Water Resources and Wetlands	Increase of turbidity in river.	Minimal	Yes	Yes
Vegetation Clearing and Grubbing	Disturbance to and/or loss of vegetation.	Site Limited	Yes	Yes
Wildlife Resources	Disturbance to wildlife species and loss of habitat.	Minimal	No	Yes
Cultural Resources	None	None	No	No
Land Use Resources	Exclusion of incompatible uses in the project access areas.	Site Limited	No	Yes
Visual Resources	Alteration of Natural Scenic quality and viewshed intrusion.	Minimal	Yes	Yes
Socioeconomic Resources	Increased local and regional revenues.	Entire Project Area	Yes	Yes
Noise	Noise from equipment	Site Limited	Yes	Yes
Energy	Materials:	Logs	Yes	Yes
		Fossil Fuels	Yes	Yes
		Seedlings	Yes	Yes

4.2.2.1. Land Use

The ELJ construction activities would require site access and agreements for rights-of-way to construct the ELJs and plant trees. The land used for the ELJ is considered an irreversible commitment and would not be available for other land uses since the land would be used for salmon restoration purposes for the foreseeable future.

These exchanges in uses would not be viewed as a negative exchange as the sites are currently serving the purpose of salmon habitat, but the utility of the sites is not at their potential. Through the implementation of the preferred alternative, the sites would make a Pareto Optimal conversion in use status.

4.2.2.2. Visual Resources

The modification of the river's scenic byway would be degraded during actual ELJ site construction as equipment, trucks, and helicopters are located on the site for construction and material transportation purposes. These allocations would be irreversible and irretrievable in the short-term, but reversible and retrievable once the ELJs are established. When the restorative plantings grow into the sapling stages of development, the visual alteration of the ELJs placed in the river terraces and shorelines will be mostly disregarded and unseen by visitors to the area. The use of these resources would include low maintenance. The commitment of these resources would benefit the region, local communities, and the scenic and visual quality of the Upper Quinault River.

4.2.2.3. Energy

The ELJ construction activities would require natural resources such as fossil fuels (i.e., petroleum) and construction materials such as logs and large organic materials, and tree seedlings. These would require energy to manufacture. Energy used during construction and in the conversion of project materials would be irretrievable. However, fossil fuels are not in short supply at this time, and the use of these resources would not have an adverse effect on their continued availability.

The commitment of energy resources to the project is offset by the benefits derived from improving natural river processes within the Upper Quinault River ecosystem. These benefits include improved salmon habitat. These combined benefits are anticipated to outweigh the commitment of energy to the ELJ construction activities.

4.2.2.4. Vegetation Clearing and Grubbing

Land may need to be cleared for project construction, including construction access and staging areas (irretrievable). The amount of clearing would depend on the size of the project construction footprint and the access to a given project site. Clearing may involve tree and shrub removal as well as grubbing (stump and root removal). Equipment used for clearing and grubbing could include excavators, bulldozers, etc. Cleared vegetation could be salvaged and used as part of the restoration efforts or disposed of properly. Vegetation clearing and grubbing would be a short term activity that would be associated with the construction phase of the project.

4.2.2.5. Soil Related

Vehicular access to work sites and the individual excavations are expected to have some impact on the local geologic materials (soils). Access would include temporary haul roads, access ramps and loops to individual features of the project, parking areas, stockpile sites, contractor use areas, and fueling and maintenance stations for heavy equipment. Effects from equipment traffic would be confined to relatively shallow depths on most soils. These effects would have greater influence on the soils that have developed within, and that are imprinted on, the parent geologic materials comprising the floodplain.

A. Soil Rutting

Soil rutting potential and compaction is considered on sites where the Hoh sandy loam and Udifluvent soils are found (moderate risk to rutting) and within the Queets silt loam soils (high risk to rutting) (Figure 20). These soil rutting and compaction risks are associated with elevated soil moisture and soil silt loam content consistent with high rainfall and post site saturation without suitable time for subsurface drainage.

B. Seedling Mortality

Those areas considered as Hoh medial fine sandy loam, and Chitwhin medial silt loam, are classified as moderate to seedling mortality risks. Artificial reforestation efforts will be most successful if organic matter is included in site preparation, and when ELJ materials are placed.

The limited area outcroppings of the Chowchow-Water complex are classified as “High” to seedling mortality. In these areas, extensive water inundation during the growing season can lead to tree mortality. Alleviation of these risks can include enhanced tree regeneration tactics and the selection of water tolerant species for the low-land planting sites.

All of the sites within the geologic floodplain that have been evaluated are considered as “low” in their potential for seedling mortality. The unmapped areas (by the NRCS) are anticipated to receive a similar evaluation when they are completed.

C. Hand Planting

Hand planting of conifer and hardwood trees is relied on for restorative planting success to stabilize work sites in the short-term. In the long term, the success of vegetation planting is relied on to establish the mature conifer forests that will ultimately establish the self-sustaining hard points within the floodplain, and give stability to the meandering river.

4.3. Direct Effects

4.3.1. Threatened, Endangered, and Sensitive Species

4.3.1.1. Bird Species

A. Northern Spotted Owl

A brief description of lands designated as critical habitat for the northern spotted owl has been identified in the Federal Register on August 13, 2008 (US GPO 2008). Within Washington Unit 1, Olympic Peninsula, the Olympic Peninsula Unit consists of approximately 134,400 ha (332,100 ac) in Clallam, Jefferson, Mason, and Grays Harbor Counties, Washington, and is comprised of lands managed by the Olympic National Forest. This unit includes one area that, with approximately 194,000 ha (479,400 ac) of habitat or habitat-capable areas in the adjacent Wilderness and Olympic National Park, meets the size requirement of a large habitat block, and two areas that meet the size requirement of small habitat blocks.

The establishment and maintenance of extended blocks of late successional conifer forests is beneficial to Northern Spotted Owl survival and population rehabilitation. The preferred alternative implements management practices that establish mature conifer forests within the riparian zone and extends the existing preferred habitat between the ridgelines that are currently separated by the Upper Quinault River floodplain.

The harvest of trees for ELJs could result in loss of Northern Spotted Owl habitat. All logs used for ELJs will come from timber sales that have gone through consultation, and as a result, no loss of habitat is expected, and there would be no loss of habitat associated with temporary access, or roads.

Noise and visual disturbance to nesting spotted owls associated with construction is a low risk, none of the historic spotted owl sites in the valley are located along the floodplain. However, no spotted owl surveys have been conducted in the project area during the past 5 years, so the current status of spotted owls in upper Quinault Valley is unknown with certainty.

Any construction of access roads, helicopter flight paths, or ELJs that occurs in close proximity to suitable spotted owl nesting habitat will comply with the seasonal restrictions listed in ACOE restoration programmatic (USFWS 2006). Therefore, the effects of noise and construction activities to spotted owls are considered to be insignificant.

Therefore, the proposed project may affect, but is not likely to adversely affect spotted owls.

The No Action Alternative would presumably continue current management practices that show little promise of late successional conifer forest development within the geologic floodplain from the headwaters downriver to Lake Quinault. The process of river avulsion within the drainage has prevented re-establishment of substantial terrace islands supporting the desired mature conifer forests needed by the Northern Spotted Owl and the Blueback salmon.

B. Marbled Murrelet

The USF&WS has developed conservation needs designed to stabilize and increase Marbled Murrelet habitat quality and quantity on land and at sea that are the primary means for stopping the current population decline and encouraging future population growth (USFWS 2011). Conservation actions are categorized by short-term and long-term actions by the USF&WS and are identified as follows:

Short-term conservation actions:

- maintain all occupied nesting habitat on Federal lands administered under the Northwest Forest Plan;
- on non-Federal lands, maintain as much occupied habitat as possible and use the Habitat Conservation Plan process to avoid or reduce the loss of habitat;
- maintain potential and suitable habitat in large contiguous blocks;
- maintain and enhance buffer habitat surrounding occupied habitat;
- decrease adult and juvenile mortality; and

- minimize nest disturbances to increase reproductive success.

Long-term conservation actions:

- increase the amount and quality of suitable nesting habitat;
- decrease fragmentation of nesting habitat by increasing the size of suitable stands;
- protect "recruitment" nesting habitat to buffer and enlarge existing stands, reduce fragmentation, and provide replacement habitat for current suitable nesting habitat lost to disturbance events;
- speed up development of new habitat; and
- improve the distribution of nesting habitat across the landscape

The establishment and maintenance of extended blocks of late successional conifer forests is beneficial to Marbled Murrelet survival and population rehabilitation. The preferred alternative implements management practices that establish mature conifer forests within the riparian zone and extends the existing preferred habitat between the ridgelines that are currently separated by the Upper Quinault River.

The harvest of trees for ELJs could result in loss of Marbled Murrelet habitat. All logs used for ELJs will come from timber sales that have gone through consultation, and as a result, no loss of habitat is expected, and there would be no loss of habitat associated with temporary access, or roads.

Marbled Murrelet nesting habitat is located within the floodplain, and some ELJ construction sites may be located adjacent to nesting habitat. There is a potential for disturbance to murrelets. Therefore, any projects located in close proximity to murrelet habitat will implement the seasonal restrictions listed in the ACOE restoration programmatic (USFWS 2006).

The proposed use of large trucks, helicopter flight paths, and heavy equipment will cause increased levels of sound in the action area. Previously completed analyses of the potential for noise disturbance to murrelets (USDI 2003, USFWS 2006) leads to the conclusion that murrelet nesting behaviors may be disrupted by loud noise and activity that occurs in close proximity to an active nest during the early portion of the nesting season (USDI 2003). To minimize noise disturbance to murrelets, the Park Service incorporated a seasonal restriction that prohibits heavy equipment (including helicopter) use in murrelet nesting habitat during the early murrelet nesting season, and restricts project activities to daylight hours only. These precautions will be followed for construction activities within the Upper Quinault River associated with implementation of actions from this Environmental Assessment.

In Washington, the murrelet early nesting season is defined as April 1 to August 5. Early nesting season behavior includes nest site selection, egg laying, incubation, and brooding of newly-hatched nestlings (Nelson 1997). More than 90 percent of murrelet young have hatched by August 5 in Washington (Hammer and Nelson 1998). After hatching and a short period of parental brooding, the nestlings are left alone for the majority of the day while the adults forage in marine waters, with feedings occurring predominately during the early morning and evening hours. Therefore, after August 5, with the 2-hour dawn and dusk restricted timing windows, the likelihood that a murrelet chick would miss a feeding due to noise disturbance is considered to be discountable. After September 15, we expect that all murrelet nestlings have fledged and are no longer present at nest sites (Hammer and Nelson 1998). Therefore, project activities that occur after September 15 would have no effect to murrelets.

With implementation of the seasonal restriction listed above, the proposed project may affect, but is not likely to adversely affect marbled murrelets.

The No Action Alternative would presumably continue current management practices that show little promise of late successional conifer forest development within the geologic floodplain from the confluence downriver to Lake Quinault. The process of river avulsion within the drainage has prevented re-establishment of substantial terrace islands supporting the desired mature conifer forests needed by the Marbled Murrelet and the Blueback salmon.

4.3.1.2. Fish Species

A. Essential Fish Habitat

Essential Fish Habitat (EFH) has been designated by NMFS within the Upper Quinault River watershed under the Magnuson-Stevens Fishery Conservation and Management Act (NMFS 2002). EFH includes all Chinook, and coho salmon habitat. There will be short-term sediment impacts during the construction phase of the project, however the long-term effect on EFH will be beneficial. The project area within the Upper Quinault River is within Essential Fish Habitat and would be adversely affected.

B. Dolly Varden, and Bull Trout Critical Habitat

Bull trout and Dolly Varden within the Quinault River drainage seek habitat components that provide favorable water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors. Maintaining favorable habitat requires stream channel and flow stability (USFWS 2011).

The Preferred Alternative implements management activities to benefit the restoration of the river hydrology, geomorphic processes, and stability of Blueback salmon and all other salmonid species, including bull trout and Dolly Varden. The benefits to bull trout will be substantial as the preferred alternative is implemented. The preferred alternative would potentially have negative impacts for bull trout during ELJ construction (i.e., in-water work that increases turbidity).

The implementation of the Preferred Alternative will have long term, beneficial effects to bull trout. However, there will be short-term adverse effects to bull trout associated with any construction site that requires worksite isolation, dewatering and fish removal. The formal programmatic consultation with ACOE for fish habitat restoration addresses these possibilities and prescribes programmatic methods to mitigate adverse impacts. Short-term adverse effects, including incidental take, do not trigger the need for the preparation of an Environmental Impact Statement (EIS). Each in-water ELJ work site has the potential to result in incidental take of bull trout via direct harm from worksite isolation and dewatering, and in short-term exposure to construction related turbidity plumes.

However, the BMPs and minimization measures in the ACOE programmatic consultation greatly reduce the magnitude and duration of these effects (USFWS 2006).

The proposed action **may affect, and is likely to adversely affect bull trout**. This determination is based on the rationale that the project will result in significant adverse effects, including direct injury from fish capture and handling in and injury or mortality of bull trout in the Upper Quinault River and associated floodplain tributaries. The adverse effects associated with this action will occur over a period of 3 to 4 years in dispersed locations. Key bull trout spawning habitats will not be affected by the action. Therefore, we do not expect that the adverse effects associated with the restoration plan will lead to significant population declines at the project area scale or at the scale of the Quinault River bull trout core area population.

The proposed **action may affect, and is likely to adversely affect designated bull trout critical habitat**. This determination is based on the rationale that the project will result in short-term adverse effects to bull trout critical habitat primary constituent elements, including water quality and stream substrates, associated with 18 km (11 miles) of bull trout spawning and rearing habitat in the Upper Quinault River and associated floodplain tributaries, and annual impact areas to represent a fraction of this total area over a prolonged time period. The project would also result in significant long-term beneficial effects of restoring habitat complexity access to approximately 18 km (11 miles) of floodplain habitats.

The No Action Alternative will continue to maintain the status quo in terms of the existing river processes, the continued degradation of suitable habitat caused by river avulsion, sediment loads, and extreme water temperature changes caused by a lack of dense overstory forests that allows direct solar radiation to reach the river for extended shallow water stretches of the river. The nature of the braided channels without overstory forest protection also increases the predation by raptors on fish in the river. The bull trout is at increased risk within this No Action Alternative.

4.3.2. Water Quality

An alternative would be considered to have a significant effect on water quality if it would substantially degrade water quality, contaminate a public water supply, substantially degrade or deplete ground-water resources or interfere with ground-water recharge, or expose sensitive species or humans to substantial pollutant concentrations.

The Preferred Alternative will not contaminate a public water supply, substantially degrade or deplete ground-water resources or interfere with ground-water recharge, or expose sensitive species or humans to substantial pollutant concentrations.

This Preferred Alternative has been designed to improve existing watershed functions and restore historic functions that were lost as a result of anthropogenic actions and climatological changes. Project activities would have substantial long-term benefits to water quality. While there is the potential for temporary and indirect effects to downstream water quality in the case of a discharge of sediment during construction and during initial project implementation, appropriate BMPs and mitigation measures would be utilized.

In the short-term, during the actual construction of ELJs, there is a possibility of increased sediment loads reaching the stream or being liberated after construction and during freshets that provide the initial flushing of the sites. Although these increased and short-term transformations in sedimentation may be minimal, there are several mitigation measures recommended in Section 5 (Mitigation Measures) to reduce the potential negative effects.

Activities associated with ELJ construction would have the short-term potential to result in temporary negative effects on water quality and sediment levels. Excavation would disturb a significant amount of soil which could conceivably be transported downstream if not planned for or mitigated appropriately. However, construction work would only occur during low water periods and during dewatering of the Quinault River side channels and braided networks and when there are no flows in the channel, to minimize the potential of discharging sediment to the Quinault River or its tributaries.

The installation of ELJs with restorative planting would, in the long-term, realign segments of the Upper Quinault River to restore sinuosity to the channel and to reduce scour in portions of the river. Long-term potential impact will be represented by localized changes in the hydraulics of the river and side channels with ELJs accumulating additional wood debris and maturing of the planted vegetation. Increased accumulation and storage of coarse sediment is expected to occur.

In the long-term, the implementation of the Preferred Alternative will partially reduce sedimentation in the river through improved channel formation, side channel establishment, and less rapid avulsion of the channel perimeter. The Preferred Alternative would improve water quality and salmon spawning habitat in the Upper Quinault River. Sedimentation extremes delivered into the river are still anticipated because of other factors described in this assessment.

The Preferred Alternative also includes elements associated with in-stream habitat restoration and streambank stabilization. In-stream riffles and streambank stabilization structures would be applied to stabilize the toe, bank and overbank zones of the streambank. Installation of streambank stabilization structures would require heavy equipment to be working within the edges of the river channel. The use of heavy equipment, if unmitigated, would have the potential to discharge pollutants to the Quinault River. However, prior to installation of habitat structures or streambank stabilization structures, the river system would be at low flow amounts allowing work to progress without entering the river's waters.

Off-site water quality could be indirectly affected in the scenario that there is a discharge of sediment flowing into the downstream areas outside the project footprint of the ELJ construction activities. Through proper implementation of BMPs (Section 5 - Mitigation Measures), soil erosion would be minimized to avoid adverse affects to water quality. Through the proper implementation of the mitigation measures, there would be no significant direct or indirect affect to water resources as a result of the project.

The No Action Alternative would not improve water quality or salmon spawning habitat in the Upper Quinault River and erosion and sediment transport to Lake Quinault and within the river would continue. The existing backwater effects from the NPS Bridge and continued bank erosion downstream from it would continue to directly affect the river's water quality, supporting fisheries, and other aquatic organisms and directly affect water quality where it empties into Lake Quinault. These conditions are based on technical predictive analyses conducted during previous studies (BOR 2005, QIN 2008).

4.3.2.1. Federal Water Pollution Control Act (Clean Water Act)

Executive Order 11990 (Federal register 1977), Wetlands Protection. *Compliance*. This order directs all Federal agencies shall take action to minimize the destruction, loss or degradation of, and to preserve and enhance the natural and beneficial values of wetlands. The preferred alternative would not result in the destruction, loss or degradation of wetlands. Wetland areas and functional quality may increase as a result of implementing the preferred alternative.

Congress intended the Clean Water Act of 1972 (Public Law 92-500) as amended in 1977 (Public Law 95-217) and 1987 (Public Law 100-4) would protect and improve the quality of water resources and maintain their beneficial uses (USFWS 2000). Section 313 of the Clean Water Act and Executive Order 12088 of January 23, 1987, address Federal agency compliance and consistency with water pollution control mandates. Agencies must be consistent with requirements that apply to "any governmental entity" or private person. Compliance is to be in line with "all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution."

The Clean Water Act (Sections 208 and 319) recognized the need for control strategies for nonpoint source pollution. The National Nonpoint Source Policy (December 12, 1984) provides a protection and improvement emphasis for soil and water resources and water-related beneficial uses. Soil and water conservation practices (BMPs) were recognized as the primary control mechanisms for nonpoint source pollution.

Work in and near wetlands or other waters of the U.S. will require Section 401 certification from Washington State Department of Ecology (WSDOE). WSDOE has extensive Best Available Science (BAS) documents and tools for evaluating wetlands in Washington State. These BAS documents will be incorporated into any review and authorizations involving work in or near wetlands and is made part of this permitting process.

Temporary access roads for instream project work as well as fill placed in waters including wetlands requires U.S. Army Corps of Engineers regulatory approval. The Corps of Engineers wetland permit under Section 404(f) of the Clean Water Act will be mandatory for this project, as will WSDOE Section 401 permitting. Detailed project descriptions will be provided to Corps of Engineers standards that will quantify the amount of wetlands affected prior to implementation. The standard applied for all projects implemented under this plan of action is to avoid wetlands if possible, and if not able to avoid, then to minimize the effects to wetlands considering it has values and functions.

4.3.3. Air Quality

Air Quality would not be considered to be significantly impaired through either the Action or No Action Alternatives associated with the activities described in this assessment. In consideration of Action Alternative 1, the temporally limited amount of time the sites would have large equipment working to install the ELJ structures would be mostly overlooked by people owing to the juxtaposition of the work sites to US101 and ambient large truck traffic present in these areas during July through October.

4.3.4. Socioeconomic Effects

Initial evaluation of the effects associated with the project indicate that there would likely be little to no significant negative effect(s) on the quality of the human environment and no unresolved conflicts concerning the short-term impacts of the restoration activities.

4.3.4.1. Section 106, National Historic Preservation Act Compliance

The National Historic Preservation Act (NHPA), as amended, requires that Federal agencies consider the effects that their projects have on historic properties. Section 106 of this Act and its implementing regulations (36 CR Part 800) provides procedures that Federal agencies must follow to comply with NHPA on specific undertakings. The Act requires Federal agencies to consult with the State Historic Preservation Officer (SHPO), Native American tribes with a traditional or culturally-significant religious interest in the study area, and the interested public The Federal agency is responsible for the identification of historic properties that would potentially be affected by the undertaking. After the identification effort the Federal agency in consultation with the SHPO/THPO, and possibly the Keeper, makes a determination of eligibility. The Federal agency then continues the consultation, which can involve other consulting parties and the ACHP, and makes a determination of potential adverse effects. If there will be adverse effects the agency continues the consultation to find a resolution of the adverse effects. This may or may not involve mitigation.

Section 800.6 of 36 CFR 800 regulations requires agencies to notify the Advisory Council on Historic Preservation (ACHP) and invite their participation for any undertakings that have an adverse effect upon a National Historic Landmark. Section 800.10 directs agency officials, to the maximum extent possible, to undertake such planning and actions as may be necessary to minimize harm to any National Historic Landmark that may be directly and adversely affected by an undertaking. Section 800.10 also directs agencies to notify the Secretary (through NPS) of any consultation involving a National Historic Landmark and invite the Secretary to participate in the consultation where there may be an adverse effect.

Under Section 101(d)(2) of the NHPA, Indian tribes have an opportunity to assume all or any part of the functions of a SHPO in accordance with specific procedures outlined in the Act. The tribal official who has assumed responsibilities of the SHPO for Section 106 compliance on tribal lands under Section 101(d)(2) of NHPA, is referred to as the Tribal Historic Preservation Officer (THPO). The Quinault Indian Nation has assumed the responsibilities of the SHPO for Section 106 compliance on these lands adjacent to the Quinault Indian Reservation.

4.3.4.2. Labor Recruitment

Estimates by the Quinault Indian Nation, Division of Natural Resources have been made on the direct and indirect employment associated with the establishment of restoration components (ELJ construction and restorative planting). These estimates were made as part of a submission by the Quinault Indian Nation for funding to the American Recovery and Reinvestment Act: Upper Quinault River Salmon Habitat Restoration Project in April 2009. The proposal was not funded.

Based on the estimates in the funding request to establish 99 ELJs and initiate restorative planting, the project would have directly created or retained an estimated 119 part or full-time habitat restoration jobs. An additional 210 jobs (which represent indirect and induced employment) would have been created or sustained as the income earned by the project workers is spent in other sectors of the economy. The goal of the proposed action is to employ the local community and other regional support personnel in restoring the physical and biological processes that would have created and maintained a healthy riverine ecosystem supportive of wild anadromous fish.

Table 9. Number and Types of Jobs Estimated for 99 ELJs and reforestation.

Number of Positions and Status	Duties
1 full time	Fisheries Biologist
1 full time	GIS Analyst
1 full time	Grant Administrator
5 full time	Fisheries Technician jobs retained
11 part time	Fisheries Technicians for 2 seasons
2 part time	Scientists
2 part time	Data Entry Technicians
6 part time	Forestry Consultants
4 part time	Chainsaw Operators
17 full time	Laborers, 2 seasons
8 part time	Field Technicians for 2 seasons
16 part time	Forestry Technicians, 2 seasons
12 part time	Engineering jobs
2 part time	Aerial Photographers/LiDAR Operators
5 part time	LiDAR/Photography Processors

Table 9. Number and Types of Jobs Estimated for 99 ELJs and reforestation.

Number of Positions and Status	Duties
12 part time	Logging Equipment Operators
14 part time	Truck Drivers

4.4. Cumulative Effects

There are no anticipated negative cumulative effects related to the action alternative described in this EA.

4.5. Disproportionate Effects

There are no anticipated negative disproportionate effects related to the action alternative described in this EA.

5. Mitigation Measures

5.1. Permitting

Permitting and consultation requirements for proposed activities occurring during habitat restoration projects in the Upper Quinault River are covered under the umbrella of a streamlined permitting process established by the federal, state and county agencies. The streamlined process expedites permitting and ESA consultation for in-stream habitat restoration projects in the State of Washington. Wetlands that are not jurisdictional for the U.S. Army Corp of Engineers (i.e. isolated) remain in the jurisdictional for WSDOE as waters of the state (subject to RCW 90.48, the State Water Pollution Control Act) and requires separate permitting, should impacts be proposed to such wetlands. Standard application forms (i.e. Joint Aquatic Resource Permit Application, Army Corp-USFWS Specific Project Information Form, WDFW Streamlined Fish Habitat Enhancement Application) are used to expedite the exchange of information and decisions between agencies and the project proponent.

Once the application package is received by the lead federal regulatory agency, for example the U.S. Army Corp of Engineers for a Nationwide Permit, they are required to complete all aspects of the permitting process within a reasonable timeline per the permit process. Based on the experience gained from Alder Creek Side Channel Pilot Project (Pilot) and the existing working relationship between the Quinault Indian Nation and the regulatory agencies, the typical timeline to secure permits and complete ESA consultation is 90-120 days. The permitting agencies are usually notified of Quinault Indian Nation's intent to submit permit applications for a proposed project during the assessment and concept design phase several months before the permit application is submitted.

All project activities implemented under the implementation of this Environmental Assessment will be consistent with all project design criteria and conservation measures listed in the ACOE programmatic consultation (NMFS & USF&WS 2008), and site-specific Specific Project Information Forms (SPIFs) will be completed annually for each ELJ project as needed. Those measures are incorporated by reference and will be put into operation during the implementation of projects listed here. Temporary Sediment and Erosion Control BMPs such as silt fencing on vulnerable slopes, water filled isolation dams and diversion structures, construction fencing, and filter fabric would be implemented to minimize soil erosion in the case of storm events during construction. BMPs would be consistent with federal and state permit conditions. Daily BMP inspections during construction would be conducted and remedial actions would be taken should deficiencies be noted. Construction vehicles and equipment will be limited to restricted areas. Construction equipment shall be cleaned to remove any loose dirt or sediment prior to exiting the site. Washing will take place in an area stabilized with crushed stone and drain to an approved sediment trap or basin.

The ACOE Programmatic Biological Opinion (USFWS 2006), included in Appendix A: Project Development Procedures (Section 8) and incorporated in its entirety by reference, details several strategies to minimize the negative effects of erosion and sedimentation to the river during river restoration activities. These mitigation measures will be followed during all project activities and include, but are not limited to the details of Section 5.1.1 (General Prescriptions that Apply to all Proposed Restoration Actions).

5.1.1. General Prescriptions that Apply to all Proposed Restoration Actions

1. **Pre-Construction/Surveying**
   1. All organic material that has to be cleared for access will remain on site.
   2. The removal of riparian vegetation for access will be minimized and estimated in the Specific Project Information Form (SPIF) at the time the COE seeks to conduct the action.
   3. The number of temporary access roads will be minimized and roads will be designed to avoid adverse effects like creating excessive erosion.
   4. Temporary access-ways across slopes greater than 30 percent will be avoided. If temporary access needs to cross slopes greater than 30 percent it will be indicated in the SPIF.
   5. No permanent access-ways will be built. All temporary access-ways will be removed (including gravel surfaces) and planted after project completion.
   6. New temporary stream crossings will avoid potential spawning habitat (i.e. pool tailouts) and pools to the maximum extent possible. They will minimize sedimentation impacts by using best management practices like mats and boards to cross a stream. Best management practices will be listed by each applicant in a SPIF. After project completion temporary stream crossing will be abandoned and the stream channel restored where necessary.
   7. Boundaries of clearing limits associated with site access and construction will be marked to avoid or minimize disturbance of riparian vegetation, wetlands, and other sensitive sites.
   8. A Pollution and Erosion Control Plan, commensurate with the size of the project, must be prepared and carried out to prevent pollution caused by surveying or construction operations.
   9. A supply of emergency erosion control materials will be on hand and temporary erosion controls will be installed and maintained in place until site restoration is complete.
2. **General**
   1. Work windows will be applied to avoid and minimize impacts to listed salmonids or forage fish.
   2. Electrofishing is not proposed in the vicinity of redds from which fry may not have emerged, or in areas where adult salmonids may be holding prior to spawning.
   3. Sandbags may be placed to temporarily keep fish out of work areas. Sandbags will be removed after completion of project.
   4. Temporary roads in wet or flooded areas will be abandoned and restored by the end of the in-water work period.
   5. Existing roadways or travel paths will be used whenever possible.
   6. Any large wood, native vegetation, weed-free topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration.
   7. When construction is finished, the construction area will be cleaned up and rehabilitated (replanted and reseeded) as necessary to renew ecosystem processes that form and maintain productive fish habitats.
   8. Work below the OHWL or mean lower low tide line will be completed during preferred in-water work windows, when listed salmonids or forage fish are least likely to be present in the action area. Exceptions will be requested in the SPIF.

9. If listed fish are likely to be present, the project sponsor will assess what is less impacting to fish, isolation of the in-water work area or work in the wet, see citation "6. Isolation of Work Site".
10. Prepare a Work Area Isolation Plan for all work below the bankfull elevation requiring flow diversion or isolation. Include the sequencing and schedule of dewatering and rewatering activities, plan view of all isolation elements, as well as a list of equipment and materials to adequately provide appropriate redundancy of all key plan functions (e.g., an operational, properly sized backup pump and/or generator). This standard material does not need to be submitted with a SPIF. However, it needs to be available to the Services at their request.
11. Any water intakes used for the project, including pumps used to dewater the work isolation area, will have a fish screen installed, operated and maintained according to NMFS' fish screen criteria (NMFS 1997; NMFS 2008).
12. The site will be stabilized during any significant break in work.
13. Project operations will cease under high flow conditions that may inundate the project area, except as necessary to avoid or minimize resource damage.
14. All discharge water created by construction (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) will be treated to avoid negative water quality and quantity impacts. Removal of fines may be accomplished with bioswales; concrete washout with altered ph, may be infiltrated.

3. Equipment

1. Heavy equipment will be limited to that with the least adverse effects on the environment (e.g., minimally-sized, low ground pressure equipment).
2. When not in use, vehicles and equipment that contain oil, fuel, and/or chemicals will be stored in a staging area located at least 150 feet from the COE' jurisdictional boundary of wetlands and waterbodies. If possible staging is located at least 300 feet away from the COE's jurisdictional boundary of wetlands and waterbodies, and on impervious surfaces to prevent spills from reaching ground water. Where moving equipment daily at least 150 feet of waterbodies would create unacceptable levels of disturbance (multiple stream crossings, multiple passes over sensitive vegetation) a closer staging location with an adequate spill prevention plan may be proposed.
3. When conducting in-water or bank work, hydraulic lines will be filled with vegetable oil for the duration of the project to minimize impacts of potential spills and leaks.
4. Spill prevention & clean-up kits will be on site when heavy equipment is operating within 25 feet of the water.
5. To the extent feasible, work requiring use of heavy equipment will be completed by working from the top of the bank.
6. Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities around the water.
7. Equipment will cross the stream in the wet only under the following conditions:
    a. equipment is free of external petroleum-based products, soil and debris has been removed from the drive mechanisms and undercarriage; and
    b. substrate is bedrock or coarse; and
    c. in soft bottom streams mats or logs are used to drive across to minimize compaction; and
    d. stream crossings will be performed at right angle if possible; and

   e. no stream crossings will be performed at spawning sites when spawners are present or eggs or alevins could be in the gravel; and
   f. the number of crossings will be minimized.

4. **Planting and Erosion Control**
   1. Within seven calendar days of project completion, any disturbed bank and riparian areas shall be protected using native vegetation or other erosion control measures as appropriate. For erosion control, sterile grasses may be used in lieu of native seed mixes.
   2. If native riparian vegetation has to be disturbed it will be replanted with native herbaceous and/or woody vegetation after project completion. Planting will be completed between October 1 and April 15 of the year following construction. Plantings will be maintained as necessary for three years to ensure 50 percent herbaceous and/or 70 percent woody cover in year three, whatever is applicable. For all areas greater than 0.5 acres, a final monitoring report will be submitted to the COE in year three. Failure to achieve the 50 percent herbaceous and 70 percent woody cover in year three will require the applicant to submit a plan with follow up measures to achieve standards or reasons to modify standards.
   3. Fencing will be installed as necessary to prevent access to revegetated sites by livestock, beavers or unauthorized persons. Beaver fencing will be installed around individual plants where necessary.

5. **Water Quality**
   1. Landward erosion control methods shall be used to prevent silt-laden water from entering waters of the United States. These may include, but are not limited to, weed-free straw bales, filter fabric, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas.
   2. Wastewater from project activities and water removed from within the work area shall be routed to an area landward of the OHWL in an upland disposal site to allow removal of fine sediment and other contaminants prior to being discharged to the waters of the United States.
   3. All waste material such as construction debris, silt, excess dirt, or overburden resulting from this project will generally be deposited above the limits of flood water in an upland disposal site. However, material from pushup dikes may be used to restore microtopography, e.g. filling drainage channels.
   4. If high flow or high tide conditions that may cause siltation are encountered during this project, work shall stop until the flow subsides.
   5. Measures shall be taken to ensure that no petroleum products, hydraulic fluid, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or deleterious materials are allowed to enter or leach into waters of the US.
   6. A spill prevention plan will be prepared for every project that utilizes motorized equipment or vehicles. Plan will be available to Service by request.
   7. An erosion control plan will be prepared for every project that results in ground disturbance. Plan will be available to Service by request.

5.1.2. Permanent Sediment and Erosion Control BMPs

The project incorporates permanent sediment and erosion control BMPs into the design. Streambank stabilization structures such as native vegetation and woody debris jams would be used to stabilize streambanks from erosion. Grade control would be achieved using in-stream riffles. These structures would control potential sediment sources after the project has been constructed.

To prevent areas of disturbed soil from contributing sediment to the channels of the Upper Quinault River, all project areas would be revegetated. Floodplain and terrace reforestation will place softwood and conifer seedlings with browse protection to provide for long term vegetative rehabilitation.

The floodplain and terrace forest restoration strategy consists of 1) rapidly establishing conifers and black cottonwood stands that will eventually supply key member pieces for logjams, conifer nursery logs, and floodplain stabilization, and 2) restoring a mature self-sustaining forest. The forest restoration approach emulates natural floodplain and terrace development (e.g., forest succession) found in the Quinault River floodplain, while strategically using individual tree life history characteristics for specific reforestation conditions (e.g., logjam forested islands, young alder floodplain, young mixed conifer deciduous forest, floodplain and terrace meadow, and shrub vegetation).

5.2. Mitigating Soil Rutting Hazard

Mitigation measures for soil rutting hazards include the use of high-track machines as opposed to wheeled equipment for all on-site activities within the high risk soil rutting areas. Standard track machines are suitable for use in the moderate soil rutting risk areas, provided soil moisture is acceptably low. Sites should not be entered with heavy equipment while the soils are saturated.

A protective approach to soil rutting mitigation will be followed on all sites. Although all of the proposed sites are located within areas determined to be low to moderate risk to soil rutting potential, the implementation of the Preferred Alternative activities will be implemented with attention to site vulnerability to compaction and rutting.

5.3. Reducing Seedling Mortality

Although direct seedling mortality owing to soil factors is considered “low” in the Upper Quinault river geological floodplain, the potential for increased seedling mortality from ungulate browsing is high. Elk populations are high in the valley and their browse pressure on hardwoods is substantial. Tree shelters and browse protectors attached to planted vegetation will allow the trees to become established and grow to heights above the browse pressure.

5.4. Spill Control Mitigation

Contractors hired for the restoration work shall implement spill prevention best management practices (BMPs) (e.g., maintain spill prevention kit onsite). As part of the contract requirements, the contractor would produce and adhere to a spill prevention containment and control (SPCC) plan. Heavy equipment would not be parked (overnight) or staged within the ordinary high water mark of a given channel. Construction vehicles and equipment will be serviced in specific upland areas or stabilized areas to prevent accidental spills of fluids, oils and lubricants into surface water. This area will consist of a clean gravel pad with an impervious liner underneath. Refueling and lubrication would occur in specified staging areas outside the ordinary high water mark. Heavy equipment would use only biodegradable hydraulic fluids. All fuels, lubricants, and fluids required for operation of the heavy equipment would be stored in upland staging areas with measures for containment, as specified in the SPCC plan.

5.5. Threatened Bird Mitigation Measures

Both the Northern Spotted Owl and the Marbled Murrelet habitat preference is similar, in that they both prefer habitat consistent with old growth forests for nesting, and the combined nesting period begins around March 1 (Northern Spotted Owl) and ends by September 15 (Marbled Murrelet). Project activities generating noise above ambient levels involved with the Preferred Alternative will not be conducted before 2 hours after sunrise or within 2 hours before sunset, within 250 feet of suitable nesting habitat, from March 1 through September 15 (e.g., activities of helicopter flight, blasting, or pile driving).

The following is summarized without editorial change from the July 8, 2008 United States Department of Commerce, National Marine Fisheries Service, and the United States Department of the Interior, Fish and Wildlife Service: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic, "**Appendix F:" Minimization Measures For Terrestrial Plants And Animals** (NMFS & USF&WS 2008).

5.5.1. Marbled murrelet /marbled murrelet critical habitat

- MM1: Restoration activities generating noise above ambient levels within 200 feet (1.0 mile for blasting and pile driving) of suitable nesting habitat will not occur from April 1 to August 5. Any activities (1.0 mile for blasting and pile driving) occurring within 200 feet of suitable nesting habitat from August 6 to September 15 will only occur between two hours after sunrise and two hours before sunset. Aircraft will maintain at least a 250 ft. distance from nesting habitat between August 6 and September 15, and will only fly near nesting habitat between two hours after sunrise and two hours before sunset.
- MM2: Activities within potential nesting habitat for the marbled murrelet will not remove or kill trees with suitable platforms, remove suitable platforms, or reduce the suitability of the stand as nesting habitat.
- MM3: Activities within potential murrelet nesting habitat in stands of at least one half the site potential tree height will not inhibit the development of the stand into suitable habitat and will not reduce any buffering qualities of the stand for adjacent suitable habitat.
- MM4: Activities which modify stands outside of suitable nesting habitat will not impede development of constituent elements or reduce any buffering qualities of the stand for adjacent suitable habitat.
- MM5: Activities that are conducted in the marine environment shall not generate underwater sound pressure levels that exceed 150dB re: 1µPa2/Hz (<190 dBpeak) at 10 meters. Examples of these types of actions include impact pile driving and use of underwater or nearshore explosives. Explosives are sometimes used to remove or breach dikes and levees.

5.5.2. Northern spotted owl /Northern spotted owl critical habitat

- NSO1: Restoration activities will not result in the removal or degradation of suitable nesting or foraging habitat for northern spotted owls or otherwise impact the suitability of owl habitat.
- NSO2: Restoration activities generating noise above ambient levels within 200 feet (1.0 mile for the use of explosives and pile driving) of suitable nesting habitat will not occur from March 1 to July 31
- NSOCH1: Activities adjacent to critical habitat may involve minimal modification of current high quality suitable habitat, but will not adversely impact constituent elements.
- NSOCH2: Activities may modify younger stands adjacent to critical habitat. However, any modification will not impede development of constituent elements or reduce any buffering qualities of the stand for adjacent suitable habitat.
- NSOCH3: Activities may modify spotted owl dispersal habitat. However, any modification will not result in the stand no longer being considered dispersal habitat.

6. Consultation and Coordination

6.1. Consultation

The Quinault Indian Nation received Consultation from representatives of federal, state and local agencies, and other concerned citizens during the development of this environmental assessment (Table 11).

6.2. Coordination and Permits

6.2.1. Section 10 Nationwide Permit

The U.S. Army Corp of Engineers is responsible for issuing this permit for activities occurring within navigable waters of the United States, of which the restoration reach of the Upper Quinault River is included. A Nationwide Permit is approved by the Army Corp of Engineers upon completion of other federal requirements which are included below.

Timeline for completion: April 2011 – July 2011

6.2.2. Section 106 Consultation – The National Historic Preservation Act

The Quinault Indian Nation and State Historic Preservation Office (SHPO) work together to satisfy this requirement in parallel with the Army Corp Nationwide Permit, USFWS ESA Consultation, and State permitting processes. Findings of an evaluation by Quinault Indian Nation and SHPO will be stated through a letter of concurrence from both parties will be provided to the Army Corp of Engineers and cooperating federal agencies (Figure 30). The resulting decision will result in the standard permitting conditions used to protect historical or cultural sites if encountered during the project.

Each Federal agency is responsible for its Section 106 consultation. The federal agencies work with the SHPO/THPO, the tribes, and other consulting parties to complete the Section 106 process and arrive at a concurrence on historic property eligibility and determination of effects. If there is more than one Federal agency, then one agency can, and is encouraged to, take the lead for Section 106 Consultation. When one agency does take the lead the other agencies are still responsible for the findings and determinations. Hence if the US Army Corps of Engineers requires copies of consultation documents to ensure that the Section 106 consultation obligations are met.

Figure 30. State Historic Preservation Officer Concurrence of Activities.

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
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June 30, 2011

Dr. William E. Schlosser
Kamiak Ridge LLC
1515 NW Kenny Drive
Pullman, Washington 99163

Re: Upper Quinault River Salmon Restoration NEPA Compliance
Log No.: 041211-02-BIA

Dear Dr. Schlosser:

Thank you for contacting our department on behalf of the Quinault Indian Nation. We have reviewed the EA you provided for the proposed Upper Quinault River Salmon Restoration NEPA Compliance document for undertakings in Grays Harbor and Jefferson Counties, Washington.

We concur with your proposed protocols as detailed on pages 15 and 16. Please contact us as the protocol requires when you have developed specific projects.

We would appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4. Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified.

Thank you for the opportunity to comment and a copy of these comments should be included in subsequent environmental documents.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: rob.whitlam@dahp.wa.gov

cc: J. James

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

Figure 31. Tribal Historic Preservation Officer Concurrence of Activities.

July 19, 2011

Dr. William E. Schlosser
Kamiak Ridge, LLC
1515 NW Kenny Dr.
Pullman, WA 99163

RE: Upper Quinault River Salmon Habitat Restoration NEPA Compliance Environmental Assessment July 2011

This letter provides concurrence from the Quinault Indian Nation that the Upper Quinault River Salmon Habitat Restoration NEPA Compliance Environmental Assessment's proposed actions under the Preferred Alternative with Mitigation Measures are not likely to adversely affect cultural resources and follow the terms and conditions specified in the U.S. Army Corp of Engineers 2008 Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation.

Cultural Resources – The Quinault Indian Nation shall fulfill Cultural Resources Section 106 consultation requirements for future restoration projects. If signs of encountering cultural resources occur we are confident that Section 3.5 (Cultural Resources) contains response actions sufficient to protect and preserve unique Quinault Indian Nation artifacts. These comments are based on the current information within the Quinault Indian Nation inventory. However should new information become available, the Nation may update or revise recommendations due to inadvertent discoveries.

Endangered Species Act and Essential Fish Habitat Consultations – The Quinault Indian Nation shall fulfill Endangered Species Act Section 7 and Magnuson-Stevens Act Essential Fish Habitat consultation requirements for future restoration projects. As stated in the Environmental Assessment, the Bureau of Indian Affairs and Quinault Indian Nation have agreed to incorporate all of the appropriate project design criteria and follow the Terms and Conditions as specified in the U.S. Army Corp of Engineers 2008 Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation and subsequent programmatic habitat restoration consultations issued to the U.S. Army Corp of Engineers. Any proposed projects that do not meet the programmatic consultation criteria will be evaluated under separate consultations.

Sincerely,

Mark Mobbs
Environmental Protection Manager
Quinault Indian Nation
Taholah, Washington 98587

6.2.3. Section 401 Consultation - Clean Water Act

The Applicant will need to apply to submit a Joint Aquatic Resource Permit Application (JARPA) to the WSDOE for a 401 Water Quality Certification (WQC). The WSDOE has 180 days from the date of issuance of a Nationwide Permit to issue a decision on the 401 WQC. More detailed information regarding project implementation will be necessary for application review.

The Army Corp of Engineers will request review of the project and a Section 401 WQC from the WSDOE. Issuance of a certification means that WSDOE anticipates that the proposed project will comply with state water quality standards and other aquatic resource protection requirements under the Department's authority. The 401 Certification will cover both the construction and the functioning project after its completion. Conditions of the 401 WQC become conditions of the Section 10 Nationwide Permit. Typical timeline for completion: April – July

6.2.4. Section 404 Consultation - Clean Water Act

Section 404 of the Clean Water Act regulates the discharge of dredged, excavated, or fill material in wetlands, streams, rivers of the United States. The U.S. Army Corps of Engineers is the federal agency authorized to issue Section 404 Permits for certain activities conducted in wetlands or other U.S. waters depending on the scope of the project and method of construction.

Note: A general permit was pending which would give the State the lead for most general 404 permits, enabling this function to be handled during the state permitting process. Typical timeline for completion: April – July

6.2.5. Section 7 Endangered Species Act (ESA) Consultation

In 2008 the U.S. Army Corp of Engineers and USFWS completed a Programmatic Biological Assessment and Biological Opinion intended to streamline the ESA and EFH consultation process for Corps Nationwide Permits (NWP). By doing so they were able to reduce the time to complete permitting and ESA consultation from more than a year to a few months. The U.S. Army Corp of Engineers consults with U.S. Fish & Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) using the Programmatic Biological Opinion to evaluate and identify effects of the proposed project on ESA listed fish, plants and wildlife; critical bull trout habitat and essential fish habitat (EFH). Corp and USFWS use the Specific Project Information Form (SPIF) for the ESA consultation.

All project activities implemented under the implementation of this Environmental Assessment will be consistent with all project design criteria and conservation measures listed in the ACOE programmatic consultation (NMFS & USF&WS 2008), and site-specific Specific Project Information Forms (SPIFs) will be completed annually for each ELJ project as needed. Those measures are incorporated by reference and will be put into operation during the implementation of projects listed here. Typical timeline for completion: April – July.

6.2.6. Hydraulic Code of Washington (HCW)

The Washington State Department of Fish and Wildlife (WDFW) is responsible for regulating activities and protecting aquatic habitats in the State of Washington. This mandate is satisfied by issuing a Hydraulic Project Approval (HPA) for work to occur in or near the water. The HPA permitting process is covered under the streamlined permitting process with permits typically issued within 30-45 days. Typical timeline for completion: April – July

6.2.7. State of Washington Aquatic Lands Act

An Aquatic Land Use Agreement with the Washington Department of Natural Resources (WDNR) will be secured by the Quinault Indian Nation for the restoration reach of the Upper Quinault River. The agreement authorizes access to the river and restoration related activities that would occur within the Ordinary High Water Mark (OHWM) of the Quinault River.

6.2.8. State Environmental Policy Act (SEPA)

The proposed projects would be in compliance with permissible activities and effects already covered by the streamlined permitting and consultation process for habitat restoration projects; the project is exempt from SEPA.

6.2.9. Shoreline Management Act (SMA)

The proposed project would be in compliance with permissible activities and effects already covered by the streamlined permitting and consultation process for habitat restoration projects; the project is exempt from SMA.

6.2.10. NEPA Compliance

The Quinault Indian Nation has contracted with the consulting firm Kamiak Ridge, LLC to write a Programmatic Environmental Assessment (PEA) and decision document for the Upper Quinault River Salmon Habitat Restoration Plan; and to coordinate regulatory and public meetings following Bureau of Indian Affairs NEPA compliance process guidelines. The Bureau of Indian Affairs is acting on behalf of the Quinault Indian Nation, as the Lead Federal Agency for the NEPA compliance process. Timeline for completion of the PEA: February 2011 – September 1, 2011

6.3. Agencies with regulatory and permitting authority

U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
National Marine Fisheries Service
Washington Department of Fish and Wildlife
Washington Department of Ecology
Washington Department of Natural Resources
Washington State Historic Preservation Office
Grays Harbor County
Jefferson County

Table 10. List of Preparers.

Name	Title	Representing	City, State, Zip
William E. Schlosser, Ph.D.	Environmental Scientist and Regional Planner	Kamiak Ridge, LLC	Pullman, Washington 99163
William E. Armstrong, B.A.	Salmon Resources Scientist	Quinault Indian Nation, Division of Natural Resources, Department of Fisheries	Taholah, Washington 98587
Birgit R. Schlosser, B.A.	Environmental Program Support Specialist	Kamiak Ridge, LLC	Pullman, Washington 99163

Table 11. Planning committee membership in the planning for this NEPA Compliance document providing consultation and coordination activities.

Name	Title	Representing	City, State, Zip
Wayne Moulder	T.A. Forest Manager	Bureau of Indian Affairs - Taholah	Taholah, Washington 98587-0039
Joe Fitting	Real Estate Services Officer	Bureau of Indian Affairs - Taholah	Taholah, Washington 98587-0039
BJ Howerton	Acting Regional Director BIA - Portland	Bureau of Indian Affairs – Northwest Regional Office	Portland, OR 97232-4169
Sarah Crumb	Deputy District Director	Congressman Norm Dicks	Tacoma, Washington 98402
Herb Welch	Commissioner	Grays Harbor County	Montesano, WA 98563
Lee Napier		Grays Harbor County	Montesano, WA 98563
Al Scalf	Director of Community Development	Jefferson County	Port Townsend, WA 98368
David Sullivan	Commissioner	Jefferson County	Port Townsend, WA 98368
John Austin	Commissioner	Jefferson County	Port Townsend, WA 98368
Phil Johnson	Commissioner	Jefferson County	Port Townsend, WA 98368
Stacy Hoskins	Director of Community Development	Jefferson County	Port Townsend, WA 98368
Zoe Ann Lamp	Associate Planner DRD Lead	Jefferson County	Port Townsend, WA 98368
Jennifer Steger	Regional Supervisor, Northwest and Alaska Region	NOAA Restoration Center	Seattle, WA 98112-2013
Polly Hicks		NOAA Restoration Center	Seattle, WA 98112-2013
Tiffany Royal	Information Officer	Northwest Indian Fisheries Commission	Olympia, WA 98516

Table 11. Planning committee membership in the planning for this NEPA Compliance document providing consultation and coordination activities.

Name	Title	Representing	City, State, Zip
Karen Gustin	Superintendent	Olympic National Park	Port Angeles, WA 98362
Louise Johnson	Chief of Natural Resources Management	Olympic National Park	Port Angeles, WA 98362
Teri Tucker	Planning and Environmental Compliance	Olympic National Park	Port Angeles, WA 98362
Todd Suess		Olympic National Park	Port Angeles, WA 98362
Dave Bingaman	Division of Natural Resources, Director	Quinault Indian Nation	Taholah, Washington 98587-0189
Jim Plampin	Silviculturist	Quinault Indian Nation	Taholah, Washington 98587-0189
Justine James	Cultural Resource Specialist	Quinault Indian Nation	Taholah, Washington 98587-0189
Larry Gilbertson	Director, Department of Fisheries	Quinault Indian Nation	Taholah, Washington 98587-0189
Mark Mobbs	Environmental Programs Manager	Quinault Indian Nation	Taholah, Washington 98587-0189
Mike Stamon	Special Projects Forester	Quinault Indian Nation	Taholah, Washington 98587-0189
Nancy Eldridge	Planning Forester	Quinault Indian Nation	Taholah, Washington 98587-0189
Karen Allston	Senior Assistant Attorney General	Quinault Indian Nation – OAG	Taholah, Washington 98587-0189
Peter Crocker	Legal Intern	Quinault Indian Nation – OAG	Taholah, Washington 98587-0189
Eric Delvin	Conservation Coordinator	The Nature Conservancy	Seattle, WA 98101
James Schroeder	Director of Freshwater Programs	The Nature Conservancy	Seattle, WA 98101
Chris Jenkins	Regulatory Branch	U.S. Army Corps of Engineers	Seattle, WA 98134-2329
Darren Habel	Biologist	U.S. Army Corps of Engineers	Seattle, WA 98134-2329
Lori Morris	Tribal Liaison	U.S. Army Corps of Engineers	Seattle, WA 98134-2329
Muffy Walker	Regulatory Branch	U.S. Army Corps of Engineers	Seattle, WA 98134-2329
Ron Wilcox	Regulatory Representative	U.S. Army Corps of Engineers	Seattle, WA 98134-2329

Table 11. Planning committee membership in the planning for this NEPA Compliance document providing consultation and coordination activities.

Name	Title	Representing	City, State, Zip
Doug Zimmer	Tribal Liaison and NEPA	U.S. Fish and Wildlife Service	Lacey, WA 98503
Kevin Shelley	ESA/Sec 7	U.S. Fish and Wildlife Service	Lacey, WA 98503
Roger Peters	Supervisory Fish and Wildlife Biologist	U.S. Fish and Wildlife Service	Lacey, WA 98503
Vince Harke	Fish & Wildlife Biologist	U.S. Fish and Wildlife Service	Lacey, WA 98503
Zach Radmer	Biologist	U.S. Fish and Wildlife Service	Lacey, WA 98503
Andy Gendaszek	Hydrologist	U.S. Geological Survey	Tacoma, WA 98402
Christiana R. Czuba	Hydrogeologist	U.S. Geological Survey	Tacoma, WA 98402
Jon Czuba	Hydrologist	U.S. Geological Survey	Tacoma, WA 98402
Patrick Moran	Biologist	U.S. Geological Survey	Tacoma, WA 98402
Rick Dinicola		U.S. Geological Survey	Tacoma, WA 98402
Rich McConnell	Co-Chair	Upper Quinault River Committee	Quinault, Washington 98575
Keith Olson	Co-Chair	Upper Quinault River Committee	Quinault, Washington 98575
Bob Metzger	Aquatic Program Manager	USDA Forest Service, Olympic National Forest	Olympia, WA 98512
Dean R. Millett	District Ranger	USDA Forest Service, Olympic National Forest	Forks , WA 98331
Timothy E. Davis	Forest Planner	USDA Forest Service, Olympic National Forest	Olympia, WA 98512
Lori Ochoa	Federal Permits	Washington Department of Ecology	Olympia, WA 98504-7775
Rick Mraz	E.S.	Washington Department of Ecology	Olympia, WA 98504-7775
Sally Toteff	Regional Director	Washington Department of Ecology	Olympia, WA 98504-7775
Tom Laurie	Advisor on Tribal and Environmental Affairs	Washington Department of Ecology	Olympia, WA 98504-7775
Amy Iverson	Area Habitat Biologist	Washington Department of Fish and Wildlife	Montesano, WA 98563
Stephan Kalinowski	Regional Habitat Program Manager	Washington Department of Fish and Wildlife	Montesano, WA 98563
Brady Scott	Acting Asst Division Manager	Washington Department of Natural Resources	Olympia, WA 98504-7001
Lisa Kaufman	Restoration Manager	Washington Department of Natural Resources	Olympia, WA 98504-7001
Devona Ensmenger	Washington Program Manager	Wild Salmon Center	Port Angeles, WA 98632

7. Public Involvement

The Quinault Indian Nation has involved numerous agencies in discussions regarding implementation of river restoration and salmon habitat recovery in the Upper Quinault River. Several site visits occurred with the Tribes and agencies, since the first investigative study by the Bureau of Reclamation (2005) and the Quinault Indian Nation study (Salmon Habitat Restoration Plan; Upper Quinault River 2008). The Nation has also participated with the Federal agencies in the Upper Quinault River basin in the adoption of management plans and providing input for the need to mitigate the negative effects of anthropogenic activities over the past 100 years.

In March 2011, the invitation of cooperators to the NEPA planning process was initiated by sending letters to Federal, State, County, and local agencies, congressional representatives, and individual landholder stakeholders within the Upper Quinault River Basin by President Fawn Sharp of the Quinault Indian Nation (Table 11). These letters were followed by personal contacts and correspondence by the Quinault Indian Nation's consultant, Kamiak Ridge, LLC, to arrange participation in three planning committee meetings to discuss the scope of the work and the range of restoration activities identified for this river basin.

A session of the Multi-Jurisdictional Planning Committee was held at a tribal facility in Ocean Shores on April 6, 2011. Additional Multi-Jurisdictional Planning Committee meetings were held on June 8 in Lacey, Wa, and July 13 at Amanda Park, Wa (accompanied by a field tour).

Initial press releases concerning this process were published in Nugguam in the May, 2011 issue. Additional press releases were published in June, and July, 2011 in the Nugguam. The field tour, starting in Amanda Park and visiting sites within the Upper Quinault River was published in regional media outlets, including The Daily World (Aberdeen, WA) with interviews and a summary of the restoration activities.

Public review of the EA was conducted from June 13-July 20. Coincidental with this period was a public display in Taholah during Chief Taholah Days on July 2-5, 2011.

The EA document was made available on the internet at:

http://www.Resource-Analysis.com/UQR/ (Figure 32)

Visits to this website was recorded at over 544 unique visitors, and 131 downloads of the PDF format of the EA. This internet site also included word document forms to provide comments, and an interactive comments page allowing people to provide their remarks electronically after verification of their name and contact information.

Figure 32. Internet site hosting the Public Review of the EA.

Copies of the letters and news release are found in Appendix D: Multi-Jurisdictional Planning Committee Correspondence and Public Outreach (Section 11).

8. Appendix A: Project Development Procedures

8.1. Quinault Division of Natural Resources – Upper Quinault River Restoration Project Development Procedure (Bill Armstrong, QIN)

The QDNR applies a task oriented project development procedure (Tasks 1–5) to satisfy design and implementation requirements for habitat restoration projects in the Upper Quinault River. The first step in the procedure is to determine the ownership of property where the project will occur or for access to the project site. Without landowner agreement or consent, project development tasks cannot proceed. Access agreements or partnerships will be negotiated that create a relationship between the Nation and local property owners. Once a legal agreement is reached with the landowner, the procedure may include but is not limited to analyses necessary to 1) assess risks and benefits of treatment in a project area or river reach, 2) identify and develop the appropriate restoration technique, site plans, and engineering designs necessary to meet site or reach specific restoration objectives, 3) identify expected geomorphic and hydrologic responses to treatment, 4) provide sufficient information necessary to identify the specific mitigation or conservation measures necessary to complete the streamlined permitting and programmatic ESA consultation process. Varying levels of analyses are applied depending on location, project specific objectives, treatment technique or design complexity, and associated real and perceived risks to habitat, infrastructure, and property.

The Nation recognizes the federal land managers, specifically the National Park Service (ONP) and the U.S. Forest Service (ONF), may be required to conduct additional analyses or evaluations on a project by project basis prior to implementing a project on lands within their jurisdiction. The QDNR project development procedure when applied to ONP or ONF lands would be modified to include those analyses as required.

8.1.1. Task 1 – Geomorphic Site Assessment and Conceptual Design

A geomorphic site assessment and conceptual design includes a review of pertinent background information including but not limited to applicable reports, plan maps, survey data, LiDAR, and any conceptual sketches or other information. Other sources of information may include aerial photographs, U.S. Geological Survey topographic maps, National Wetland Inventory maps, FEMA maps, historical information about the channel alignment, and previous applicable reports completed for the Quinault River. This information includes past responses of the river to previously implemented projects and ensuring adaptive management is considered and integrated into the site assessment and design work. This will be done during the implementation of scoping for each project. In addition to reviewing background information, a site visit will be conducted and topographic survey completed if necessary to determine the extent and magnitude of changes to site morphology that have occurred since most recent survey or LiDAR data was collected.

Deliverable: Summarize the site's project-relevant geomorphic characteristics including conceptual site design sketches based on the current site conditions.

8.1.2. Task 2 – Hydraulic and Sediment Modeling

Understanding hydraulic and sediment loading conditions, particularly flow depths and velocities and sources of sediment loading under particular boundary conditions, is critical to designing and modeling effects of instream structures. A 1-D hydraulic model will be applied as necessary in HEC-RAS for evaluation in the project area or reach. An appropriate sediment transport model (e.g. USBOR sediment transport model) would be applied. The hydraulic model is used to calculate bed scour depths, sheer stresses, flood velocities, and inundation depths at different scales (i.e. at specific structure locations or through a reach), and then be used to guide the final engineering design. The evaluation will utilize available hydraulic and sediment information. In some cases new data will be collected. LiDAR data (bare earth and first return) will be applied as relevant to established channel geometry in GEO-RAS and evaluate existing conditions. Model calibration will be completed with available information on water elevations associated with specific flow events.

Deliverable: Hydraulic model domain map; existing conditions and proposed conditions will be modeled to evaluate relative effect of the project on flooding and potential erosion; description of hydraulic modeling methodology and results as necessary.

8.1.3. Task 3 – Risk Assessment and Benefit Analysis

A risk assessment and benefit analysis of the proposed restoration actions based on available information and the results from Tasks 1 and 2 will be completed. The assessment will include a description of hazards and potential consequences associated with the proposed technique or project. The risk assessment will also include a list of design assumptions and constraints for use in locating, designing, and constructing structures in the project area. Existing information on resource values, geological/environmental hazards, and facilities (public and private) at risk, will be used in the evaluation.

8.1.4. Task 4 – Engineering Plans, Specifications and Estimates

Engineering plans and specifications will be prepared to 30%, 90% and final bid-ready level for the project. Task 4 includes preparation of plan sets, specifications, and construction schedule, review and comments of the plan sets, meetings between the client and contractor will take place as part of this task, the client will provide all available information on site access, working conditions, and materials in a timely manner, intermediate (draft) plans will be submitted in paper and electronic (pdf) formats; final plans will be submitted in paper, electronic (pdf), and AutoCad formats. The design plans shall also specify procedures to comply with all best management practices specified in the permits.

Deliverable: 30% "permit and consultation" set of plans and documents; 90% set of plans, specifications, and construction documents. In many instances 60% engineer led construction design sets and specifications would be used instead of 90% level designs.

8.1.5. Task 5 – Technical Memorandum

A summary of the information, findings, and recommendations obtained through completion of the project development procedure is in the form of a technical memorandum. The findings in the technical memorandum are used to educate local stakeholders and guide the decision making process to implement both site specific and reach scale projects.

8.2. Quinault Indian Nation Habitat Restoration Project Development and Implementation Process (Outline)

1. **Project Identification** -> Landowner permission and Agreement to proceed (private landowner agreements, State Land Access Agreement, Federal MOU or MOA for federal lands)
2. **Project Development** -> Geomorphic Site Assessment -> Conceptual Design -> Hydraulic and Sediment Modeling -> Risk Assessment and Benefit Analysis -> Landowner Agreement and "Approval"
3. **Access and Materials Storage and Staging** -> Landowner Agreement -> Project Management -
4. **Engineering Plans and Specifications** -> Landowner Agreement -> Federal, State, County Permitting
5. **ESA Consultation & Permitting*** -> Corp-USFWS Programmatic BO/SPIF -> Corp Nationwide Permit -> Corp Section 106 Cultural Resources -> State Historical Preservation Act -> Streamlined State HPA -> County Shoreline Exemption -> NMFS Essential Fish Habitat -> Section 404 CWA
    a. *Effects and Mitigation and Conservation measures identified
6. **Materials Procurement** -> Permitting -> Project Management -> Inventory -> Monitoring
7. **Construction** -> Project Management -> Construction Oversight -> Final Inspection
8. **Project Monitoring** -> Landowner permission and agreements

8.2.1. Restoration Project Priorities (QIN 2008)

- protect existing side channel salmon habitat and complexity
- increase mainstem river channel habitat and complexity
- convert young unstable braids and side channels to old stable side channels
- create mature forested islands in the main channel
- create mature forested terraces in the channel migration zone
- restore mature conifer regeneration process
- restore mature valley forests
- increase and restore connectivity to lateral off-channel habitat
- remove process inhibiting structures from the channel migration zone

9. Appendix B: Instream Structure Designs

This section is summarized without editorial change from the July 8, 2008 United States Department of Commerce, National Marine Fisheries Service, and the United States Department of the Interior, Fish and Wildlife Service: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic (NMFS & USF&WS 2008).

United States Department of Commerce, National Marine Fisheries Service and the United States Department of the Interior, Fish and Wildlife Service have prepared "**Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic**" document on July 8, 2008. That document (FWS No.: 13410-2008-FWS # F-0209), contains a joint biological opinion prepared by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service (the Services) pursuant to section 7(a)(2) of the Endangered Species Act on the proposed suite of nine restoration actions in Washington State (NMFS & USF&WS 2008). In this biological opinion, the Services conclude that the proposed action is not likely to jeopardize the continued existence of the following species of Endangered Species Act-listed fishes: Columbia River and Coastal-Puget Sound Interim Recovery Units of **bull trout (*Salvelinus confluentus*)**, Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), Lower Columbia River Chinook salmon, Upper Columbia River spring-run Chinook salmon, Snake River spring/summer run Chinook salmon, Snake River fall-run Chinook salmon, Lower Columbia River coho salmon (*O. kisutch*), Snake River sockeye salmon (*O. nerka*), Puget Sound steelhead (*O. mykiss*), Lower Columbia River steelhead, Middle Columbia River steelhead, Upper Columbia River steelhead, and Snake River Basin steelhead. The Services have concluded that the proposed action will not result in the destruction or adverse modification of designated critical habitats for all of the above-listed species except Lower Columbia River coho salmon (for which critical habitat has not been designated).

The U.S. Army Corps of Engineers is proposing to permit a total of nine categories of restoration actions throughout the state of Washington: Fish passage, **installation of instream structures**, levee removal and modification, side channel/off-channel habitat restoration and reconnection, salmonid spawning gravel restoration, forage fish spawning gravel restoration, hardened fords for livestock crossings of streams and fencing, irrigation screen installation and replacement, and debris and structure removal.

9.1. NMFS No.: 2008/03598, FWS No.: 13410-2008-FWS #F-0209

Endangered Species Act Section 7 Consultation, Biological Opinion And Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation; Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation.

This document (cited above) is incorporated in its entirety into this Environmental Analysis. All designs and implementation of the preferred alternative will incorporate the strategies detailed in that citation. Specific references to instream structures are included here for specific reference.

The following is cited directly from the "Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation". Numbering is changed, but the content remains unmodified.

9.1.1. Installation of Instream Structures

Anthropogenic activities that have altered riparian habitats, such as splash damming and the removal of large wood and logjams, have reduced instream habitat complexity in many rivers. They have eliminated or reduced features like pools, hiding cover, and bed complexity. Salmonids need habitat complexity for rearing, feeding, and migrating. To improve habitat complexity where an identified need exists, the COE proposes to permit the following practices:

a. **Placement of Woody Debris**
Description: Large Woody Debris (LWD) can be placed in the channel, estuary, or marine environment either unanchored or anchored in place using rock, rebar, or wooden piles. The amount of rock used is limited to that needed to anchor the LWD. The use of metal cables will be limited to situations where no other technique will work.

Conservation Measure: Large trees may be dislodged or felled for constructing in-stream habitat in areas where the following criteria are met: (1) Lack of instream LWD has been identified by a watershed analysis, reach assessment, or similar document as a limiting factor for the subject reach; and (2) Presence of an adequately stocked and healthy mature riparian forest; (3) Felling or tipping (or both) of trees into the water will not significantly impact stream shading; (4) Sufficient natural recruitment of native woody vegetation is expected and the threat of invasive vegetation filling created gaps is minimal or replanting with native woody species is planned; (5) The LWD design aims at providing several years of in-stream habitat benefits; (6) The trees are not suitable habitat for listed terrestrial species. Whenever possible, rootwads will be used for in-stream habitat, too. Attempts will be made to procure and stockpile LWD to be used before felling live trees. Finally, felling trees may be most appropriate where stream access is limited for creating LWD jams.

b. **Placement of Live Stakes**
Description: This technique consists of planting of live cottonwood stakes perpendicular in the ground. The arrays are planted either perpendicular, at slight angles to, or parallel to the flow/course of the river; in the floodplain or into the active channel, depending on the objective of the project. Objectives of flood fencing include:

i. Establish riparian vegetation and mimic (hydraulically) a mature riparian forest. Spaces between rows may be planted with additional riparian vegetation.

ii. Create habitat complexity. The live stakes slow water velocities and collect/catch debris and sediment during bankfull and flood events.
iii. Slow water velocities to reduce scour in the vicinity of riparian plantings, increasing successful establishment of new riparian plantings,
iv. Decrease width to depth ratios in widened channel reaches,
v. Create backwater effects to allow natural reconnection of side channels.

The installation of flood fences is accomplished by boring with augers and placing boles vertically into arrays, or by trenching in adjacent, and staggered, rows to create arrays.

Conservation Measures: All materials removed are replaced once boles are in place, and in fact, are used to reduce scour around boles during the first bankfull events. Boles are generally sealed on the top to prevent excessive desiccation. In sensitive areas, such as side channels and bar locations, this step is omitted.

c. Placement of Engineered Log Jams

Description: For detailed descriptions of each technique refer to the Stream Habitat Restoration Guidelines(Saldi-Caromile, et al. 2004),the Integrated Streambank Protection Guidelines (M. Cramer, et al. 2003), and the Conceptual Design Guidelines: Application of Engineered Logjams (Herrera Environmental Consultants 2006). Engineered log jams are designed collections of LWD. Different types of ELJs include bank protection ELJs (see below, General CM), bar apex ELJs, and grade control ELJs (see below). Engineered log jams are patterned after stable natural log jams and can be either unanchored or anchored in place using rebar, rock, or piles (steel may be used if other long term anchoring is not possible at site. Explain in SPIF). Engineered log jams create a hydraulic shadow, a low-velocity zone downstream that allows sediment to settle out. Scour holes develop adjacent to the log jam. While providing valuable fish and wildlife habitat they also redirect flow and can provide stability to a streambank or downstream gravelbar.

Excluded Activities: Logjams with a primary purpose other than habitat restoration or enhancement.

d. Grade Control Engineered Log Jams

Description: Grade control ELJs are designed to arrest channel downcutting or incision by providing a grade control that retains sediment, lowers stream energy, and increases water elevations to reconnect floodplain habitat and diffuse downstream flood peaks. Grade control ELJs also serve to protect infrastructure that is exposed by channel incision and to stabilize over-steepened banks. Unlike hard weirs or grade control structures, a grade control ELJ is a complex broad-crested structure that dissipates energy more gradually. Examples of grade control ELJs include Bronson Creek, Portland, Oregon (Herrera Environmental Consultants 2006).

e. Trapping Mobile Wood

Description: Construction of wood structures to trap mobile wood. Wood may be anchored with rebar, anchor rocks, and untreated wood pilings. Less than 10 inch diameter steel pilings may be used if necessary for stability reasons. Examples of streamside LWD catchers are outlined in (Slaney and Zaldokas 1997), http://nfcp.org/Archived_Reports/RM97-2.pdf and http://nfcp.org/Archived_Reports/RM96-3.pdf. The Lower Columbia Fisheries Enhancement Group which operates in southwest Washington has installed several of these structures and is willing to offer limited design help.

Conservation Measures: In the marine environment, steel piles will not be driven with an impact hammer.

f. Placement of Boulders

Description: Placement of individual large boulders and boulder clusters to increase structural diversity. Structural and hydraulic diversity is important to provide holding and rearing habitat for salmonids. As with all proposed methods, this treatment will be used in streams that have been identified as lacking structural diversity and that naturally and/or historically had boulders. (Boulders may have been removed historically to facilitate wood transport.) For a more detailed description of potential applications see “Boulder Clusters” in WDFW (2004). Preferably, boulders will be sized and located to avoid the need for anchoring. However, if necessary for design objective, boulders placed on bedrock may be pinned with for example epoxy resin (Hilty system) to ensure long-term stability (Slaney and Zaldokas 1997).

Excluded Activities: Boulders may not be cabled in systems other than bedrock.

g. Boulder Weirs and Roughened Channels

Description:

Full channel-spanning boulder weirs will be installed to enhance or provide fish habitat in stream reaches where log placements are not practicable due to channel conditions (not feasible to place logs of sufficient length, bedrock dominated channels, deeply incised channels, artificially constrained reaches, etc.). Boulder weirs and roughened channels may also be installed for grade control at culverts (see No. 1 above) and constructed side channels. For boulder weirs in wood dominated systems, grade control ELJs (see above) will be used.

Conservation Measures:

1. Boulder weirs will be installed only in:
   a. Highly uniform, incised, bedrock channels.
   b. Stream channels that have been artificially confined between levees or other floodplain revetments that are not feasible to remove or set-back.
   c. Locations for which salmonid recovery plans identifies channel spanning boulder weirs as a priority restoration technique (e.g. lower Entiat River).
   d. To provide grade control at culverts or constructed side channels.
2. Boulder weirs will be low in relation to channel dimensions so that they are completely overtopped during channel-forming, bankfull flow events (approximately a 1.5-year flow event).
   Boulder weirs will be placed diagonally across the channel or in more traditional upstream pointing "V" or "U" configurations with the apex oriented upstream.
3. Boulder weirs will be constructed to allow upstream and downstream passage of all native listed fish species and life stages that occur in the stream at all flows.
4. The project shall be designed and inspected by a multidisciplinary team (including a salmon or trout biologist) that has experience with these types of structures.
5. Full spanning boulder weir placement will be coupled with measures to improve habitat complexity and protection of riparian areas to provide long-term inputs of LWD to the maximum extent possible.
6. Roughened channels will be designed to standards contained in the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual.

h. Gravel Placement Associated with Structure Placement

For work in gravel-deficient areas, a maximum of 100 cubic yards of clean, washed, appropriately sized gravel (river-run gravel, not quarry spalls or crushed gravel) can be imported or relocated and placed upstream of each structure. When placing LWD on the outside of meander bends, bar material can be removed from the inside of the meander bend and relocated immediately up and/or downstream of the new structure. If the work area on the gravel bar is dry, work may be performed without use of a coffer dam. This gravel relocation would be expected to speed up the realignment of the thalweg and protect the new structure.

Excluded Activities:

- Construction of instream structures with a primary purpose other than habitat enhancement.
- Construction of boulder weirs or other channel spanning structures in gravel or finer substrate dominated streams.
- Gravel shall not be placed in areas are currently suitable for salmonid spawning

9.1.2. Side Channel/Off-Channel Habitat Restoration and Reconnection

Description: Side channel habitats are generally small watered remnants of river meanders. They provide important spawning and rearing habitat for juveniles and refuge habitat during high flows. They are most common in floodplains that have been strongly glacially influenced leaving alluvial material in a flat valley floor. Off-channel habitat includes abandoned river channels, spring-flow channels, oxbows and flood swales. Off-channel habitat has been reduced by human activities in the floodplain including diking, removal of LWD, straightening of the channel, and bank armoring.

Restoration techniques covered by the Biological Assessment (BA) focus on the restoration or creation of self-sustaining off-channel habitat. Self-sustaining is not synonymous with maintaining a static condition. Self-sustaining means the restored or created habitat would not require major or periodic maintenance, but function naturally within the processes of the floodplain. However, up to two project adjustments, including adjusting the elevation of the created side channel habitat are included under this proposal. The long-term development of a restored side channel will depend on natural processes like floods and mainstem migration. Over time, the side channel may naturally get drier or be taken over by the main river flow.

The following off-channel restoration activities are covered under the BA:

- Creation of new side channel habitat. This approach would create self-sustaining side channels which are maintained through natural processes. Designs must demonstrate sufficient hydrology.
- Excavating pools and ponds in the historic floodplain/channel migration zone to create connected wetlands.
- Reconnecting existing side channels with a focus on restoring fish access and habitat forming processes (hydrology, riparian vegetation).
- ELJs, barbs and groins may be used to direct some flow through a side channel, see below General Conservation Measures 1.
- Restoration of existing side channels including one-time dredging and an up to two times project adjustment including adjusting the elevation of the created side channel habitat.

Conservation Measures:

1. All side channel and pool habitat work will occur in isolation from waters occupied by listed fish species until project completion, at which time a final opening may be made by excavation to waters occupied by listed fish or water will be allowed to return into the area.
2. Side channel habitat will be constructed to prevent fish stranding by providing a continual positive grade to the intersecting waters of the US or a year around water connection.

9.1.3. General Prescriptions that Apply to all Proposed Restoration Actions

No in-water activities are permitted in bull trout spawning and rearing areas in western Washington.

1. Pre-Construction/Surveying

10. All organic material that has to be cleared for access will remain on site.
11. The removal of riparian vegetation for access will be minimized and estimated in the Specific Project Information Form (SPIF) at the time the COE seeks to conduct the action.
12. The number of temporary access roads will be minimized and roads will be designed to avoid adverse effects like creating excessive erosion.
13. Temporary access-ways across slopes greater than 30 percent will be avoided. If temporary access needs to cross slopes greater than 30 percent it will be indicated in the SPIF.
14. No permanent access-ways will be built. All temporary access-ways will be removed (including gravel surfaces) and planted after project completion.
15. New temporary stream crossings will avoid potential spawning habitat (i.e. pool tailouts) and pools to the maximum extent possible. They will minimize sedimentation impacts by using best management practices like mats and boards to cross a stream. Best management practices will be listed by each applicant in a SPIF. After project completion temporary stream crossing will be abandoned and the stream channel restored where necessary.
16. Boundaries of clearing limits associated with site access and construction will be marked to avoid or minimize disturbance of riparian vegetation, wetlands, and other sensitive sites.
17. A Pollution and Erosion Control Plan, commensurate with the size of the project, must be prepared and carried out to prevent pollution caused by surveying or construction operations.
18. A supply of emergency erosion control materials will be on hand and temporary erosion controls will be installed and maintained in place until site restoration is complete.

2. General

15. Work windows will be applied to avoid and minimize impacts to listed salmonids or forage fish.
16. Electrofishing is not proposed in the vicinity of redds from which fry may not have emerged, or in areas where adult salmonids may be holding prior to spawning.
17. Sandbags may be placed to temporarily keep fish out of work areas. Sandbags will be removed after completion of project.
18. Temporary roads in wet or flooded areas will be abandoned and restored by the end of the in-water work period.

19. Existing roadways or travel paths will be used whenever possible.
20. Any large wood, native vegetation, weed-free topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration.
21. When construction is finished, the construction area will be cleaned up and rehabilitated (replanted and reseeded) as necessary to renew ecosystem processes that form and maintain productive fish habitats.
22. Work below the OHWL or mean lower low tide line will be completed during preferred in-water work windows, when listed salmonids or forage fish are least likely to be present in the action area. Exceptions will be requested in the SPIF.
23. If listed fish are likely to be present, the project sponsor will assess what is less impacting to fish, isolation of the in-water work area or work in the wet, see citation "6. Isolation of Work Site".
24. Prepare a Work Area Isolation Plan for all work below the bankfull elevation requiring flow diversion or isolation. Include the sequencing and schedule of dewatering and rewatering activities, plan view of all isolation elements, as well as a list of equipment and materials to adequately provide appropriate redundancy of all key plan functions (e.g., an operational, properly sized backup pump and/or generator). This standard material does not need to be submitted with a SPIF. However, it needs to be available to the Services at their request.
25. Any water intakes used for the project, including pumps used to dewater the work isolation area, will have a fish screen installed, operated and maintained according to NMFS' fish screen criteria (NMFS 1997; NMFS 2008).
26. The site will be stabilized during any significant break in work.
27. Project operations will cease under high flow conditions that may inundate the project area, except as necessary to avoid or minimize resource damage.
28. All discharge water created by construction (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) will be treated to avoid negative water quality and quantity impacts. Removal of fines may be accomplished with bioswales; concrete washout with altered ph, may be infiltrated.

3. **Equipment**

8. Heavy equipment will be limited to that with the least adverse effects on the environment (e.g., minimally-sized, low ground pressure equipment).
9. When not in use, vehicles and equipment that contain oil, fuel, and/or chemicals will be stored in a staging area located at least 150 feet from the COE' jurisdictional boundary of wetlands and waterbodies. If possible staging is located at least 300 feet away from the COE's jurisdictional boundary of wetlands and waterbodies, and on impervious surfaces to prevent spills from reaching ground water. Where moving equipment daily at least 150 feet of waterbodies would create unacceptable levels of disturbance (multiple stream crossings, multiple passes over sensitive vegetation) a closer staging location with an adequate spill prevention plan may be proposed.
10. When conducting in-water or bank work, hydraulic lines will be filled with vegetable oil for the duration of the project to minimize impacts of potential spills and leaks.
11. Spill prevention & clean-up kits will be on site when heavy equipment is operating within 25 feet of the water.
12. To the extent feasible, work requiring use of heavy equipment will be completed by working from the top of the bank.

13. Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities around the water.
14. Equipment will cross the stream in the wet only under the following conditions:
    a. equipment is free of external petroleum-based products, soil and debris has been removed from the drive mechanisms and undercarriage; and
    b. substrate is bedrock or coarse; and
    c. in soft bottom streams mats or logs are used to drive across to minimize compaction; and
    d. stream crossings will be performed at right angle if possible; and
    e. no stream crossings will be performed at spawning sites when spawners are present or eggs or alevins could be in the gravel; and
    f. the number of crossings will be minimized.

4. Planting and Erosion Control

4. Within seven calendar days of project completion, any disturbed bank and riparian areas shall be protected using native vegetation or other erosion control measures as appropriate. For erosion control, sterile grasses may be used in lieu of native seed mixes.
5. If native riparian vegetation has to be disturbed it will be replanted with native herbaceous and/or woody vegetation after project completion. Planting will be completed between October 1 and April 15 of the year following construction. Plantings will be maintained as necessary for three years to ensure 50 percent herbaceous and/or 70 percent woody cover in year three, whatever is applicable. For all areas greater than 0.5 acres, a final monitoring report will be submitted to the COE in year three. Failure to achieve the 50 percent herbaceous and 70 percent woody cover in year three will require the applicant to submit a plan with follow up measures to achieve standards or reasons to modify standards.
6. Fencing will be installed as necessary to prevent access to revegetated sites by livestock, beavers or unauthorized persons. Beaver fencing will be installed around individual plants where necessary.

5. Water Quality

1. Landward erosion control methods shall be used to prevent silt-laden water from entering waters of the United States. These may include, but are not limited to, weed-free straw bales, filter fabric, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas.
2. Wastewater from project activities and water removed from within the work area shall be routed to an area landward of the OHWL in an upland disposal site to allow removal of fine sediment and other contaminants prior to being discharged to the waters of the United States.
3. All waste material such as construction debris, silt, excess dirt, or overburden resulting from this project will generally be deposited above the limits of flood water in an upland disposal site. However, material from pushup dikes may be used to restore microtopography, e.g. filling drainage channels.
4. If high flow or high tide conditions that may cause siltation are encountered during this project, work shall stop until the flow subsides.
8. Measures shall be taken to ensure that no petroleum products, hydraulic fluid, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or deleterious materials are allowed to enter or leach into waters of the US.

9. A spill prevention plan will be prepared for every project that utilizes motorized equipment or vehicles. Plan will be available to Service by request.
10. An erosion control plan will be prepared for every project that results in ground disturbance. Plan will be available to Service by request.

9.1.4. Isolation of Work Site

To reduce impacts to listed fish and water quality, major habitat restoration projects would be performed in isolation from flowing waters whenever possible. Examples of activities that may be done in the water include placing wood and rock structures that require very little in-water excavation, small scale work in systems with sand or coarser grained substrate and work in rock bottom systems. The choice and rational on whether or not to isolate the worksite needs to be included in the SPIF. The focus needs to be on minimization of impacts on water quality, listed salmonids and forage fish. If worksite isolation and fish capture and removal is the least impacting method, the applicant will follow procedures outlined in “Appendix D” of that report.

When working in the wet some turbidity monitoring may be required, subject to discussions between applicant and the Services. Turbidity monitoring generally is required when working in streams with more than 40 percent fines (silt/clay) in the substrate. Turbidity will be monitored only when turbidity generating work takes place, for example, pulling the culvert in the wet, reintroducing water. The applicant will measure the duration and extent of the turbidity plume (visible turbidity above background) generated. The data will be submitted to the Services.

Measurements of concentration preferably in mg/l are very helpful for the Services. Turbidity measurements are used by the Services to develop procedures to minimize turbidity and estimate take for future projects. If you can provide turbidity measurements in mg/l (NTUs are also less helpful for purposes of comparison with literature values) the Services will greatly appreciate your data.

9.1.5. General Prescriptions that Apply to some of the Proposed Restoration Actions

Bank stabilization, Redirection of Flow, Riparian Invasive Plant Removal and small scale Nutrient Enhancement are frequently associated with restoration actions proposed under this programmatic. For example, riparian enhancements often require some level of bank treatment and invasive plant removal; the installation of LWD often is associated with nutrient enhancement. Neither riparian invasive plant removal nor nutrient enhancement are regulated by the COE. However, if they are part of a project otherwise covered by this programmatic, they should follow the guidelines below:

9.1.5.1. Installation of Bank Stabilization Features:

Description: In many riparian areas anthropogenic activities have led to streambank degradation and accelerated erosion. This usually leads to lack of cover, growth of invasive plants, reduction in pool habitat, and increased fine sediment input and accumulation, which all negatively affect salmonids. Projects that improve riparian habitat conditions for salmonids, such as riparian plantings or side channel construction/reactivation, may utilize the bank stabilization techniques listed below. For a detailed description of each technique refer to Integrated Streambank Protection Guidelines (Cramer et al. 2003).

All restoration/enhancement projects that employ bank stabilization need to have restoration as their primary purpose and need to address the cause of the habitat degradation. Streambank stabilization cannot be the only proposed component, but rather a conservation measure applied to help a primary action like removal of bank protection and installation of riparian revegetation to succeed.

a. **Bank Protection Engineered Log Jams**: The goal of bank protection ELJs is to protect a section of natural stream bank that may be vulnerable to accelerated erosion resulting from project activities or existing infrastructure that have altered the natural stream flow. Bank protection ELJs can be placed intermittently as a series of flow defectors or as a continuous revetment (Herrera 2006). Examples in the Pacific Northwest include the Elwha River in Washington and Johnson Creek in Portland, Oregon.
b. **Groins/Spur Dikes:** Groins are large roughness elements that project from the bank into the channel. Different from barbs, groins extend above the high-flow water-surface elevation. Usually they are constructed in a series to provide continuous bankline roughness.
   Groins must be constructed exclusively from wood with minimal anchor rock. Constructing less permanent (compared to rock) wood groins will ensure that in the long-term the groins do not interfere with natural river dynamics and provide maximal habitat.
c. **Barbs/Vanes/Bendway Weirs:** Barbs, vanes, and bendway weirs are low-elevation structures that project from a bank into the channel. They are angled upstream to redirect flow away from the bank. They increase channel roughness and reduce water velocity near the bank. Barbs have to be constructed from wood with minimal anchor rock. Wooden barbs within the active river channel may be used to allow soft bank treatments such as reshaping and native plantings to mature. Constructing less permanent (compared to rock) wood groins will ensure that in the long-term the groins do not interfere with natural river dynamics and provide maximal habitat.
d. **Rootwad Toes:** Rootwad toes are structural features that prevent erosion at the toe of a streambank. The toe refers to that portion of the steambank that extends from the channel bottom up to the lower limit of vegetation. Rootwad toes can provide the foundation for soft upper-bank treatments such as bank reshaping and soil reinforcement. Rootwad toes provide better fish habitat and have a shorter life span than rock toes.
e. **Bank Reshaping:** Reducing the angle of the bank slope without changing the location of its toe. However, the toe may be reinforced with rootwads or coir logs.

f. **Soil Reinforcement/Soil Pillows:** Soil layers or lifts encapsulated within natural materials. Often the lifts are used to form a series of stepped terraces along the bank which then are planted with woody vegetation.
g. **Coir Logs:** Coir (coconut fiber) logs are long, sausage-shaped bundles of bound-together coir. They are commonly used as a temporary measure to stabilize the bank toe while riparian vegetation grows.

10. Appendix C: Minimization Measures For Terrestrial Plants And Animals

This appendix describes specific measures and practices included in the proposed action to minimize or avoid the exposure of certain endangered, threatened, and proposed terrestrial species managed by USFWS to any effects of the underlying restoration construction activities. These measures include practices that would minimize or avoid any such effects on the designated critical habitat for those species with designated and proposed critical habitat.

This section is summarized without editorial change from the July 8, 2008 United States Department of Commerce, National Marine Fisheries Service, and the United States Department of the Interior, Fish and Wildlife Service: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic (NMFS & USF&WS 2008).

10.1. Threatened Animals

10.1.1. Marbled murrelet /marbled murrelet critical habitat

- MM1: Restoration activities generating noise above ambient levels within 200 feet (1.0 mile for blasting and pile driving) of suitable nesting habitat will not occur from April 1 to August 5. Any activities (1.0 mile for blasting and pile driving) occurring within 200 feet of suitable nesting habitat from August 6 to September 15 will only occur between two hours after sunrise and two hours before sunset. Aircraft will maintain at least a 250 ft. distance from nesting habitat between August 6 and September 15, and will only fly near nesting habitat between two hours after sunrise and two hours before sunset.
- MM2: Activities within potential nesting habitat for the marbled murrelet will not remove or kill trees with suitable platforms, remove suitable platforms, or reduce the suitability of the stand as nesting habitat.
- MM3: Activities within potential murrelet nesting habitat in stands of at least one half the site potential tree height will not inhibit the development of the stand into suitable habitat and will not reduce any buffering qualities of the stand for adjacent suitable habitat.
- MM4: Activities which modify stands outside of suitable nesting habitat will not impede development of constituent elements or reduce any buffering qualities of the stand for adjacent suitable habitat.
- MM5: Activities that are conducted in the marine environment shall not generate underwater sound pressure levels that exceed 150dB re: 1µPa2/Hz (<190 dBpeak) at 10 meters. Examples of these types of actions include impact pile driving and use of underwater or nearshore explosives. Explosives are sometimes used to remove or breach dikes and levees.

10.1.2. Northern spotted owl /Northern spotted owl critical habitat

- NSO1: Restoration activities will not result in the removal or degradation of suitable nesting or foraging habitat for northern spotted owls or otherwise impact the suitability of owl habitat.

- NSO2: Restoration activities generating noise above ambient levels within 200 feet (1.0 mile for the use of explosives and pile driving) of suitable nesting habitat will not occur from March 1 to July 31
- NSOCH1: Activities adjacent to critical habitat may involve minimal modification of current high quality suitable habitat, but will not adversely impact constituent elements.
- NSOCH2: Activities may modify younger stands adjacent to critical habitat. However, any modification will not impede development of constituent elements or reduce any buffering qualities of the stand for adjacent suitable habitat.
- NSOCH3: Activities may modify spotted owl dispersal habitat. However, any modification will not result in the stand no longer being considered dispersal habitat.

10.1.3. Bull Trout

10.1.3.1. Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (70 FR 56212). The core areas reflect the metapopulation structure of bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. Critical habitat units generally encompass one or more core areas and may include foraging, migration, and overwintering (FMO) areas, outside of core areas, that are important to the survival and recovery of bull trout.

Because there are numerous exclusions that reflect land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments. These individual critical habitat segments are expected to contribute to the ability of the stream to support bull trout within local populations and core areas in each critical habitat unit.

The primary function of individual critical habitat units is to maintain and support core areas which 1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (Rieman and McIntyre 1993); 2) provide for persistence of strong local populations, in part, by providing habitat conditions that encourage movement of migratory fish (Rieman and McIntyre 1993, MBTSG 1998); 3) are large enough to incorporate genetic and phenotypic diversity, but small enough to ensure connectivity between populations (Rieman and McIntyre 1993, Hard 1995, Healey and Prince 1995, MBTSG 1998); and 4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations (Rieman and McIntyre 1993, Hard 1995, MBTSG 1998, Rieman and Allendorf 2001).

The Olympic Peninsula and Puget Sound critical habitat units are essential to the conservation of amphidromous bull trout, which are unique to the Coastal-Puget Sound bull trout population. These critical habitat units contain nearshore and freshwater habitats, outside of core areas, that are used by bull trout from one or more core areas. These habitats, outside of core areas, contain Primary

Constituent Elements (PCEs) that are critical to adult and subadult foraging, overwintering, and migration.

Within the designated critical habitat areas, the PCEs for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. Note that only PCEs 1, 6, 7, and 8 apply to marine nearshore waters identified as critical habitat; and all except PCE 3 apply to FMO habitat identified as critical habitat.

10.1.3.2. PCEs:

(1) Water temperatures that support bull trout use. Bull trout have been documented in streams with temperatures from 32º to 72 ºF (0º to 22 ºC) but are found more frequently in temperatures ranging from 36º to 59 ºF (2º to 15 ºC). These temperature ranges may vary depending on bull trout life-history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence. Stream reaches with temperatures that preclude bull trout use are specifically excluded from designation.

(2) Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures.

(3) Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. This should include a minimal amount of fine substrate less than 0.25 inch (0.63 centimeter) in diameter.

(4) A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, currently operate under a biological opinion that addresses bull trout, or a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding with seasonal variation.

(5) Springs, seeps, groundwater sources, and subsurface water to contribute to water quality and quantity as a cold water source.

(6) Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.

(7) An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

(8) Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival are not inhibited.

Critical habitat includes the stream channels within the designated stream reaches, the shoreline of designated lakes, and the inshore extent of marine nearshore areas, including tidally influenced freshwater heads of estuaries.

In freshwater habitat, critical habitat includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line. In areas where ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series. For designated lakes, the lateral extent of critical habitat is defined by the perimeter of the water body as mapped on standard 1:24,000 scale topographic maps.

In marine habitat, critical habitat includes the inshore extent of marine nearshore areas between mean lower low-water (MLLW) and minus 10 meters (m) mean higher high-water (MHHW), including tidally influenced freshwater heads of estuaries. This refers to the area between the average of all lower low-water heights and all the higher high-water heights of the two daily tidal levels. The offshore extent of critical habitat for marine nearshore areas is based on the extent of the photic zone, which is the layer of water in which organisms are exposed to light. Critical habitat extends offshore to the depth of 33 ft (10 m) relative to the MLLW.

Adjacent stream, lake, and shoreline riparian areas, bluffs, and uplands are not designated as critical habitat. However, it should be recognized that the quality of marine and freshwater habitat along streams, lakes, and shorelines is intrinsically related to the character of these adjacent features, and that human activities that occur outside of the designated critical habitat can have major effects on physical and biological features of the aquatic environment.

Activities that cause adverse effects to critical habitat are evaluated to determine if they are likely to "destroy or adversely modify" critical habitat by altering the PCEs to such an extent that critical habitat would not remain functional to serve the intended conservation role for the species (70 FR 56212, FWS 2004). The Service's evaluation must be conducted at the scale of the entire critical habitat area designated, unless otherwise stated in the final critical habitat rule (USFWS and NMFS 1998). Therefore, adverse modification of bull trout critical habitat is evaluated at the scale of the final designation, which includes the critical habitat designated for the Klamath River, Columbia River, Coastal-Puget Sound, and Saint Mary-Belly River population segments.

11. Appendix D: Multi-Jurisdictional Planning Committee Correspondence and Public Outreach

Initiation of this planning effort was conducted by the Quinault Indian Nation and started when developing the Bureau of Reclamation (BOR 2005) river investigation and the following Quinault Indian Nation examination (QIN 2008) of salmonid restoration. The purpose and need for action were identified through these, and other efforts, to stem the loss of optimal river functioning and salmonid habitat within the Upper Quinault River. The Quinault Indian Nation sought to build and strengthen partnerships with federal, state, and county agencies of the region, non-profit and non-governmental organizations, and private landowner groups within the Upper Quinault River basin.

Quinault Indian Nation President Fawn Sharp personally invited representatives (March 7, 2011) from those listed in Table 11, to participate in the preparation of this NEPA Compliance document (Environmental Assessment) (example letter in Section 11.1). Subsequent communications were initiated by the Quinault Indian Nation's planning contractor, Kamiak Ridge, LLC, Managing Member, Dr. William Schlosser, to coordinate planning schedules (Section 11.2), share planning documents (Section 11.2), organize planning committee meetings (Section 11.1), document reviews, and to coordinate the details of formulating this NEPA Compliance document.

Public outreach activities included preparing and disseminating press releases to the Tribal Newsletter (Nugguam, based in Taholah), and regional media sources. Publication of articles by the Nugguam was made monthly in April (Section 11.4), May (Section 11.5), June (Section 11.6), and July, 2011. Publication of these materials by other media outlets was confirmed.

As the public review was announced and the display board was presented at a variety of venue within the region, a 3-fold flyer was distributed. Distribution was made accompanying the display board (Figure 37) and at other locations. The flyer gave readers an introduction to the NEPA effort, where to obtain copies of the EA, and the time period for providing comments (Figure 33 & Figure 34).

Figure 33. Cover panel of 3-fold flyer announcing public review of EA.

Provide Your Input!

Public Comments are Sought through July 20, 2011

This NEPA Compliance effort is a mandatory step in the process to use federal money, or to implement a land management activity on federally managed property. Part of that planning effort includes public participation and the opportunity to provide feedback before it is completed.

You can obtain a full copy of the Environmental Assessment by requesting it from the Quinault Division Of Natural Resources secretary, or download it from the internet at:

http://www.resource-analysis.com/UQR/

Once downloaded you can develop a clear picture of the actions proposed under this series of activities, and the additional actions needed to reinstate a healthy and viable Upper Quinault River ecosystem.

Current condition of the Upper Quinault River

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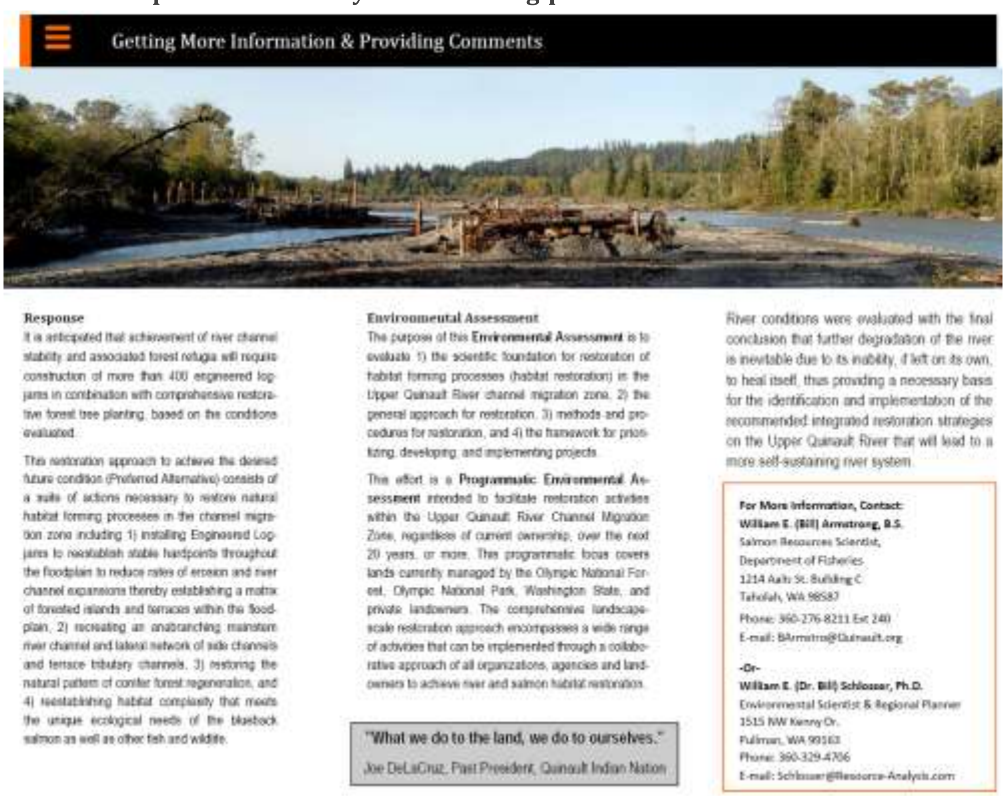
Quinault Indian Nation

National Environmental Policy Act (1969) Environmental Assessment

Upper Quinault River Salmon Habitat Restoration NEPA Compliance

Figure 34. Inside panel of 3-fold flyer announcing public review of EA.



Getting More Information & Providing Comments

Response

It is anticipated that achievement of river channel stability and associated forest refugia will require construction of more than 400 engineered logjams in combination with comprehensive restorative forest tree planting, based on the conditions evaluated.

This restoration approach to achieve the desired future condition (Preferred Alternative) consists of a suite of actions necessary to restore natural habitat forming processes in the channel migration zone including 1) installing Engineered Logjams to reestablish stable hardpoints throughout the floodplain to reduce rates of erosion and river channel expansions thereby establishing a matrix of forested islands and terraces within the floodplain, 2) recreating an anabranching mainstem river channel and lateral network of side channels and terrace tributary channels, 3) restoring the natural pattern of conifer forest regeneration, and 4) reestablishing habitat complexity that meets the unique ecological needs of the blueback salmon as well as other fish and wildlife.

Environmental Assessment

The purpose of this **Environmental Assessment** is to evaluate 1) the scientific foundation for restoration of habitat forming processes (habitat restoration) in the Upper Quinault River channel migration zone, 2) the general approach for restoration, 3) methods and procedures for restoration, and 4) the framework for prioritizing, developing, and implementing projects.

This effort is a **Programmatic Environmental Assessment** intended to facilitate restoration activities within the Upper Quinault River Channel Migration Zone, regardless of current ownership, over the next 20 years, or more. This programmatic focus covers lands currently managed by the Olympic National Forest, Olympic National Park, Washington State, and private landowners. The comprehensive landscape-scale restoration approach encompasses a wide range of activities that can be implemented through a collaborative approach of all organizations, agencies and landowners to achieve river and salmon habitat restoration.

"What we do to the land, we do to ourselves."
Joe DeLaCruz, Past President, Quinault Indian Nation

River conditions were evaluated with the final conclusion that further degradation of the river is inevitable due to its inability, if left on its own, to heal itself, thus providing a necessary basis for the identification and implementation of the recommended integrated restoration strategies on the Upper Quinault River that will lead to a more self-sustaining river system.

For More Information, Contact:
William E. (Bill) Armstrong, B.S.
Salmon Resources Scientist,
Department of Fisheries
1214 Aalis St. Building C
Taholah, WA 98587
Phone: 360-276-8211 Ext 240
E-mail: BArmstro@Quinault.org

-Or-
William E. (Dr. Bill) Schlosser, Ph.D.
Environmental Scientist & Regional Planner
1515 NW Kenny Dr.
Pullman, WA 99163
Phone: 360-329-4706
E-mail: Schlosser@Resource-Analysis.com

On June 7, the Quinault Indian Nation hosted a meeting in Amanda Park (along Lake Quinault), at the High School, for landowners in the Upper Quinault valley to discuss the progress of the Environmental Assessment, the need for NEPA compliance, engineering design of the restoration areas, targeted activities for 2011 projects, and cooperation opportunities for landowners in the area with the Quinault Indian Nation. The meeting was attended by about 30 landowners and included a presentation about NEPA compliance, the public review process, federal and state permitting for activities along the river, and engineering designs of ELJs and locations. Discussions included many questions by landowners about the durability of the ELJ designs and property ownership issues. It was a well received, presented, and informative meeting.

A kiosk was placed at the Chief Taholah Days celebration in Taholah the first weekend of July advertising the public review period of the NEPA Compliance effort of the Quinault Indian Nation and the Multi-Jurisdictional Planning Committee for the Upper Quinault River to restore the river and re-establish Blueback Salmon habitat. The display board (Figure 37) and 3-fold flyers (Figure 33 & Figure 34) were on display at the celebration and viewed by hundreds of visitors.

A NEPA Compliance Public Review field tour was held on July 13, starting at Amanda Park (high school) beginning with a short presentation about the planning effort, the overview of the successful pilot project implemented by the Quinault Indian Nation in 2008 to install 13 engineered logjams at Alder Creek (Figure 35 & Figure 36). Participants then toured of the pilot project site and targeted sites for installation of ELJs and restorative planting along the Upper Quinault River (Figure 35). The field tour was attended by approximately 30 individuals and included informative discussions about river restoration and salmon habitat needs.

Figure 35. Field tour participants along the Upper Quinault River at the 2008 pilot project (left) and within a target area for protection activities including restorative planting and ELJ placement (right).


Figure 36. ELJ placed by QIN during the 2008 pilot project (left), accumulating decked wood from river contributions (right). Main channel is in background, and new side channel is forming in foreground.

11.1. Example Invitation Letter to Participate from President Sharp (March 7, 2011)

Quinault Indian Nation

POST OFFICE BOX 189 • TAHOLAH, WASHINGTON 98587 • TELEPHONE (360) 276-8211

March 7, 2011

James Schroeder, Director of Freshwater Programs
The Nature Conservancy
1917 First Avenue
Seattle, WA 98101

Dear James Schroeder, Director of Freshwater Programs

I am writing on behalf of the Quinault Indian Nation (Nation) to update you on our progress in implementing the Upper Quinault River Salmon Habitat Restoration Plan (Plan) and to request your participation in working with us to satisfy Upper Quinault River Restoration NEPA compliance requirements.

The Nation is pleased to announce we have retained Kamiak Ridge, LLC (Kamiak) to assist us with NEPA analysis for the Plan. I take this opportunity to introduce you to our lead consultant with Kamiak: Dr. Bill Schlosser. Dr. Schlosser will be drafting the environmental assessment and leading the Nation through the NEPA process. The Bureau of Indian Affairs will be the lead federal agency for NEPA. Dr. Schlosser will represent the Nation in requesting your cooperative participation in developing an Environmental Assessment. I would appreciate your willing participation and response to his requests, and I ask that you work with Dr. Schlosser and the Nation's and BIA staff to make this Project a success.

In the coming weeks, Dr. Schlosser will contact you to schedule a meeting to brief you on the Nation's approach and timeline for completion of the Upper Quinault River Restoration NEPA process. The goal of the Nation is to complete an Environmental Assessment and obtain a final agency decision by September 1, 2011.

In addition to completing NEPA analysis of the activities identified in the Plan, the Nation recently secured funding to conduct risk assessment, hydraulic modeling, design, and prioritization of treatment sites for 9.2 kilometers of the Upper Quinault River. In addition, we will be working with private landowners this summer to build a series of engineered logjams to address erosion and habitat concerns. ELJ construction will also be occurring in the vicinity of Alder Creek this summer to further restoration in that reach of the upper Quinault River.

Again, I appreciate your cooperation in advance in working with Dr. Schlosser as we move forward with satisfying the NEPA process for the Plan.

Sincerely,

Fawn R. Sharp, President – Quinault Indian Nation

CC: Eric Delvin, Community Conservation Coordinator
David Rolph, Director of Conservation Programs - Washington Coast

11.2. Example Invitation Letter to Coordinate Participation sent by Dr. Schlosser of Kamiak Ridge (March 14, 2011)

March 14, 2011
Colonel Anthony Wright, Commander Seattle District, U.S. Army Corps of Engineers
Lori Morris, Tribal Liaison
Nancy Chin, General Investigations/Continuing Authorities Program Manager

Earlier today, I called and left a phone message for you and hope that we can talk about the U.S. Army Corps of Engineers' participation with the Quinault Indian Nation in the Upper Quinault River.

I am Dr. Bill Schlosser of Kamiak Ridge, and have contacted you on behalf of the Quinault Indian Nation concerning correspondence you recently received from President Fawn Sharp about river habitat restoration within the Upper Quinault River. My efforts today have been to confirm your participation in the planning meetings we are conducting to complete an Environmental Assessment, under NEPA compliance, for the projects the Tribal Nation is planning for this stretch of the Upper Quinault River to enhance Sockeye Salmon habitat.

The planning sessions for this effort will be held in Taholah's lower village at the Community Center, located on the south side of Quinault Street, between 1st and 2nd Ave. Our first meeting will be April 6, starting at 10:00 AM, lunch will be hosted by the Nation, and the meeting will be concluded by 3:00.

Other meetings will be held on June 8, and then a yet undetermined meeting in July or August. That last meeting will be based on cooperator availability and the document's preparedness for public review and finalization. We will work with the planning committee members to set that date early. We have decided to limit the number of meetings for this effort to three sessions in exchange for the desire to work with the planning committee over written correspondence of e-mail and postal exchanges, telephone discussions, face-to-face meetings, and internet file exchanges as the opportunities arise.

We would like to count on your participation in this effort. It is the desire of the Quinault Indian Nation to complete this NEPA compliance effort by September 1, including approval by the BIA Northwest Regional Office in Portland. Dr. BJ Howerton, Environmental Sciences Manager will be the BIA's representative providing oversight and signing the letters of approval and Finding of No Significant Impact (FONSI). Once completed, the EA will allow the Quinault Indian Nation to begin implementation to build the Engineered Logjams that have been designed by Environmental Engineering firms contracted by the Nation over the past several years.

I would like to talk with you to discuss this further. Call the Pullman number listed in the footer of this message. Or, you can respond to this message with a good time for me to call you.

Have a great week!

-Dr. Bill
William E. Schlosser, Ph.D.
Kamiak Ridge, LLC

11.1. Example Acceptance to Participate Letter (March 25, 2011)

USDA United States Department of Agriculture | Forest Service | Olympic National Forest | 1835 Black Lake Blvd SW Suite Olympia, WA 98512 (360) 956-2300 FAX: (360) 956-2330

File Code: 1950
Date: March 25, 2011

Fawn R. Sharp
President
Quinault Indian Nation
Post Office Box 189
Taholah, WA 98587

Dear Ms. Sharp:

Thank you for your March 7, 2011 letter which provided an update on your progress in implementing the Upper Quinault River Salmon Habitat Restoration Plan (Plan). This is an exciting project that will help meet shared goals for natural resource management in the upper Quinault River area.

In your letter you requested our cooperative participation in working to satisfy NEPA compliance requirements for the Plan. As we currently understand the Plan we do not envision the Forest having jurisdiction in this NEPA process. Therefore we respectfully decline to become a cooperating agency as defined in CEQ's NEPA implementing regulations (40 CFR 1501.6).

While we are unable to become a cooperating agency due to lack of jurisdiction we are very interested in making this project a success. We will gladly provide support to the NEPA process by responding to information requests, as allowed by other program commitments, from the Bureau of Indian Affairs (lead federal agency) and the contractor (Kamiak Ridge, LLC) who is assisting you in the NEPA process. Your lead consultant, Dr. Bill Schlosser, has already contacted Bob Metzger, the Forest's Aquatics Program Manager, and Bob has agreed to attend a meeting scheduled for early April.

Thank you again for keeping us informed about this project. Please continue to use Bob Metzger as the Forest's primary point of contact for information requests and the Forest's participation in the NEPA process. Bob can be reached at the Forest Headquarters address listed above, by phone at 360-956-2293, or by email at rpmetzger@fs.fed.us.

Sincerely,

MARGARET PETERSEN
Acting Forest Supervisor

cc: Dean R Millett, Kathleen OHalloran, Robert P Metzger

11.2. Example Acceptance to Participate Letter (April 6, 2011)

Peter Goldmark
Washington State
Commissioner of Public Lan

April 6, 2011

The Honorable Fawn R. Sharp, President
Quinault Indian Nation
P.O. Box 189
Taholah, WA 98587

Dear President Sharp:

I appreciate your correspondence regarding the Upper Quinault River Salmon Restoration Plan. The Washington State Department of Natural Resources (DNR) would be happy to participate in the NEPA analysis for the plan, especially since the Upper Quinault River is a navigable river and the shorelands are state-owned aquatic lands.

As I believe you are aware, in 2008, DNR issued the Quinault Indian Nation an Aquatic Lands Right-of-Entry Agreement, 23-08344, for the Alder Creek Side Channel Pilot Project, which we understood was Phase 1 of this project. In addition, on March 24, 2009, DNR provided the Nation with a letter of support in your effort to seek federal funding for Phase 2 of this project. We are glad to hear that the second phase of this project is proceeding to the environmental review process.

The appropriate person at DNR to consult with on this project is Brady Scott, the Acting Assistant Division Manager responsible for state-owned aquatic lands in your area. Please have Dr. Schlosser contact him directly to discuss the Nation's approach and timeline for completion of the Upper Quinault River Restoration NEPA process. Brady Scott and his staff would also be involved in any further authorization of state land which is necessary for Phase 2 of this project. Brady Scott can be reached at 360-460-1811, or by email at brady.scott@dnr.wa.gov.

I wish you all the best as you proceed with this worthwhile project.

Sincerely,

Peter Goldmark
Commissioner of Public Lands

cc: Leonard Young, Department Supervisor
Bridget Moran, Deputy Supervisor for Aquatics and Environmental Protection
Rodney Cawston, DNR Tribal Liaison
Kristin Swenddal, Aquatic Resources Division Manager
Brady Scott, Acting Asst. Aquatic Resources Division Manager
#10-065

Department of Natural Resources
1111 Washington ST SE
MS 47001
Olympia, Washington 98504-7001
(360) 902-1000

11.3. Example Correspondence to the Kick-off Meeting (April 8, 2011)

MEMO

To: Sarah Crumb, Deputy District Director, Congressman Norm Dicks
From: William "Dr. Bill" Schlosser, Kamiak Ridge, LLC
Date: 4/8/2011
Re: Upper Quinault River NEPA Compliance Planning Session on April 6, 2011
Message:

I extend my appreciation to everyone who attended the Upper Quinault River NEPA Compliance Planning effort on Wednesday, April 6, 2011, at the Quinault Beach Resort and Casino. Every agency, department, and organization that was invited to attend this planning effort provided representatives to this meeting. In addition to being well attended, the discussions were lively, informative, and expressed a cooperative tone to work together with the Quinault Indian Nation to accomplish the goals of this effort.

We were all encouraged by the ending series of comments shared by everyone in the meeting as each person expressed their willingness to participate as a Cooperator or Collaborator, what they will contribute to this effort, and what each person desires to get from this effort. Everyone expressed the desire to help realize a return of salmon habitat and salmon populations in the Quinault River. We were especially encouraged by the comments to repeat this process in other areas where salmon habitat has been damaged by anthropogenic changes.

We look forward to continued correspondence and our next planning session for this project on June 8. The meeting location and details will be sent to you soon. In the meantime, we will be sharing the preliminary Draft EA around the beginning of May.

Thank you again for participating!

Cc: Dave Bingaman, Manager Quinault Division of Natural Resources
Bill Armstrong, Fisheries Biologist, Department of Fisheries, Quinault DNR
President Fawn Sharp, Quinault Indian Nation

11.1. Example Correspondence by Cooperator (May 6, 2011)

United States Department of the Interior

NATIONAL PARK SERVICE

Olympic National Park
600 East Park Avenue
Port Angeles, Washington 98362-6798

IN REPLY REFER TO:
D18 (OLYM-PC)

May 6, 2010

Fawn Sharp, President
Quinault Indian Nation
P.O. Box 189
Taholah, Washington 98587-0189

Dear Fawn:

I am writing to you regarding the environmental assessment (EA) that is being prepared by the Quinault Indian Nation (QIN) and Bureau of Indian Affairs (BIA) to fulfill the requirements of the National Environmental Policy Act (NEPA) for actions identified by the QIN in the Upper Quinault River Salmon Habitat Restoration Plan.

We received your letter dated March 7, 2011 requesting that Olympic National Park (Park) participate in the NEPA process. We responded that the park would participate in the planning effort, and Park staff attended the interagency workshop hosted by the QIN on April 6 to learn more about the scope of work and project timeline. As we understand it, the Park is being asked to be a reviewing agency.

At this meeting we learned that the EA that the QIN is preparing proposes actions across many jurisdictions in the Upper Quinault River watershed, including within the boundaries of the Park. Actions within the Park will require separate NEPA documentation in addition to the EA that is being prepared by the QIN.

We received a timeline for completion of the EA from QIN consultant, Dr. Bill Schlosser on April 28, 2011(attached). The proposed schedule provides for a five-day interagency review of the draft EA prior to public release from Monday, May 9 through Friday, May 13, 2011. As a reviewing agency, we would like to request an additional two to three weeks for that review.

We would like to work in partnership with the QIN and BIA to fulfill mutual objectives related to the restoration of the Upper Quinault River watershed in a manner consistent with NPS Management Policies and the Park's 2008 GMP. If you would like to meet or schedule a phone call to discuss further, please contact me at (360) 565-3004, or call Environmental Protection Specialist, Teri Tucker at (360) 565-3008 for more information.

Sincerely,

Karen Gustin
Superintendent

CC: (via email) B.J. Howerton, Bureau of Indian Affairs [BJ.Howerton@bia.gov]

11.2. Example Correspondence Announcing Planning Committee Review of Draft EA (May 9, 2011)

May 9, 2011

John Austin
Commissioner
Jefferson County
Jefferson County Administrative Building
P.O. Box 1220
Port Townsend, WA 98368

It is with extreme pleasure that I provide you with this e-mail message to let you know that the Preliminary Draft Environmental Assessment for the Upper Quinault River Salmon Habitat Restoration has been reviewed by the Quinault Division of Natural Resources and promoted to Draft Environmental Assessment, ready for your review.

You can access the plan in a couple of ways.

1. Use the FTP site we displayed at the project planning kickoff meeting
2. Access the plan for download from the web site.

FTP site:

Address: FTP://data.Resource-Analysis.com/
User: QINSalmon
Password: NEPA2011

This site is also useful to access other files related to this plan, and to convey data to us at Kamiak Ridge or the Quinault Division of Natural Resources)

Web site:

Address: http://NIMS.Kamiak-Ridge.com/UQR/FilesUQR.html

Download the files using your web browser.

At both access points, you will be given the option of downloading the file in PDF format, or as a Word file. There are 2 PDF options, 1) full resolution file (about 8 MB), and a reduced resolution file (6 MB). If you have the download bandwidth, the higher resolution is better to look at and print from. The Word file is in MS Word version 2007. It is a much larger file (34 MB).

If you download the PDF file, and you have Acrobat Pro, then please use this software's functionality to enter your edits directly into the PDF. Change the file name to include your name as the reviewer, and return it to the FTP site.

If you download the Word file, and wish to provide comments, please turn on the track changes option to record your edits. Then return your edits in the word file to the FTP site – change the file name to end with your name showing that it was done by you.

If you cannot enter your edits directly to either document, then please follow this protocol when conveying your comments:

1. Indicate the section number where the edit can be found (e.g., 3.1.4)
2. If you would like to see a text change, copy the text into your e-mail message or word file, then enter your changes or comments.
3. If you have context comments, provide them.
4. Please do not rely on page numbers to reference your edits as these will change rapidly as the document is modified. The section numbers are most useful.

Timing:

A couple weeks ago I sent you a revised timeline indicating that we would provide you with the Draft version to edit on May 9, expecting edits by May 13. We were not prepared to deliver it to you on the morning of May 9 (continuing edits), but we are delivering it now, and ask that you provide your comments by Friday, **May 20. The extra week for review should be beneficial for everyone**.

I ask that you provide your comments to me, via e-mail at this address. If you have any questions you can contact me (number listed below) or Bill Armstrong at QDNR (360-276-8211 ext 240) barmstro@quinault.org.

We are preparing for all edits to be responded to and integrated into the EA, and reviewed by the Quinault Division of Natural Resources staff starting as soon as all edits from this planning committee review are integrated.

We are anticipating our planning committee meeting on June 8, in Lacy. We look forward to seeing you there!

-Dr. Bill

William E. Schlosser, Ph.D.
Kamiak Ridge, LLC
Managing Director
1515 NW Kenny Dr.
Pullman WA 99163
Tel Pullman: 509-592-7650
Tel Port Orchard: 360-329-4706
Tel Boise: 208-608-5775
Schlosser@Resource-Analysis.com
Kamiak@Resource-Analysis.com
http://www.Resource-Analysis.com

11.3. Example Correspondence by Cooperator Concerning Cooperation on the EA (May 23, 2011)

United States Department of the Interior
NATIONAL PARK SERVICE
Olympic National Park
600 East Park Avenue
Port Angeles, Washington 98362-6798

IN REPLY REFER TO:
D18 (OLYM-PC)

May 23, 2011

Fawn Sharp, President
Quinault Indian Nation
P.O. Box 189
Taholah, Washington 98587-0189

Dear Fawn:

I am writing in response to the request sent on behalf of the Quinault Indian Nation (QIN) by Dr. William Schlosser via email on May 9, 2011. Dr. Schlosser requested our review of a draft environmental assessment (EA) prepared by the QIN and Bureau of Indian Affairs (BIA) to consider actions identified in the QIN Upper Quinault River Salmon Habitat Restoration Plan.

As currently proposed a considerable portion of the potential area of effect is within Olympic National Park. Consequently the QIN and BIA have requested that we review the internal draft document. We appreciate your consideration in offering to adjust the desired reply date to provide an additional week for agency review as compared to your original schedule however, it remains insufficient time to adequately review the draft document and provide the detailed comments requested by Dr. Schlosser.

My staff is in the process of reviewing the draft EA, and will provide the QIN and BIA with written comments by May 31, 2011 on areas outside the Park. The National Park Service Organic Act does not allow us to delegate to another agency or tribe the mandatory analyses necessary to determine whether impairment or unacceptable impacts may occur. We indicated to you in our letter dated May 6, 2011, that the actions proposed within Olympic National Park will require a finding of no significant impact (FONSI) signed by the National Park Service (NPS).

We would like to affirm our interest in partnering with the QIN and BIA to fulfill mutual objectives related to the restoration of the Upper Quinault River watershed in a manner consistent with NPS Management Policies and the Park's 2008 GMP. If you would like to meet or schedule a phone call to discuss further, please contact me at (360) 565-3004, or call Environmental Protection Specialist, Teri Tucker at (360) 565-3008 for more information.

Sincerely,

Karen Gustin
Superintendent

CC: (via email) B.J. Howerton, Bureau of Indian Affairs [BJ.Howerton@bia.gov]
Dr. William Schlosser, [Schlosser@Resource-Analysis.com] and Bill Armstrong, QIN

11.4. Press Release Published in Nugguam April 2011

Quinault Blueback Recovery
By William E. Schlosser, Ph.D. & Birgit R. Schlosser
Kamiak Ridge, LLC

Since time immemorial, the Quinault River has been the home to salmon including the sockeye (Blueback) salmon. They are born here, raised in the cool, clear waters of the Quinault River, and then released to the wide world's oceans. They return home to breed and lay their eggs, entrusting their offspring to the care of the river as the entire cycle is repeated. The waters have changed, and fish are not as abundant as they once were.

The Quinault River floodplain has been drastically altered over the past century as timber was clearcut from the shorelines, bridges were erected, homes placed along the river banks, and roads built. Land use activities influenced the natural behavior of the river in the valley bottom. The populations of Blueback salmon, traditionally considered a cultural icon of the Quinault Nation, are especially sensitive to the changes of the river and have become dangerously low in the last few decades to the point that total extinction of the species is a risk.

The Blueback need a healthy network of side channels located adjacent to the main river channel. Mature timber stabilizing stream banks and potentially serving as hard points for log jams have provided a favorable combination of habitat features as reliable nurseries for the salmon eggs. Currently, the Quinault Hatchery at Lake Quinault is one of the reasons the Blueback can still hold on to life in the the remaining fewer than three miles of spawning habitat of the ever meandering river.

Unless about 12 miles of degraded river floodplain are returned to sustainable habitat conditions through a comprehensive and science based recovery effort, the Blueback risks virtual extinction. During the last decade, the Quinault Department of Fisheries has conducted scientific research to develop a viable strategy to gradually restore the Blueback river habitat. A plan for salmon restoration involves, as its critical component, the introduction of simulated natural log jams (engineered log jams) in the river, helping to stabilize the river floodplain and creating sustainable side channel spawning and rearing habitat for the Blueback.

Restoration of the Blueback populations translates into the long term recovery program of the entire landscape-based ecosystem. Installation of engineered Log Jams will be enhanced with the floodplain tree planting component to help the river recover from a century of destabilizing changes. When the ELJs are strategically placed along high spot islands of the river basin, they will be planted with alder, black cottonwood, Sitka spruce, and Douglas-fir so that a nature forest has a chance of recovery within the basin. The restoration project will become a logical extension to other components of the same work already conducted by the Nation's Department of Fisheries to keep improving the quality of the native rearing habitat and sockeye supplementation program at Lake Quinault.

The restoration program was started several years ago with a pilot project to install 13 engineered logjams in Alder Creek (within the Upper Quinault River basin) in an effort to deflect the main river channel away from this side channel, and resulted in Blueback spawning during the first year! The approach supported by the local Quinault valley community and other stakeholders proved successful and very exciting in its immediate effect.

The next phase of the restoration effort is scheduled for this year. To carry out this work, the Quinault Indian Nation must work with federal compliance requirements for using federal money and with private, state, and federal land management agencies to complete a National Environmental Policy Act (NEPA) assessment of the actions being proposed. The NEPA compliance for the preparation of an Environmental Assessment will make it possible for the Nation to install more ELJs to continue the Blueback salmon recovery effort.

The Nation will host a NEPA Compliance meeting on April 6, at the QBRC in Ocean Shores where representatives from 17 different federal offices, agencies, state departments, County representatives, NGOs, and others will meet to begin the Environmental Assessment planning effort. The planning team is coming together to assist in the development of a strategy to make the salmon restoration effort extend for decades to come.

The Environmental Assessment will be showcased at a kiosk at Chief Taholah Days in July for interested people to learn more about what is happening. Articles in the Nugguam will be published to keep everyone aware of the progress. The Bureau of Indian Affairs will review and approve the Environmental Assessment by September 1. Installation of the ELJs will begin in September and October while the river's waters are low, so that when the returning Blueback adults get to the river, they will find improved habitat to spawn in.

The restoration of the Upper Quinault River will take decades of consistent and dedicated effort. The restoration will initially require a change from the situation we have now. This is where we start on a long road of moving the decision-making process from the level of an immediate fix to an approach of providing long-term benefits for both the river ecosystem and the people embraced by it. Let us first stop the damage that is happening now, and give the river a chance and time to recover.

If you have questions about these efforts, contact Bill Armstrong of the Quinault Division of Natural resources, Department of Fisheries, at 360-276.8211 Ext 240.

11.5. Press Release Published in Nugguam May 2011

Quinault Blueback Recovery

By William E. Schlosser, Ph.D. & Birgit R. Schlosser
Kamiak Ridge, LLC

Since time immemorial, the Quinault River has been the home to salmon including the sockeye (blueback) salmon. They are born here, raised in the cool, clear waters of the Quinault River, and then migrate out to the wide world's oceans. They return home to spawn, entrusting their off spring to the care of the river as the entire cycle is repeated. The waters have changed, and fish are not as abundant as they once were.

The Quinault River floodplain has been drastically altered over the past century as timber was clearcut from the shorelines, bridges were erected, homes placed along the river banks, and roads built. Land use activities influenced the natural behavior of the river in the valley bottom. The populations of blueback salmon, traditionally considered a cultural icon of the Quinault Nation, are especially sensitive to the changes of the river.

In order to thrive, the blueback need a healthy network of side channels located adjacent to the main river channel. Mature timber stabilizing stream banks and potentially serving as hard points for log jams have historically provided a favorable combination of habitat features as reliable nurseries for the salmon eggs.

Until 12 miles of degraded river floodplain are returned to sustainable habitat conditions through a comprehensive and science based recovery effort, the blueback population will continue to decline. During the last decade, the Quinault Department of Fisheries has conducted scientific research to develop a viable strategy to gradually restore the blueback river habitat. A plan for salmon restoration involves, as its critical component, the introduction of simulated natural log jams (engineered log jams) in the river, which will help stabilize the river floodplain and create sustainable side channel spawning and rearing habitat for the blueback.

Restoration of the blueback translates into the long term recovery program of the entire landscape-based ecosystem. When the engineered log jams are strategically placed along high spot islands of the river basin, they will be planted with alder, black cottonwood, Sitka spruce, and Douglas-fir so that a natural forest has a chance of recovery within the basin. These restoration efforts are a logical extension to other components of the plan already being implemented in part by the Nation's Department of Fisheries, including improving the quality of the native rearing habitat and sockeye supplementation at Lake Quinault.

Restoration efforts were started several years ago with a pilot project that installed 13 engineered logjams in Alder Creek (within the Upper Quinault River basin) designed to deflect the main river channel away from this side channel, and resulted in blueback spawning during the first year! The approach, supported by the local Quinault valley community and other stakeholders, proved successful and very exciting in its immediate effect.

The next phase of the restoration effort is scheduled for this year. To carry out this work, the Quinault Indian Nation is working with private, state, and federal land management agencies to complete a National Environmental Policy Act (NEPA) assessment of the restoration actions being proposed, which will provide the foundation for required permits. To that end, the Nation hosted a NEPA Compliance meeting on April 6, at the QBRC in Ocean Shores where representatives from 17 different federal offices, agencies, state departments, County representatives, NGOs, and others met to begin the Environmental Assessment planning effort.

The Environmental Assessment will be showcased at a kiosk at Chief Taholah Days in July for interested people to learn more about what is happening. Articles in the Nation's paper, the Nugguam, are being published to keep the Reservation community aware of the progress. The Bureau of Indian Affairs will review and approve the Environmental Assessment by September 1. The Nation plans to begin installation of the ELJs in September and October while the river's waters are low, so that when the returning blueback adults get to the river next spring, they will find improved habitat in which to spawn.

The restoration of the Upper Quinault River will take decades of consistent and dedicated effort. The Nation is committed to using a restoration approach that will provide long-term benefits for both the river ecosystem and the people embraced by it. The Nation looks forward to working cooperatively and collaboratively with federal, state, and local agencies, NGOs, and the local community to restore this precious resource.

If you have questions about these efforts, contact Bill Armstrong of the Quinault Division of Natural resources, Department of Fisheries, at 360-276.8211 Ext 240.

11.6. Press Release Published in Nugguam June 2011

Quinault Blueback and Logjams!

By William E. Schlosser, Ph.D., Kamiak Ridge, LLC

Since time immemorial, Quinault Blueback have returned to the Quinault River to continue their cycle of life. The Quinault River is unique and holds all of the necessities for the Blueback's vigour: clean and clear water, Lake Quinault, and what used to be multiple healthy spawning habitats in its upper reaches. Blueback live in Lake Quinault as young before their journey to the ocean, then again as adults as they prepare for their final stage of procreation. During this final stage they enter the Upper Qui nault River to seek spawning grounds.

The spawning grounds of the Upper Quinault River have historically provided a variety of habitats for salmon of all species; places where they initiate the end of one cycle and the beginning of another. Salmon and steelhead return to the same places to spawn, to begin the cycle of life for their offspring.

Over the past century, human encroachment has caused the populations of salmon and steelhead to drop to dangerously low levels. The combination of heavy off-shore fishing pressures and a drop in suitable spawning habitats in the Upper Quinault River have created a challenge that nature will not be able to correct without assistance. This assistance has been planned for by the Quinault Division of Natural Resources, Department of Fisheries and a host of federal, state, and private cooperators. These activities can stop the decline in salmon numbers while setting the stage for a return to historic populations.

One restorative activity in the Upper Quinault River is the introduction of engineered logjams along the river to provide stability as the river meanders across the floodplain. These engineered logjams, combined with the planting of native vegetation trees (hardwoods and softwoods) to provide short-term stability of remaining salmon spawning habitat, and long-term stability (hard-points) to the river as it attempts to meander across the basin.

The loss of "hard points" (natural logjams) in the river valley within the past century happened as a result of excessive logging that had removed old growth trees within the floodplain. In response, the movement of the river across the floodplain increased and homes and roads within the floodplain were threatened, complicating the river's movements. The river, once an anabranching channel network with a main channel that cut deeply into the valley floor, became a shallow, braided river channel. These changes translated into a loss of salmon habitat, especially Blueback salmon habitat.

The Quinault Indian Nation demonstrated the restoration concept in 2008 with construction of the Alder Creek Side Channel Pilot Project; the tribe's first engineered logjam and floodplain forest construction project. The project involved construction of 12 engineered logjams, stabilization of existi ng natural ones and reforestation of engineered logjam islands and the adjacent floodplain. Engineered logjams, a fundamental element of the restoration approach, are an environmentally friendly engineering technology that will inhibit further loss of important side channel habitat, limit expansion of the main channel, gradually recreate anabranching morphology of the river, and foster the development of mature, self-sustaining floodplain forests and new salmon habitat. The Pilot Project successfully demonstrated the Quinault Indian Nation's ability to implement the engineered log jam and floodplain forest restoration approach and helped to secure support from the local community and land managers in the Upper Quinault River watershed, setting the foundation for future restoration efforts.

The Quinault Indian Nation formed, and leads, a multi-jurisdictional planning committee with representatives from Congressman Norm Dicks' Office, the Bureau of Indian Affairs, Olympic National Forest, Olympic National Park, US Fish and Wildlife Service, NOAA Restoration Center, National Marine Fisheries Service, US Army Corps of Engineers, US Geological Survey, Washington Department of Ecology, Washington Department of Fish and Wildlife, Washington Department of Natural Resources, Grays Harbor and Jefferson Counties, Northwest Indian Fisheries Commission, The Nature Conservancy, Wild Salmon Center, and the Upper Quinault River Committee. This team of professionals have joined forces to work with the Quinault Indian Nation to restore salmon habitat within the Upper Quinault River. The results of their cooperation have been documented in an Environmental Assessment for the installation of engineered logjams and restoration plantings.

The Environmental Assessment is part of a required National Environmental Policy Act compliance to spend federal money or to work on federal lands in the execution of a project. The Quinault Indian Nation has identified several factors that can lead to increased salmon habitat restoration. Engineered logjams and restoration planting are only a part of this solution.

On June 10, the Bureau of Indian Affairs is scheduled to publish the Finding of No Significant Impact (FONSI) for the Upper Quinault River Salmon Habitat Restoration Environmental Assessment. The posting of the FONSI and the Final Environmental Assessment opens a 30 day public comment period. During this time, people are encouraged to obtain a copy of the Environmental Assessment and FONSI, read it, and provide written comments. Comments received between June 10 and July 15 will be considered, documented, and may be integrated into the Environmental Assessment.

During Chief Taholah Days (first week of July), in Taholah, at the Community Center, a display about this project will be available for people to view, take handouts from, and learn more about this monumental project's efforts.

On July 13, a public meeting will be held starting at Amanda Park where a short presentation will familiarize people with the project's scope and plans. Those attending will be invited up river to view the results of the 2008 pilot project and see additional sites scoped for enhancement during the field tour.

The Environmental Assessment and Finding of No Significant Impact can be downloaded from the Internet at

http:/www.Kamiak-Ridge.com/UQR/

The planning documents and instructions for providing comments are available at this site. Those interested can also contact the Nation's planning consultant, Dr. Bill Schlosser of Kamiak Ridge, LLC, at Schlosser@Resource-Analysis.com, 360-329-4706, or Quinault Department of Fisheries, Salmon Resources Scientist Bill Armstrong barmstro@Quinault.org, (360) 276-8211 ext 240.

11.7. Press Release Published in the Regional Media: Public Review & Field tour

Quinault River Recovery Efforts

The Quinault Indian Nation, working with the Bureau of Indian Affairs and a host of other federal, state, county, and non-governmental organizations, has developed a long-term recovery plan for the Upper Quinault River to restore mature floodplain forests and degraded salmon habitat. The first phase of river restoration will improve in-stream habitat and river structure that was lost starting with timber harvesting in the river valley beginning over a hundred years ago. Modifications in the valley such as road building, bridge crossings, developments, and other events that have caused a reduction in river stability and the resulting loss of critical salmon habitat.

The initial plans involve strategically placing engineered logjams adjacent to the river channel to help guide the river into a stable path where salmon habitat can form. These sites will be planted with native tree species to give them long-term stability, shading, and future recruitment of large wood debris.

This plan of events has been documented in a National Environmental Policy Act (NEPA) compliance document - Environmental Assessment (EA). This Environmental Assessment is being made available for public review and comments beginning on June 17 and will continue through July 20. The document is available online at:

http://www.Resource-Analysis.com/UQR/

People interested in these events are encouraged to download the Environmental Assessment and provide written comments to the plans and projected impacts of the river and salmon habitat restoration efforts. During this public review period, the Quinault Indian Nation is hosting related outreach activities including a display at Chief Taholah Days in Taholah on July 1-5. A Field Tour will start at the historic Lake Quinault Lodge on July 13 (10:00 - 3:00) where attendees will learn more about the Upper Quinault River Salmon Habitat Restoration effort, then go into the field to visit Engineered Logjam sites placed by the Quinault Indian Nation in 2008 to start these efforts. Other sites will be visited to discuss potential restoration activities, including plans for 2011 installation of engineered logjams. Please dress appropriately for a field tour near the river (boots and hats!) and bring your lunch.

The Bureau of Indian Affairs is the lead federal agency considering this EA and is prepared to sign a Finding of No Significant Impact (FONSI) after the close of the public review period (July 20). Questions about this process and how you can become involved should be directed to:

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11.8. Press Release published in The Daily World (June 21, 2011)

The Quinault Indian Nation wants to create dozens of engineered logjams up and down the Quinault River in an effort to stave off erosion on the riverbanks and solidify the path of the meandering river. The goal would be to strengthen the run of blueback salmon.

The Quinault Nation released an environmental assessment this week, soliciting public comments to the Bureau of Indian Affairs Northwest Regional Office in Portland. Consultants for the tribe hope for approval by Sept. 1.

The Quinault Nation crafted a pilot project in 2008 setting up 13 of the engineered logjams on the Jefferson County side of the Quinault River. The “islands” are designed to collect woody debris and create a natural logjam to not only slow down the river but get a handle on the erosion issues along the riverbank and restore salmon habitat.

The Quinaults are now proposing to place these same logjams on about 12 miles of the river between Grays Harbor and Jefferson County.

“Unless about 12 miles of degraded river floodplain are returned to sustainable habitat conditions through a comprehensive and science based recovery effort, the blueback risks virtual extinction,” wrote the Quinault’s consultant, Bill Schlosser of Pullman-based Kamiak Ridge, LLC.

The Quinaults describe the blueback, which are also known as sockeye salmon, as their “national treasure” and say it had been “the foundation of a rich and stable culture for thousands of years.”

Data provided by the Quinaults in the environmental assessment show that the number of bluebacks dropped from more than 1 million in the 1940s to less than 100,000 today.

“The principal factor behind the decline of the blueback is believed to stem from the loss of stable spawning habitat in the Quinault River system above Lake Quinault,” the assessment states.

The thought behind these “islands” of criss-crossed logs is that the river’s channel will stabilize around them. These sites will also be planted with native tree species to give them long-term stability, shading, and future recruitment of large wood debris.

The environmental review says that 113 acres of forestland would be planted and 300 acres of degraded floodplain forest would be restored.

Schlosser said the pilot program proved that habitat for the blueback salmon could be created.

“Engineered logjams, a fundamental element of the restoration approach, are an environmentally friendly engineering technology that will inhibit further loss of important side channel habitat, limit expansion of the main channel, gradually recreate anabranching morphology of the river ...,” Schlosser said.

Animation provided by the Kamiak consulting group show maps of the Quinault River between 1990 and 2009 and clearly shows a river that has continued to meander and impact the surrounding property owners over the years.

During the December 2007 storm, one home was flooded and teetered on the edge of the riverbank. The family escaped unharmed, but eventually the home had to be moved, but not before the septic tank ended up in the river.

The animation offers a new hope for the river showing that the single channel could develop into several tributaries and creeks that could be used as habitat for the Blue back salmon.

“The overall goal of the engineered logjam design is to emulate the function once provided by old-growth riparian trees which stabilized the river banks,” according to the environmental assessment. “The huge old-growth trees also formed stable snags and logjams when they fell into the river which controlled channel migration and morphology. …

“One of the primary functions of these natural logjams was to split flow and form islands, creating side channels and stable ground for the next generation of riparian forest to mature. Historic clearing of the old-growth forest set in motion the gradual degradation of the system that continues today.”

Quinault Indian Nation President Fawn Sharp says the tribe has spent $2.15 million on restoration costs on the Upper Quinault so far.

She said restoration work is also planned this summer, with $440,000 planned in one area of the river and $193,000 planned for Alder Creek.

The entire project, including the logjams, is expected to cost the tribe at least $5.4 million over 12 years.

Sharp has been pushing for federal funding to assist the project and received at least one small federal grant from the U.S. Forest Service last year.

The environmental assessment is available for review at www.Resource-Analysis.com/UQR/. Public comment will be accepted through July 20.

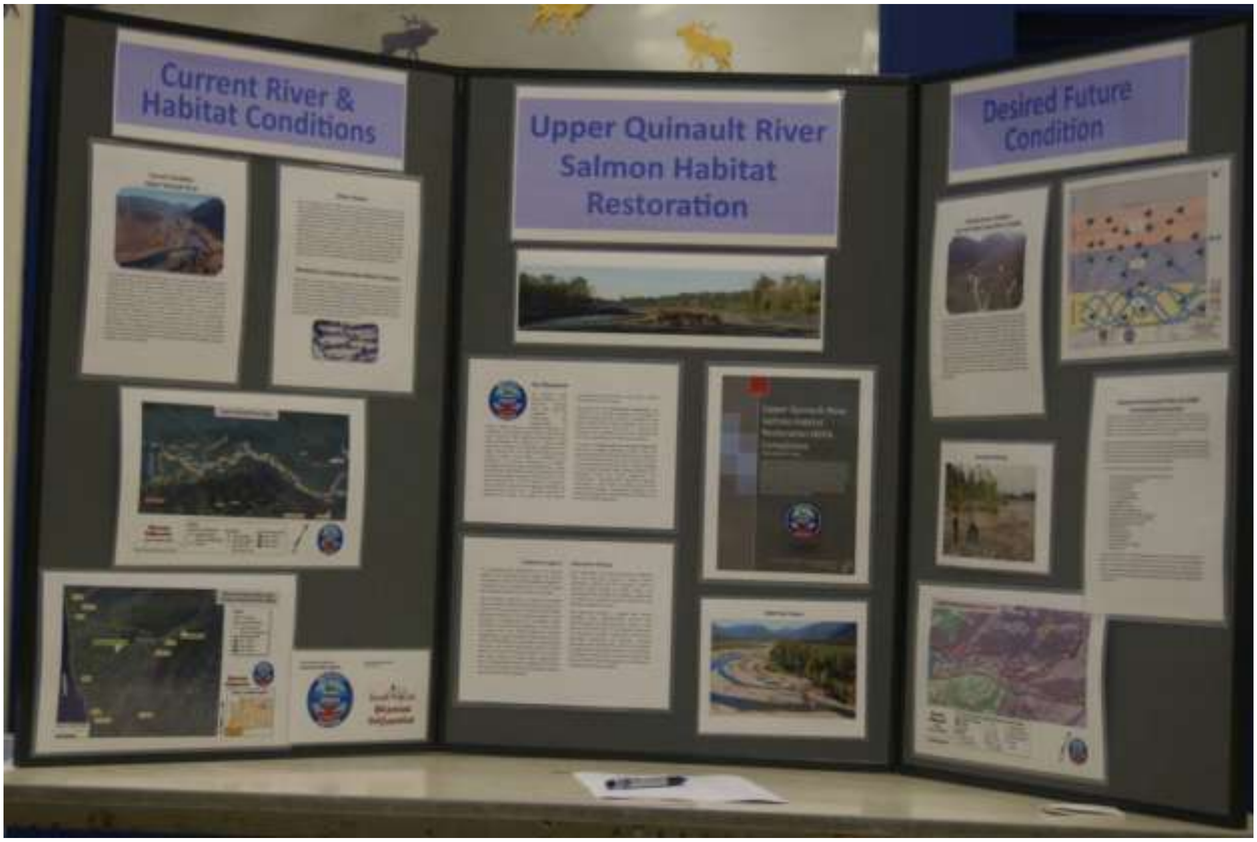
During this public review period, the Quinault Indian Nation is hosting related outreach activities including a display at Chief Taholah Days in Taholah on July 1-5.

There will also be a Field Tour from 10 a.m. to 3 p.m., July 13 where attendees will learn more about the Upper Quinault River Salmon Habitat Restoration effort, to visit Engineered Logjam sites placed by the Quinault Indian Nation in 2008 to start these efforts. Meet at the Amanda Park High School parking lot (along US-101) at 10 a.m.

11.9. Project Display

A three-panel display was created to summarize the Environmental Assessment and the overall project's implementation intent. This display was used at multi-jurisdictional committee meetings, Chief Taholah Days, the Quinault field tour, and at the Quinault Division of Natural Resources entry hall.

Figure 37. Upper Quinault River Salmon Habitat Restoration Display.



12. Appendix E: Restoration Areas

12.1. Typical Designs

Typical designs provide the concept of identifying the geomorphic, wildlife, and Best Management Practices (BMPs) applied to each Restoration Area generally, and each site specifically. Typical designs should not be considered as stringent or dictating of actions (Figure 66 - Figure 71). They contain approaches used and applied to specific sites to give example of the procedures as they are implemented.

12.2. Land Ownership

At statehood in 1889, Washington's Constitution established state ownership to the "beds and shores of all navigable waters in the state…" (Article XVII). This includes about 2,000 square miles of marine waters - beaches tidelands and bedlands of Puget Sound, the coast - as well as most of the navigable rivers, streams and lakes (WDNR 2011).). Though not formally determined, the Upper Quinault River is assumed to be navigable. Washington Department of Natural Resources (the agency with authority of management of bedlands) follows the rule that "navigable" means that a body of water is 'capable or susceptible' of navigation — that is, that the water body has been, is now, or could be used for the transport of useful commerce. Rivers that were meandered by early surveys are assumed to be navigable. There is historic information that the Quinault River was navigable under this definition. Because the River is ambulatory and moves widely between the valley walls within this glacially formed basin, the ownership of the lands within this basin is complicated. Ownership of river beds depends on the nature of the movement of the channel—whether sudden and abrupt (an avulsion) or gradual (accretion and erosion)—and whether ownership of the bed was transferred to the state at statehood or whether portions of it were patented to private individuals by the federal government prior to statehood.

In 1940, President Franklin Roosevelt issued a Proclamation expanding the Olympic National Park and declaring its boundary in several parcel Sections to be the Quinault River (54 Stat. 1241, January 2, 1940). Based on river boundary law, the ownership boundary of the Park is the ordinary high water mark of the Upper Quinault River where Park lands abut the River to the North. The Olympic National Forest lands that abut the River to the south also have a boundary of the ordinary high water mark. The ordinary high water mark is the natural physical feature of the mark on the bank demonstrating an absence of water flow (generally a lack of vegetation). It is also legally defined by the state and federal government. Whichever jurisdiction has authority to determine that boundary applies its own definition. As far as non-federal land abutting the Upper Quinault River, in general, ownership is to the ordinary high water mark of the outermost channel of the River.

In the case of an ownership dispute, the determination of ownership (and thus, management authority) of the properties abutting the Upper Quinault River would be made through an ordinary high water mark survey. The U.S. Department of Interior, Bureau of Land Management, as the official federal surveyor, would conduct that survey to determine the ownership boundary of federal land (BLM 2011). In the case of private or state-owned lands, a licensed surveyor can conduct such a survey and record it with the appropriate county agency. In the case of an unresolved dispute, state courts have ultimate jurisdiction to determine disputes involving non-federal lands, and federal courts ultimately determine disputes related to federal lands.

Estimated land ownership/management authority is displayed on many maps in this document based on available data particularly in Figure 38 - Figure 65. Ownership boundaries are estimated and represent a collection of data from different sources. Many of the data are out-of-date and do not reflect actual current ownership. These ownership boundaries should not be considered conclusive or authoritative. They are for reference purposes only.

12.3. Restoration Areas

The Upper Quinault River Restoration Area (Restoration Area) is defined as the total surface area encompassed by the geologic floodplain boundary (4,287.9 ha, 10,595.6 acres) and includes all aquatic and terrestrial habitats. Six restoration reaches were designated for the Restoration Area (Figure 38 – Figure 41). There are four restoration reaches (Reaches 1-4; Figure 42 – Figure 53) from Lake Quinault to the vicinity of the confluence of the East and North Fork Quinault Rivers. The restoration area extends upstream past this point to Graves Creek in the East Fork Quinault River (Reach 5; Figure 54 – Figure 57) and to the North Fork Quinault River Ranger Station in the North Fork Quinault River (Reach 6; Figure 58 – Figure 61). The reaches were identified by examining local characteristics such as river channel morphology, hydrologic features, bedrock controls, and sediment source (i.e. alluvial fans) that create suitable break-points.

The Restoration Area is condensed further from the reach scale into even smaller, more manageable areas in each reach consisting of three “zones” including 1) the Active Channel Migration Zone, 2) the Floodplain (100 year flood inundation), and 3) the Channel Migration Zone (CMZ). Restoration activities will occur in all three zones through all six reaches depending on reach specific restoration needs in order to achieve long term restoration objectives. As a general guideline, most ELJs and variations thereof identified in the preferred alternative will be constructed within the Active Channel Migration Zone and Floodplain with an ELJ buffer along, but not limited to, a band between the floodplain and channel migration zone (Figure 66). Restoration planting elements will be implemented wherever applicable within all three zones to meet forest restoration objectives.

12.4. Reach 1: Lake Quinault to Finley Creek Alluvial Fan (RK 0 to 2)

Reach 1 is of low restoration priority (Figure 42 – Figure 45). The reach is characterized as the Quinault River Delta at Lake Quinault and dampening effects to river flows caused by the lake. This reach is a candidate for all elements of the preferred alternative, however, due to its proximity to the lake, limited salmon habitat potential, and proximity downstream of the Finley Creek alluvial fan, this reach has received the least amount of restoration planning consideration to date. Pending completion of restoration activities in the higher priority reaches upstream and in Finley Creek in Olympic National Park, this area will likely see limited ELJ construction in the first 15 years although the reach does provide opportunity for implementation of the floodplain roughness technique and in-stream large wood debris enhancement, especially in lateral terrace tributaries. Restoration planting of old homestead pastures, red alder stand conversion to conifer, restoration planting of conifer and black cottonwood, and conifer release are the most likely restoration techniques expected to occur in this reach in the near term.

12.5. Reach 2: Finley Creek Alluvial Fan to Big Creek (RK 2 to 9.5)

Reach 2 holds the highest restoration priority (Figure 42 – Figure 45). The project development process for this reach began in 2008 and implementation of the preferred alternative will continue for at least the next 20 years. This reach is candidate for implementation of all elements of the preferred alternative due to its high restoration potential. This reach contains some of the most productive essential salmon habitat and critical native char habitat remaining in the Upper Quinault River. In addition to habitat restoration potential, the core of the Quinault Valley Community is located in this reach.

12.6. Reach 3: Big Creek to Clarks Spur (bedrock outcrop); includes Big Creek (RK 9.5 to 14)

Reach 3 is of the highest restoration priority (Figure 46 – Figure 49). The project development process for this reach began in 2010 and implementation of the preferred alternative will continue for at least the next 20 years. This reach is candidate for implementation of all elements of the preferred alternative due to its high restoration potential. This reach contains some of the most productive essential salmon habitat and critical native char habitat remaining in the Upper Quinault River.

12.7. Reach 4: Clark's Spur (bedrock outcrop) to the confluence of the East Fork and North Fork of the Quinault River; includes Big Creek (RK 14 to 19)

Reach 4 is of the highest restoration priority (Figure 50 – Figure 53). The project development process for this reach is expected to begin in 2012 and implementation of the preferred alternative will continue for at least 20 years after that. This reach is candidate for implementation of all elements of the preferred alternative due to its high restoration potential following Bridge modifications or removal necessary to restore natural channel morphology in this reach (QIN 2008). Prior to the cumulative negative effects associated with impacts from the Olympic National Park Bridge, this reach once contained some of the most productive essential salmon habitat and critical native char habitat in the restoration area. Of the high priority reaches, this reach has experienced significant degradation from cumulative negative effects, caused by the ONP Bridge effects on channel morphology and hydrology. The ONP Bridge has transformed this reach into one of most degraded areas of the upper Quinault River with additional negative effects to the lower reaches.

12.8. Reach 5: East Fork Quinault River: Forks to Graves Creek

Reach 5 is of the highest restoration priority (Figure 54 – Figure 57). This reach is of the highest restoration priority because it contains the largest proportion of the spring chinook salmon spawning population remaining in the entire Quinault Basin (QIN 2008). When the project development process for this reach is expected to begin is unknown and contingent upon action by Olympic National Park to implement access alternative evaluations and road alternatives and riprap revetment removal prior to implementation of the preferred alternative. Once implemented, the preferred alternative will continue for at least the next 20 years. The most significant anthropogenic factor to salmon habitat conservation and restoration of natural processes in this reach is the negative cumulative effects of riprap revetments and emergency repairs by Olympic National Park to provide ongoing protection for the Graves Creek Road. The Graves Creek Road has experienced chronic failures and maintenance issues along much of its length since the inception of Olympic National Park due to its location within the floodplain and channel migration zone. The road provides seasonal public access to the Graves Creek Campground and serves as the main access route to the Enchanted Valley trailhead and other areas of the Olympics via O'Neil Pass. Habitat restoration activities and applicability of the preferred alternative to the East Fork Quinault River is likely contingent upon realignment or removal of the Graves Creek Road from the floodplain and channel migration zone.

12.9. Reach 6: North Fork Quinault River: Forks to N.F. Quinault River Ranger Station

Reach 6 is low restoration priority primarily due to its mostly pristine, naturally functioning condition (Figure 58 – Figure 61). The most significant anthropogenic factor to salmon habitat conservation and maintaining natural processes in this reach is the potential for negative cumulative effects caused emergency road repair activities by Olympic National Park to protect the North Fork Quinault River Road. The North Fork Quinault River Road provides seasonal public access to the North Fork Quinault River Campground and trailheads including North Fork Quinault River, Irely Lake, and Skyline. The road ends at the rarely used North Fork Quinault Ranger Station. The North Fork Quinault River functions for the most part as a pristine river; road protection and repairs using riprap in this restoration reach has been minimal to date.

In addition to this reach scale concept, the Quinault Indian Nation has adopted a project area concept approach to develop and implement restoration projects in the Upper Quinault River. The purpose of the reach scale and project area concept is to provide manageable restoration project areas within the greater restoration area and to provide opportunity for project planning and development, including cost estimation and phased construction achievable during the brief work windows each summer. This project area approach is conceptual and is not intended to dictate project development or restoration priorities nor is it intended to negate the need to treat multiple project areas or reaches simultaneously. The Quinault Indian Nation will develop additional project areas in collaboration with the Olympic National Park, Olympic National Forest, and private landowners for the entire restoration reach. This approach will allow the Nation and restoration partners to address prioritized areas for restoration while at the same time providing manageable work areas within the greater reach scale context.

A total of thirty five project areas within the active channel migration zone of the Quinault River in Reaches 2 to 3 have been identified by the Nation to date. All of these project areas are located within the active channel migration zone on state owned or private lands outside of Olympic National Park and Olympic National Forest (Section 13, Appendix F: Typical Site Plans (ELJ & Planting)).

Figure 38. Upper Quinault River topography and Geologic Floodplain.

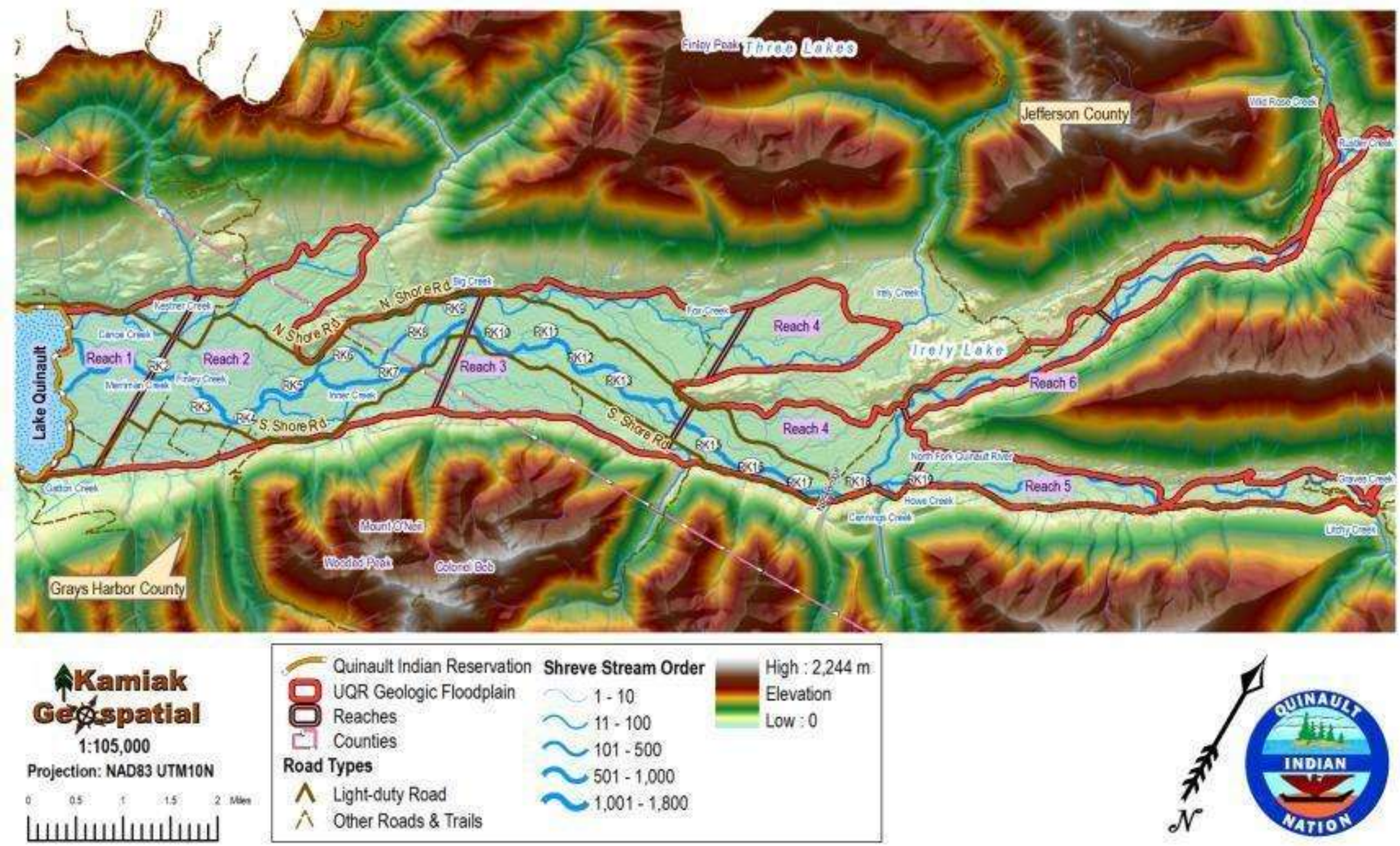


Figure 39. Upper Quinault River land ownership boundaries.

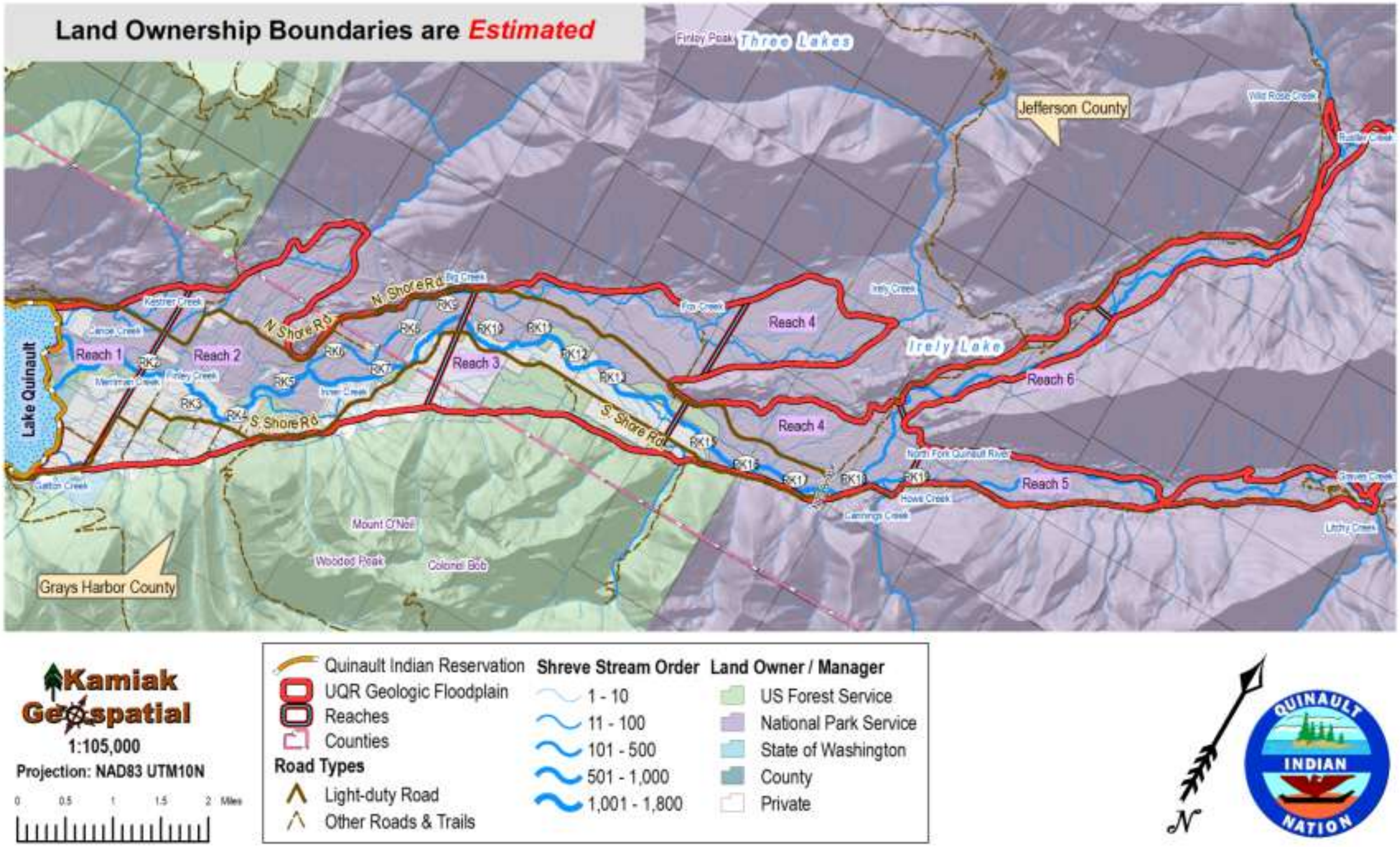


Figure 40. Upper Quinault River land ownership and active channel migration zone.

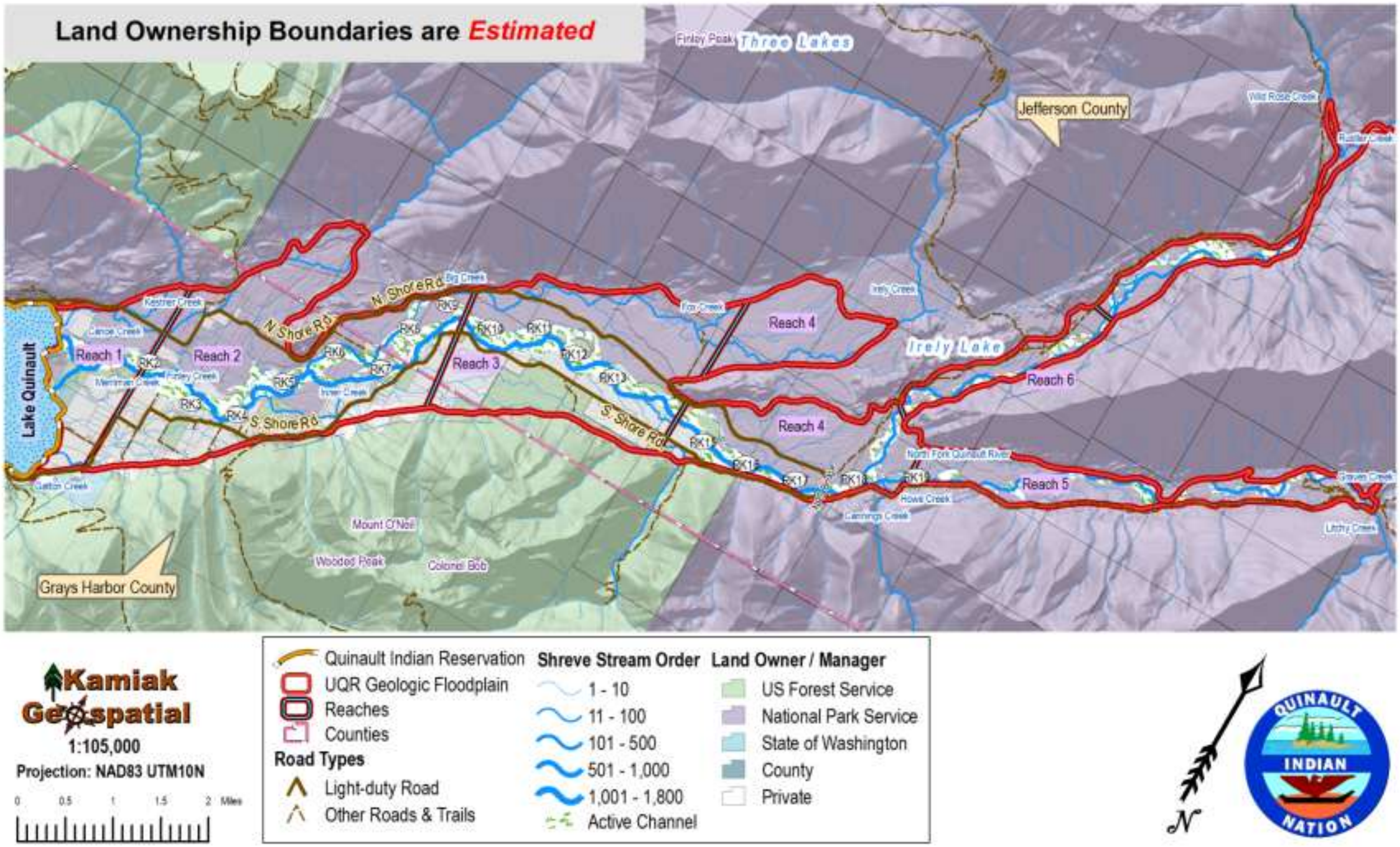


Figure 41. Upper Quinault River land ownership and floodplain (1% Probability).

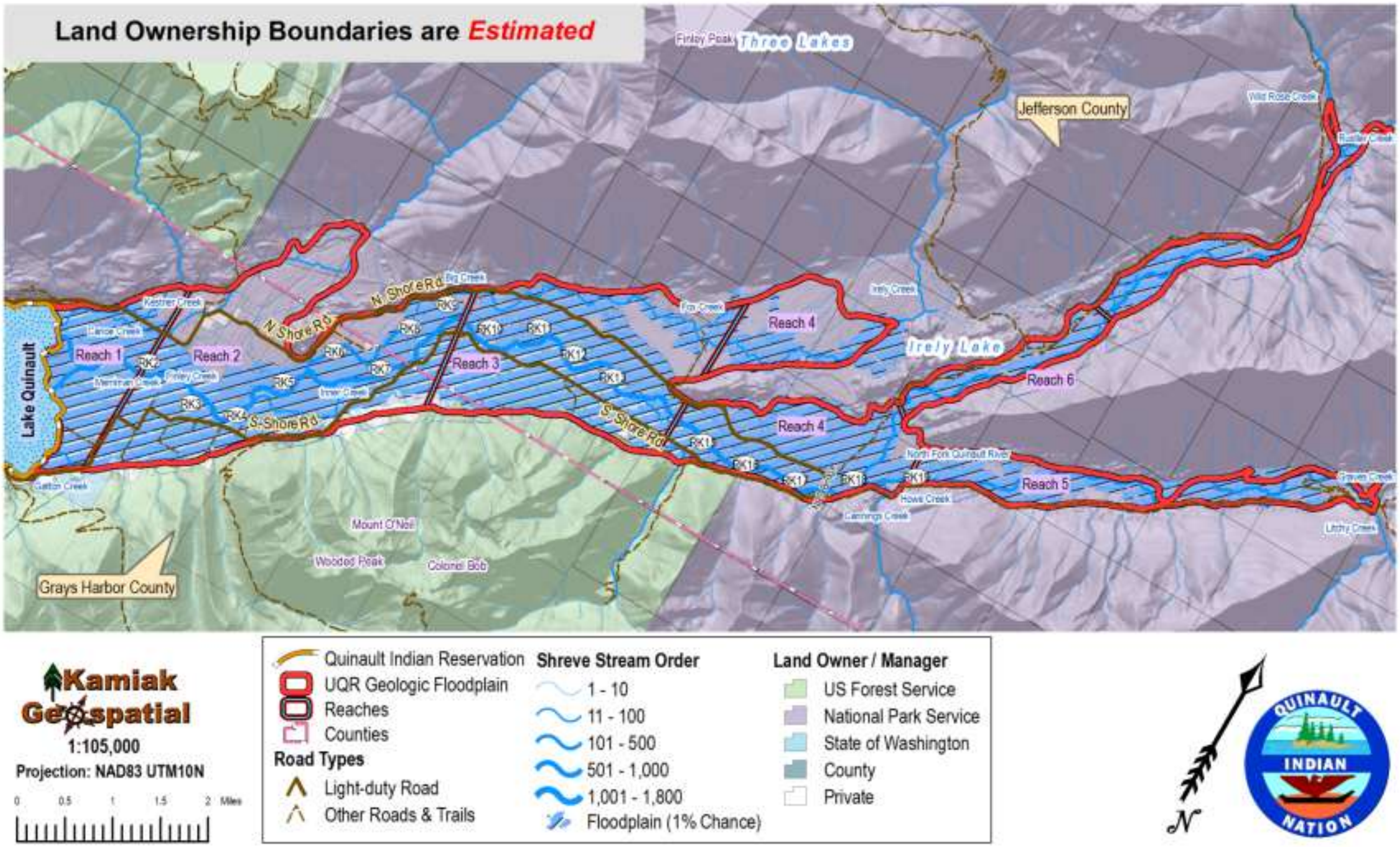


Figure 42. Reach Areas 1 & 2 NAIP aerial imagery (2009).

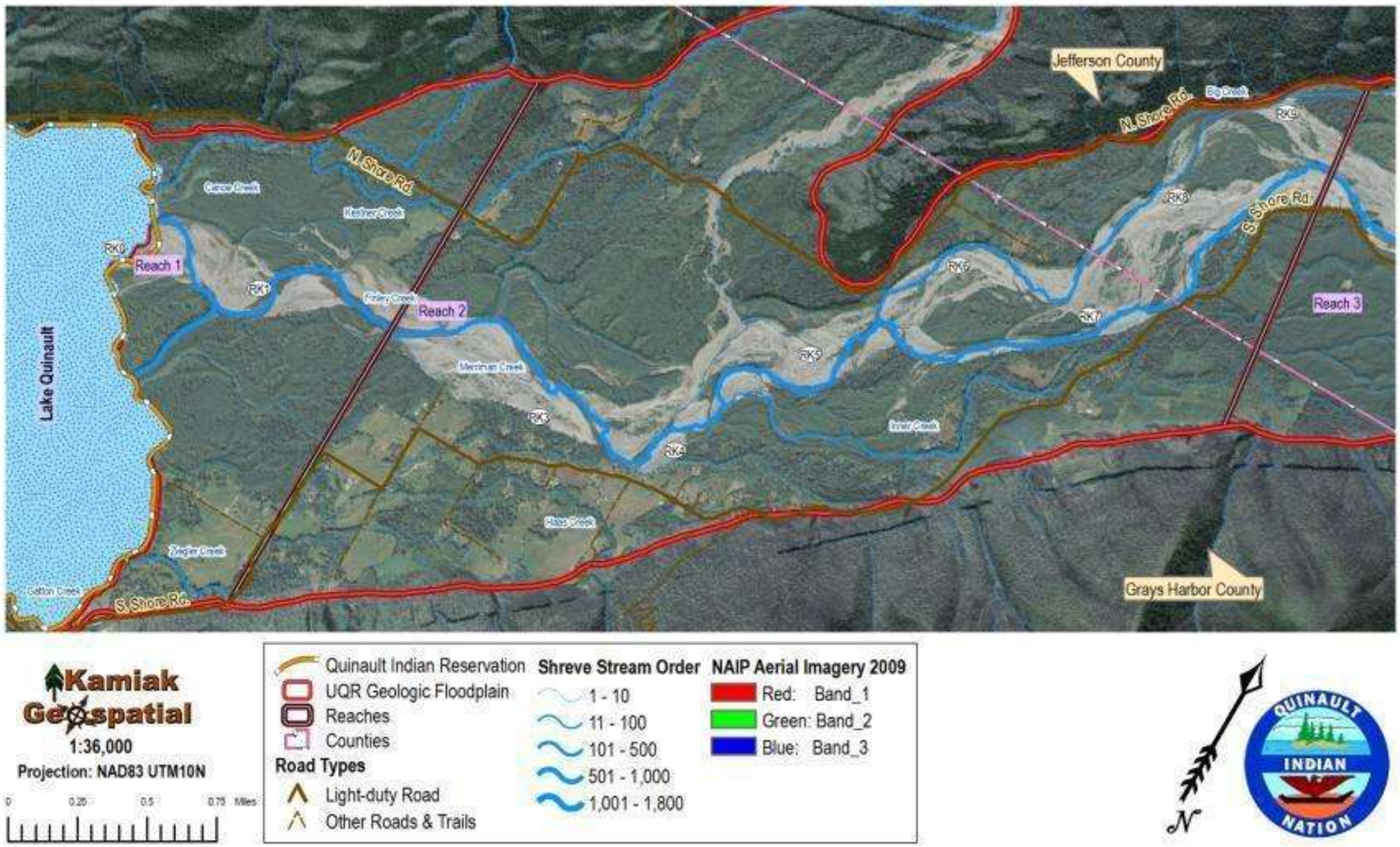


Figure 43. Reach Areas 1 & 2 land ownership.

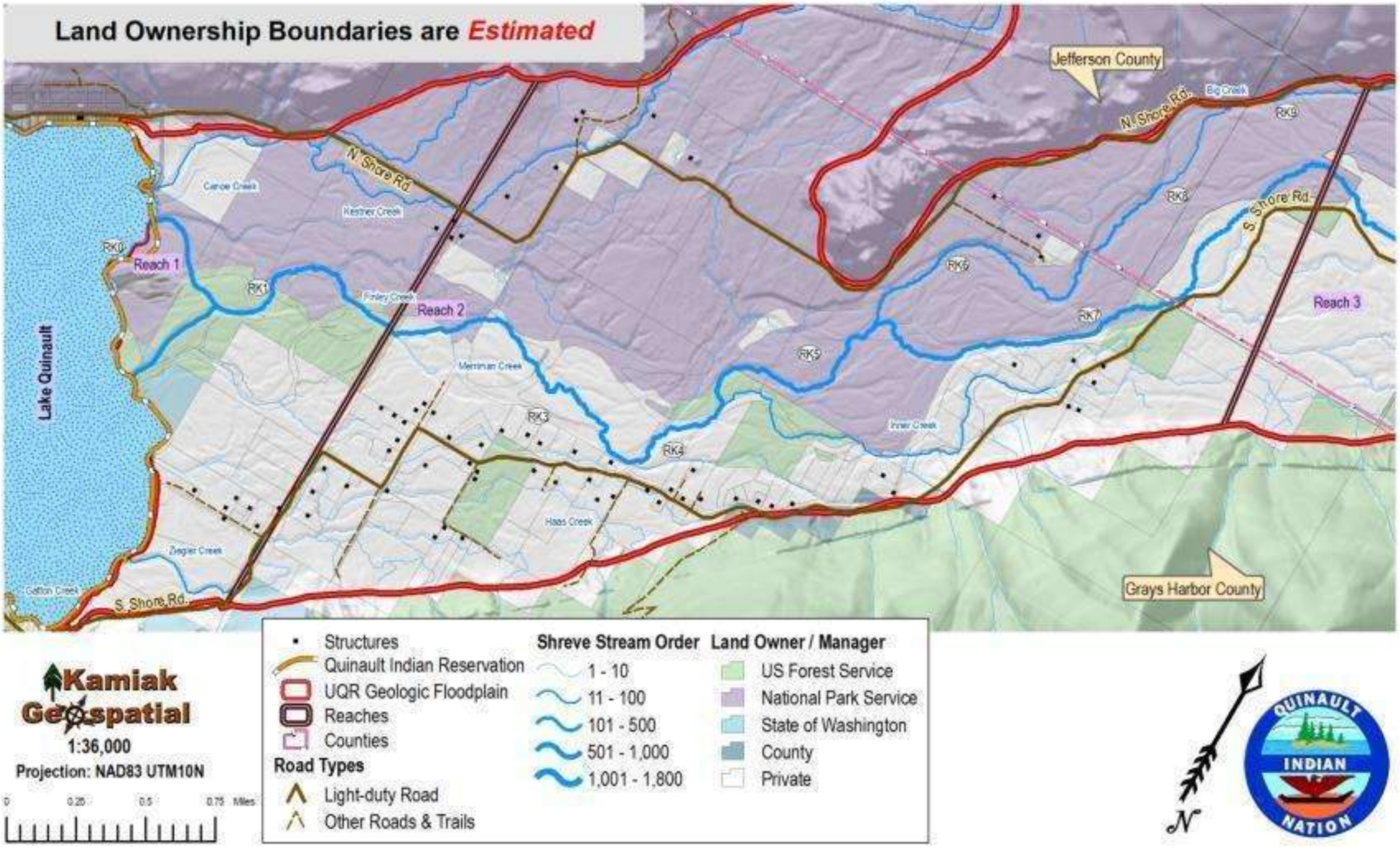


Figure 44. Reach Areas 1 & 2 land ownership and Active Channel Migration Zone.

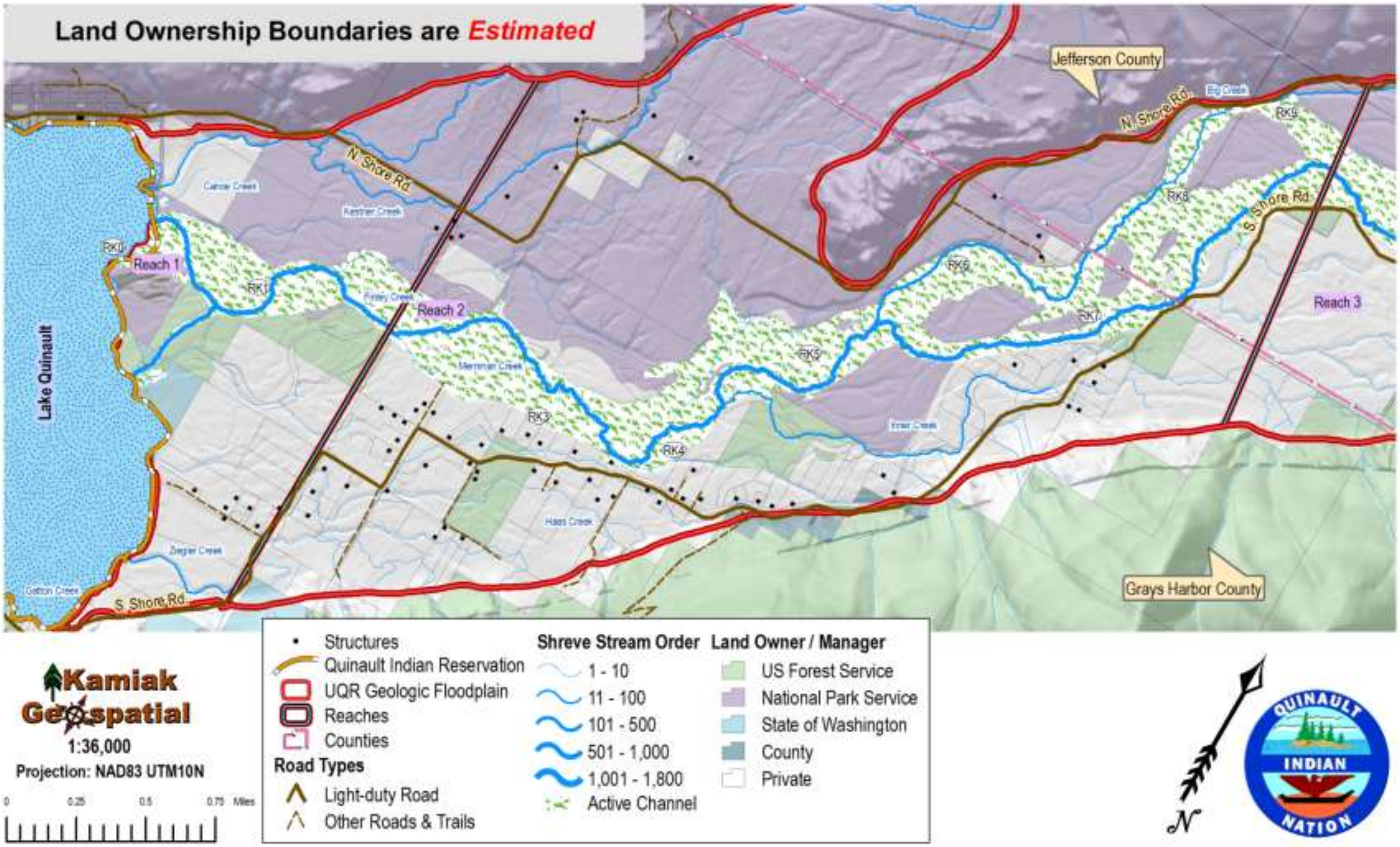


Figure 45. Reach Areas 1 & 2 land ownership and floodplain (1% Probability).

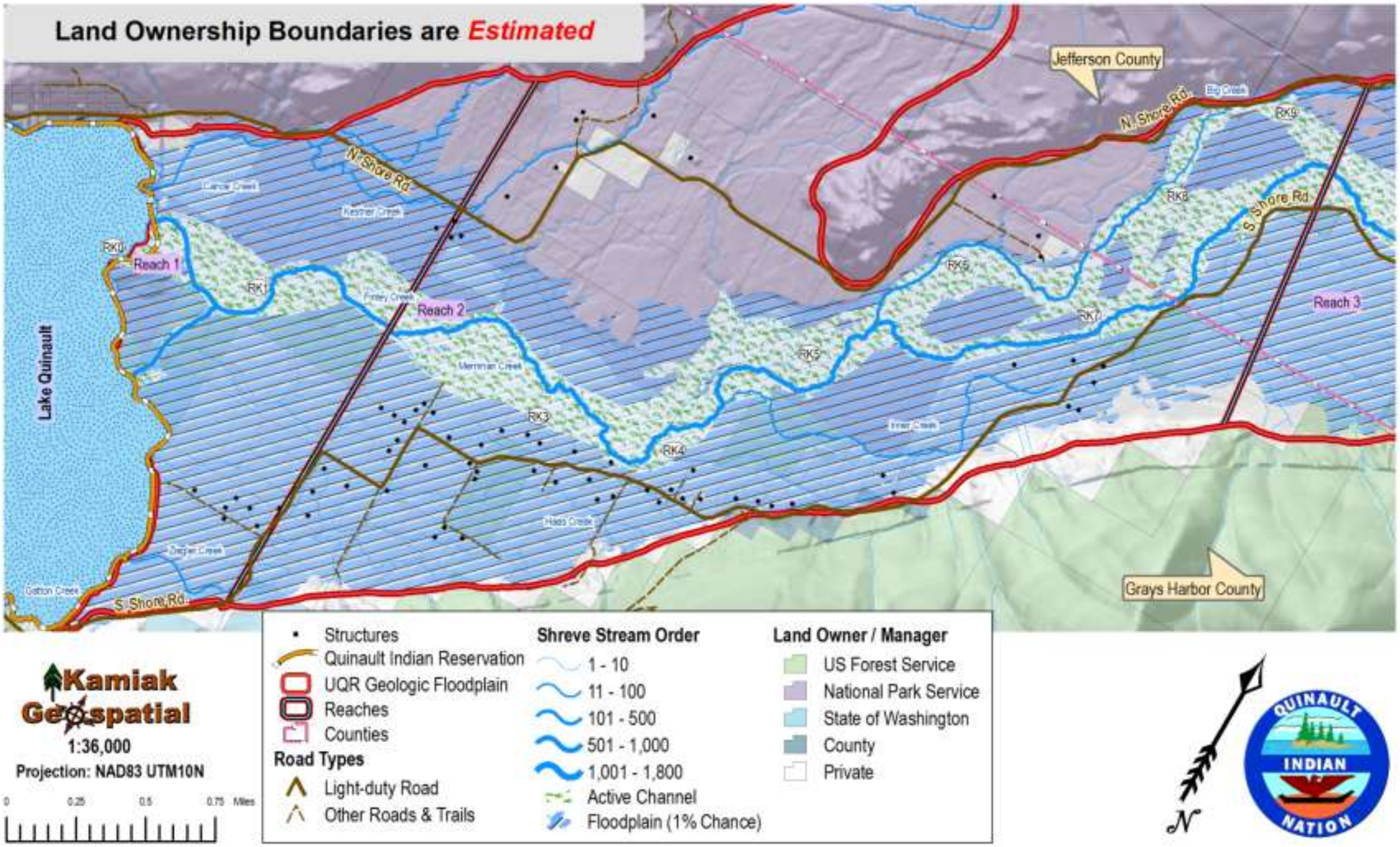


Figure 46. Reach Area 3 NAIP aerial imagery (2009).

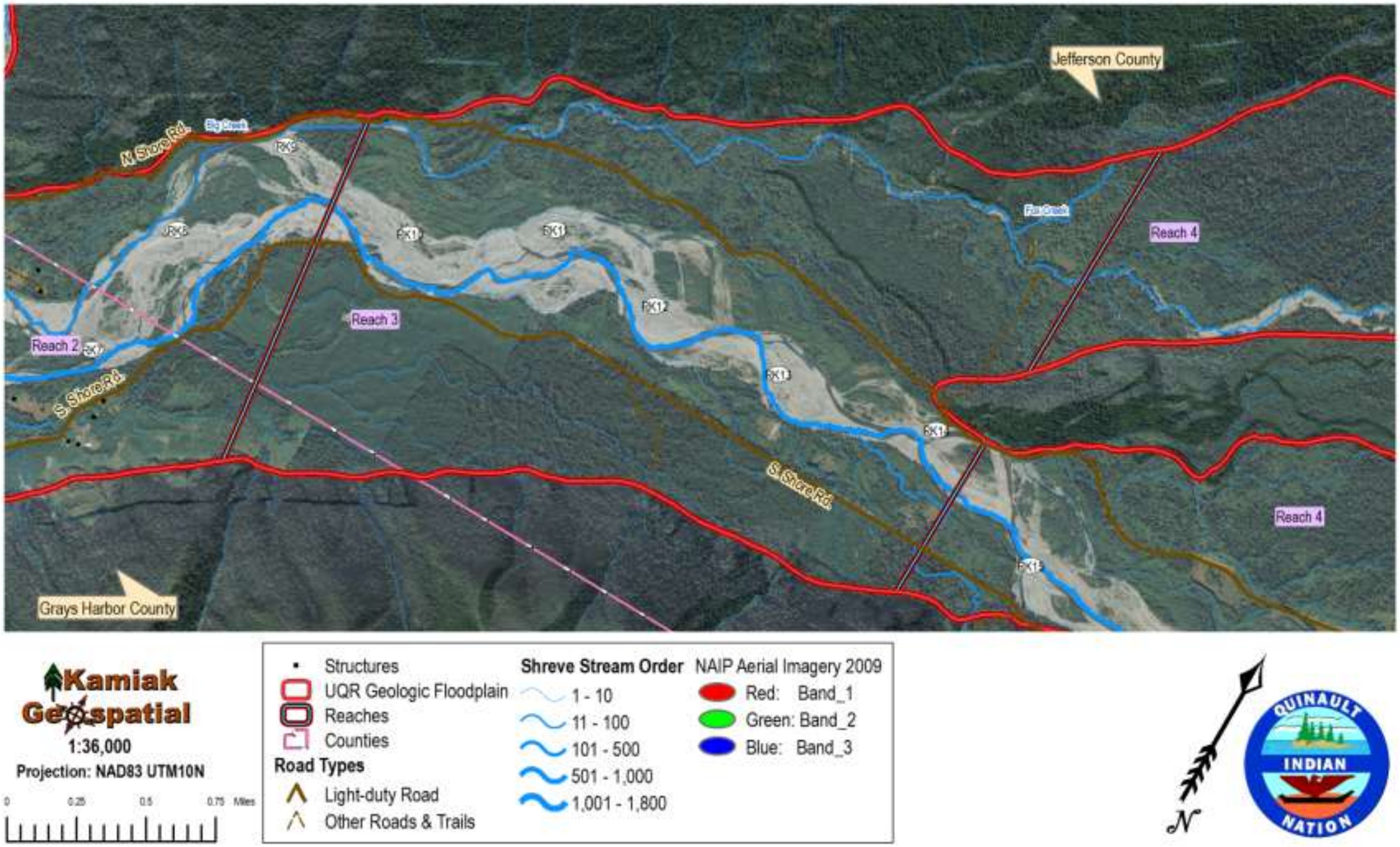


Figure 47. Reach Area 3 land ownership.

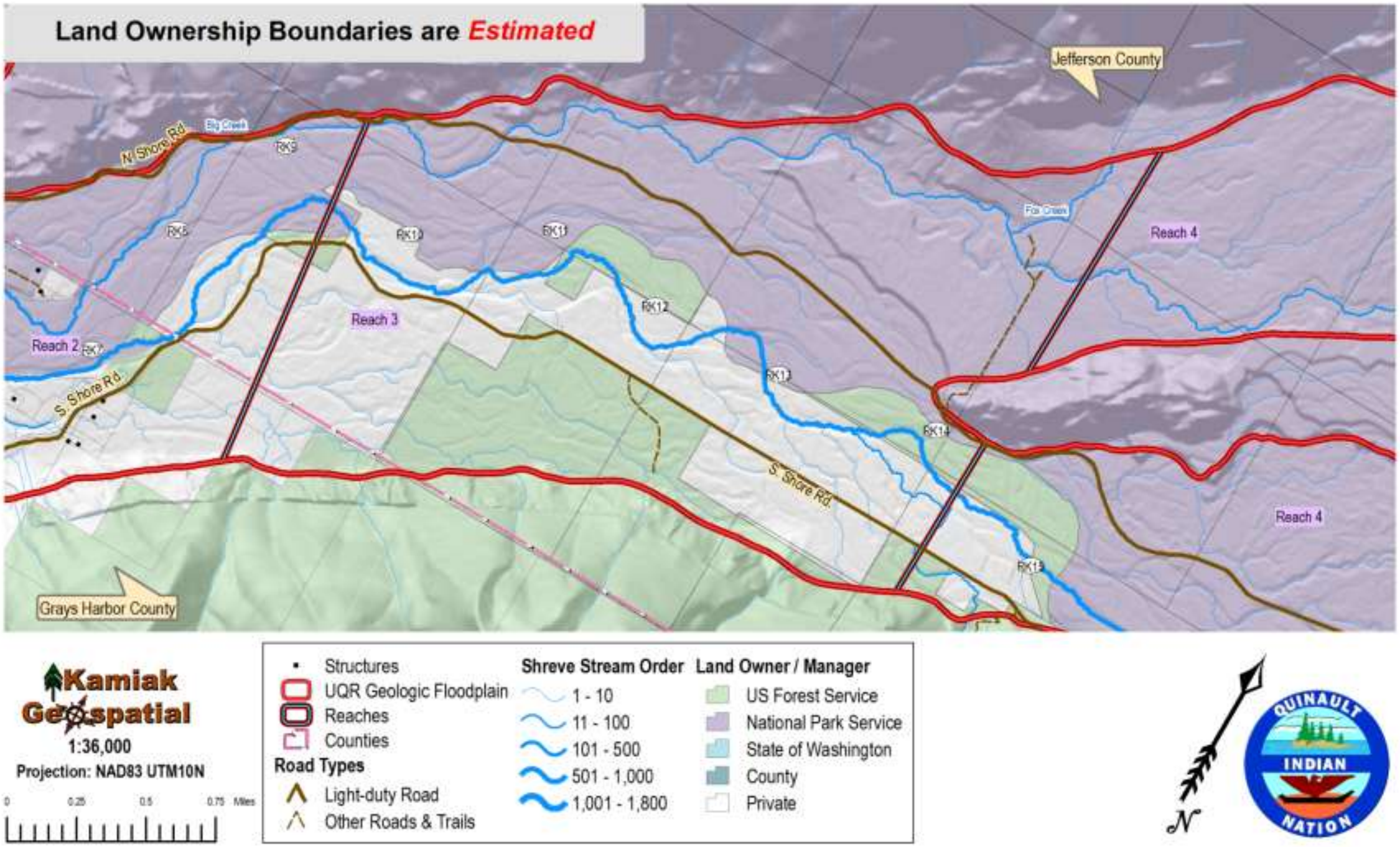


Figure 48. Reach Area 3 land ownership and Active Channel Migration Zone.

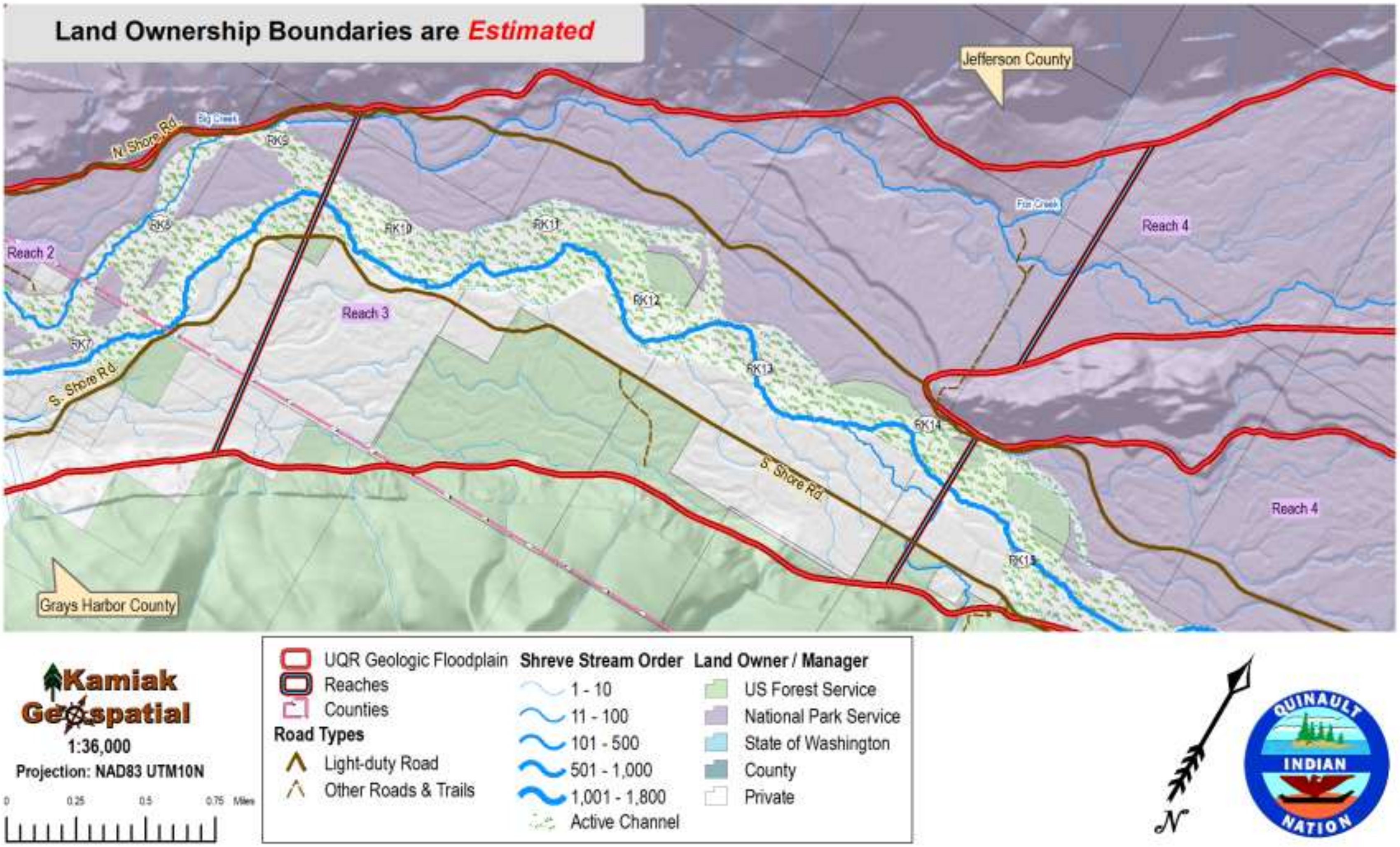


Figure 49. Reach Area 3 land ownership and floodplain (1% Probability).

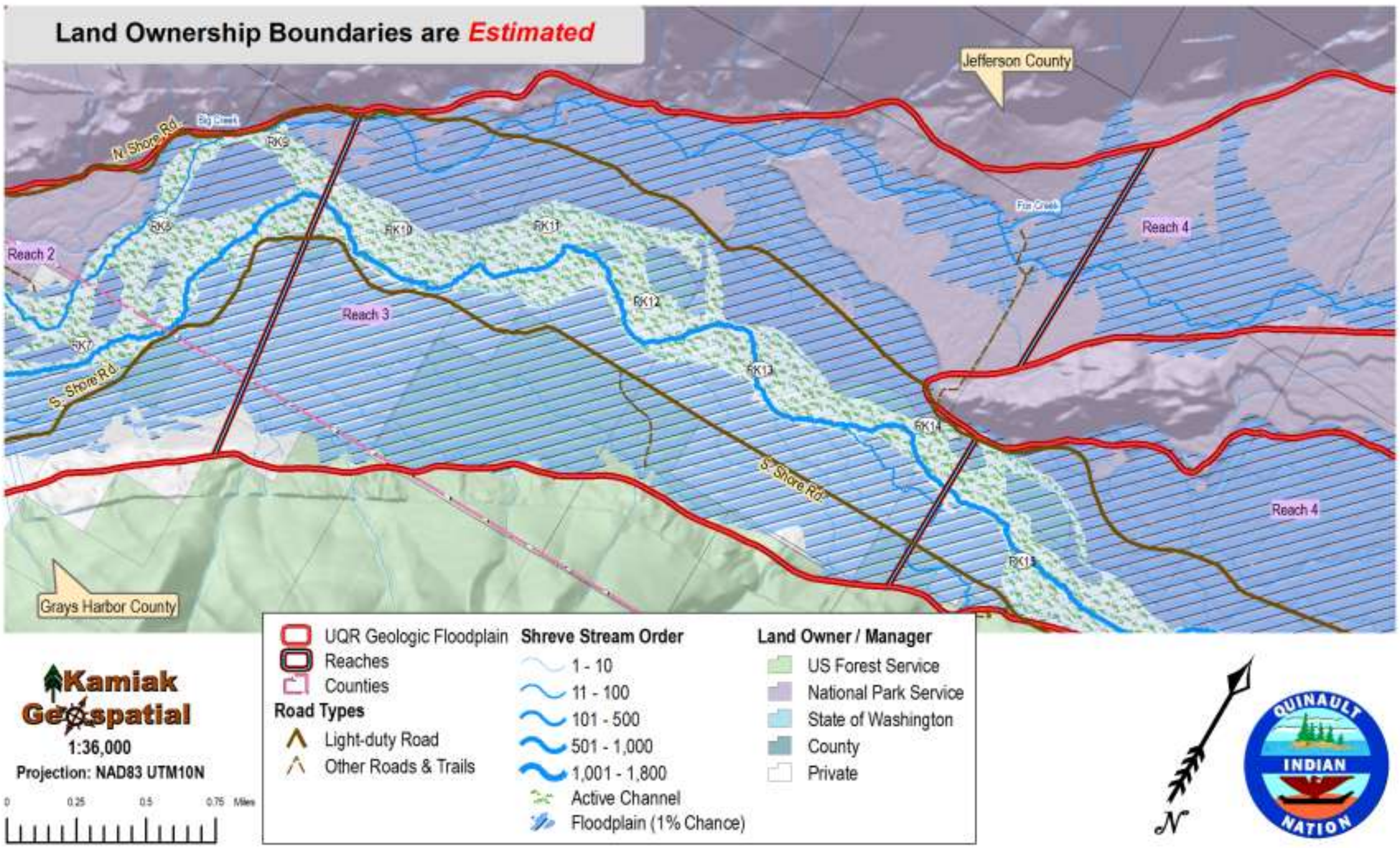


Figure 50. Reach Area 4 NAIP aerial imagery (2009).

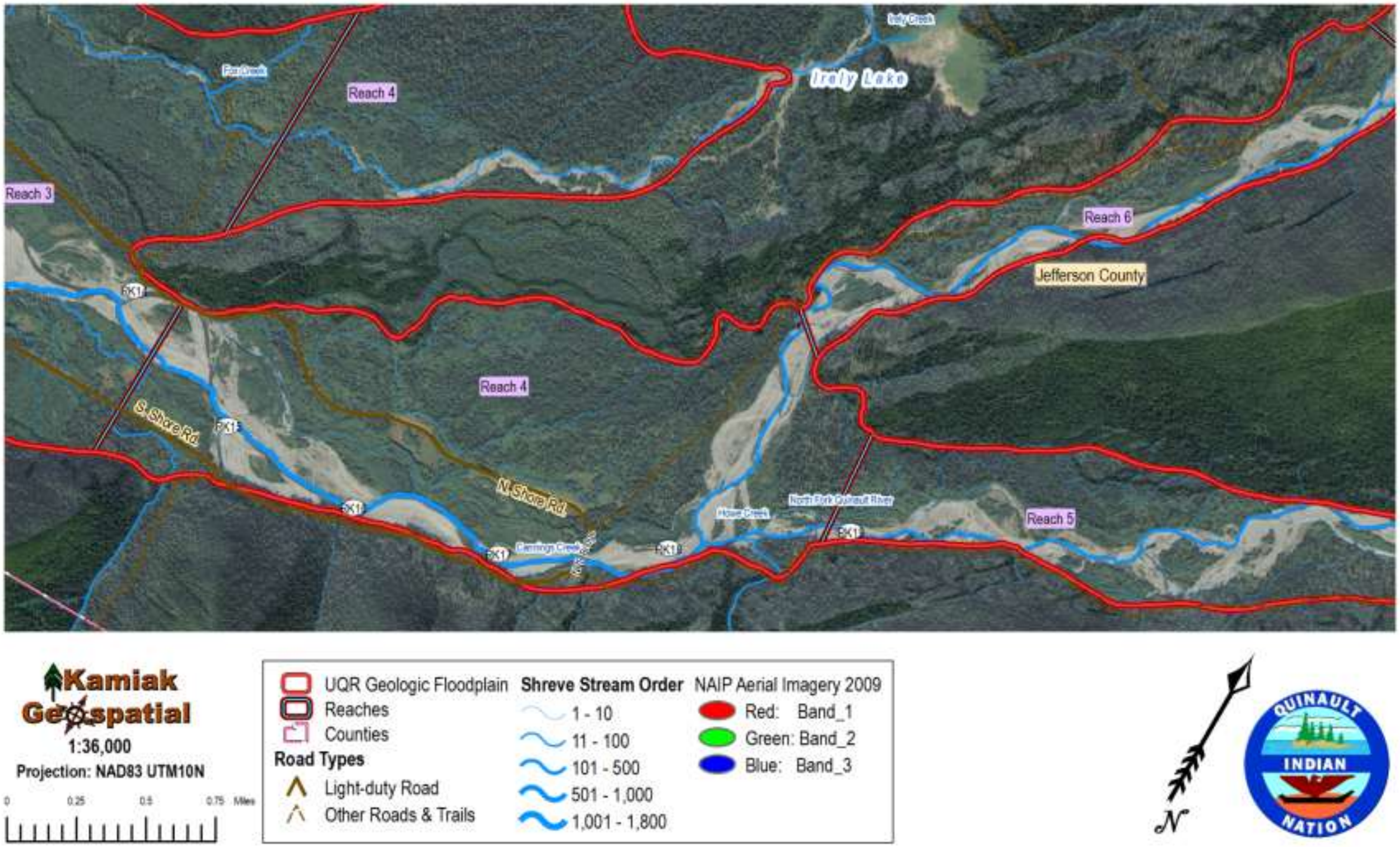


Figure 51. Reach Area 4 land ownership.

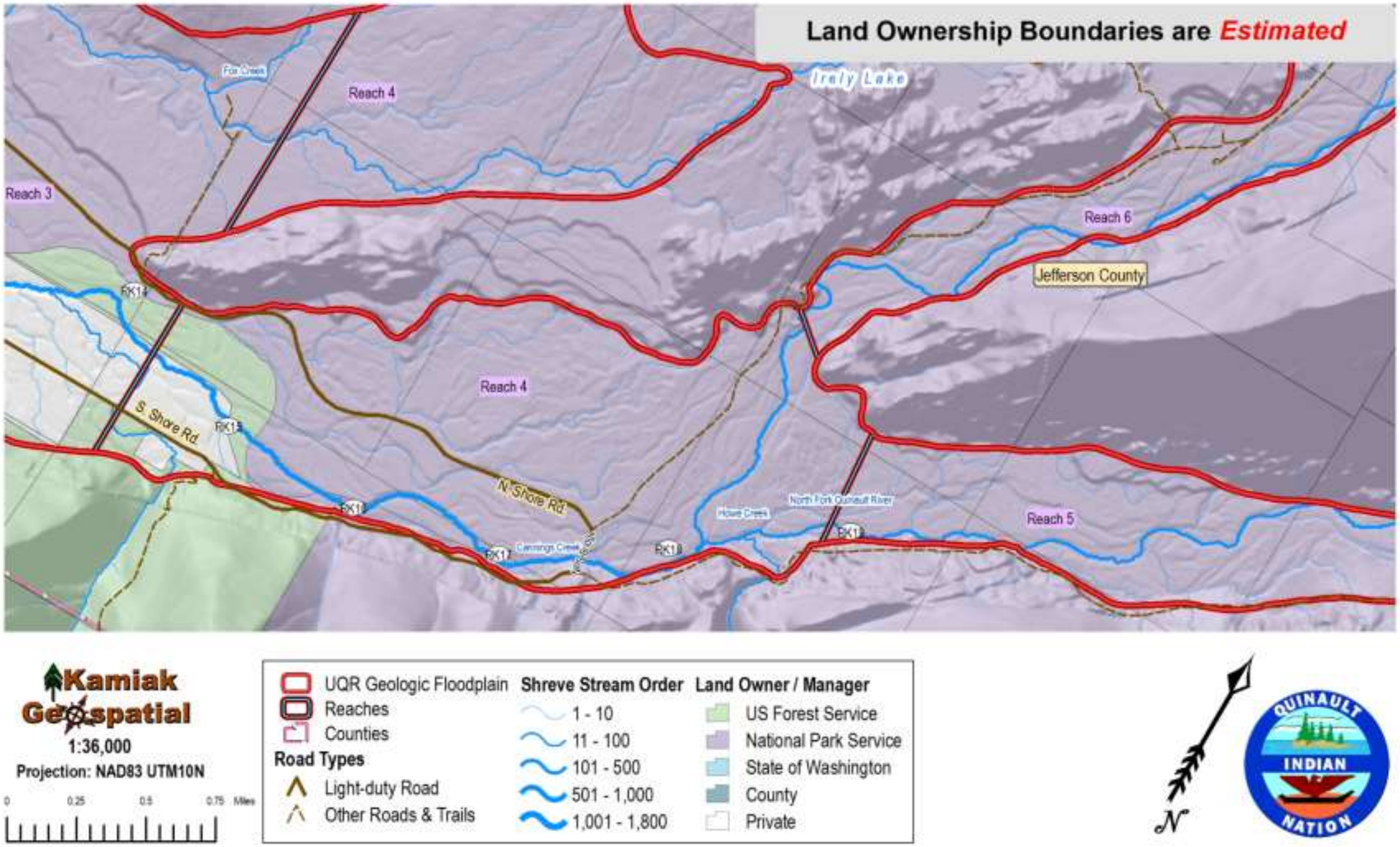


Figure 52. Reach Area 4 land ownership and Active Channel Migration Zone.

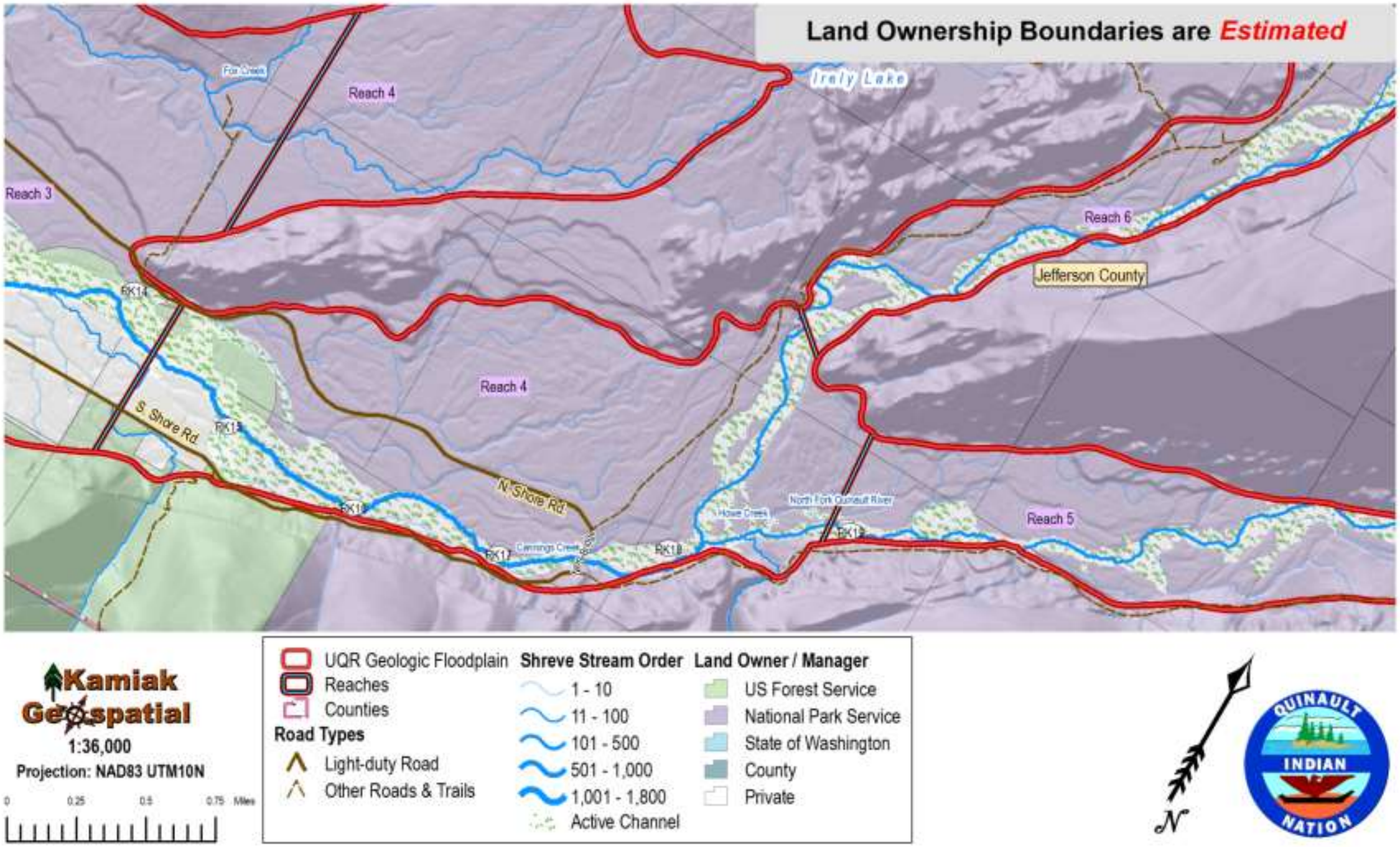


Figure 53. Reach Area 4 land ownership and floodplain (1% Probability).

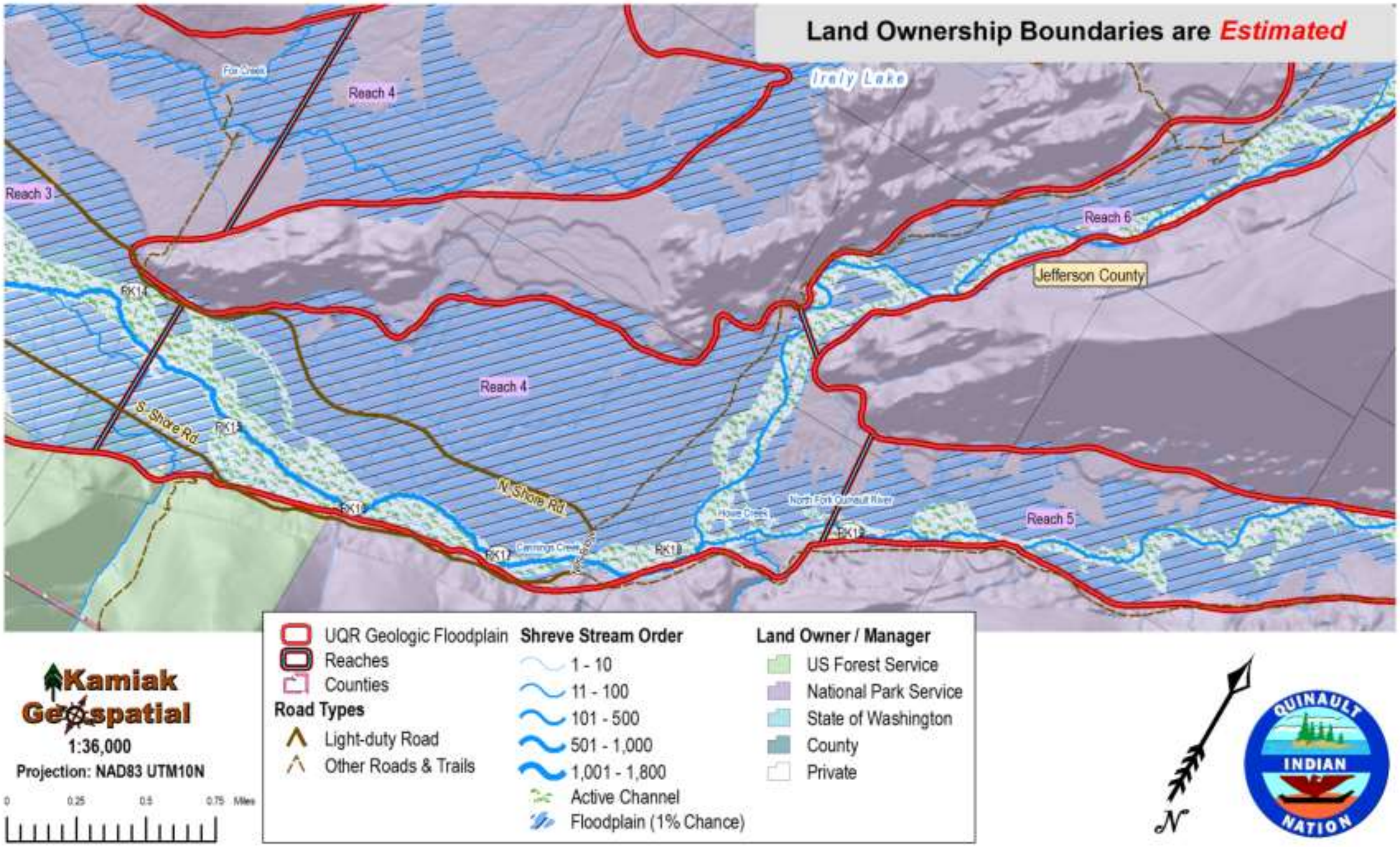


Figure 54. Reach Area 5 NAIP aerial imagery (2009).

Figure 55. Reach Area 5 land ownership.

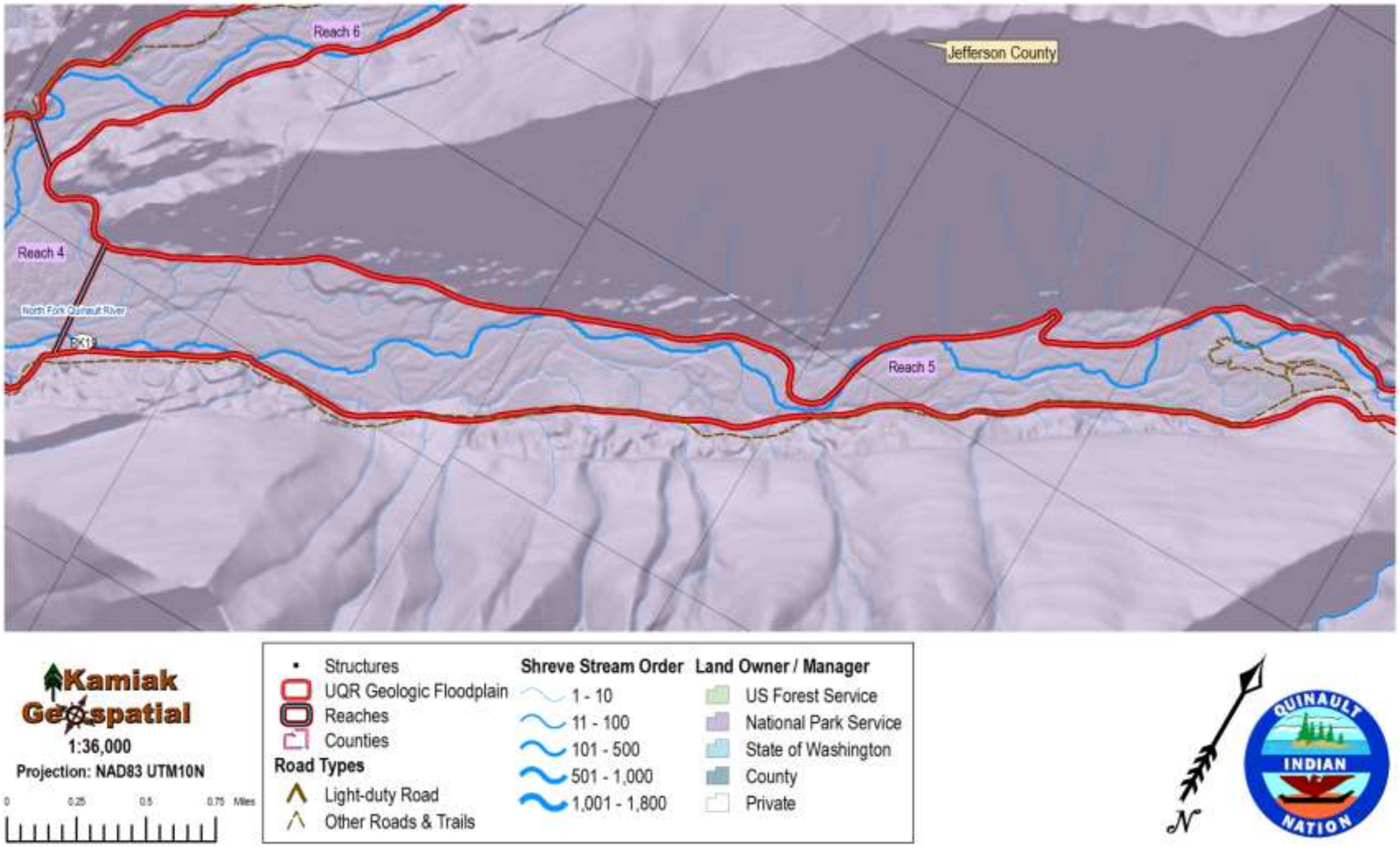


Figure 56. Reach Area 5 land ownership and Active Channel Migration Zone.

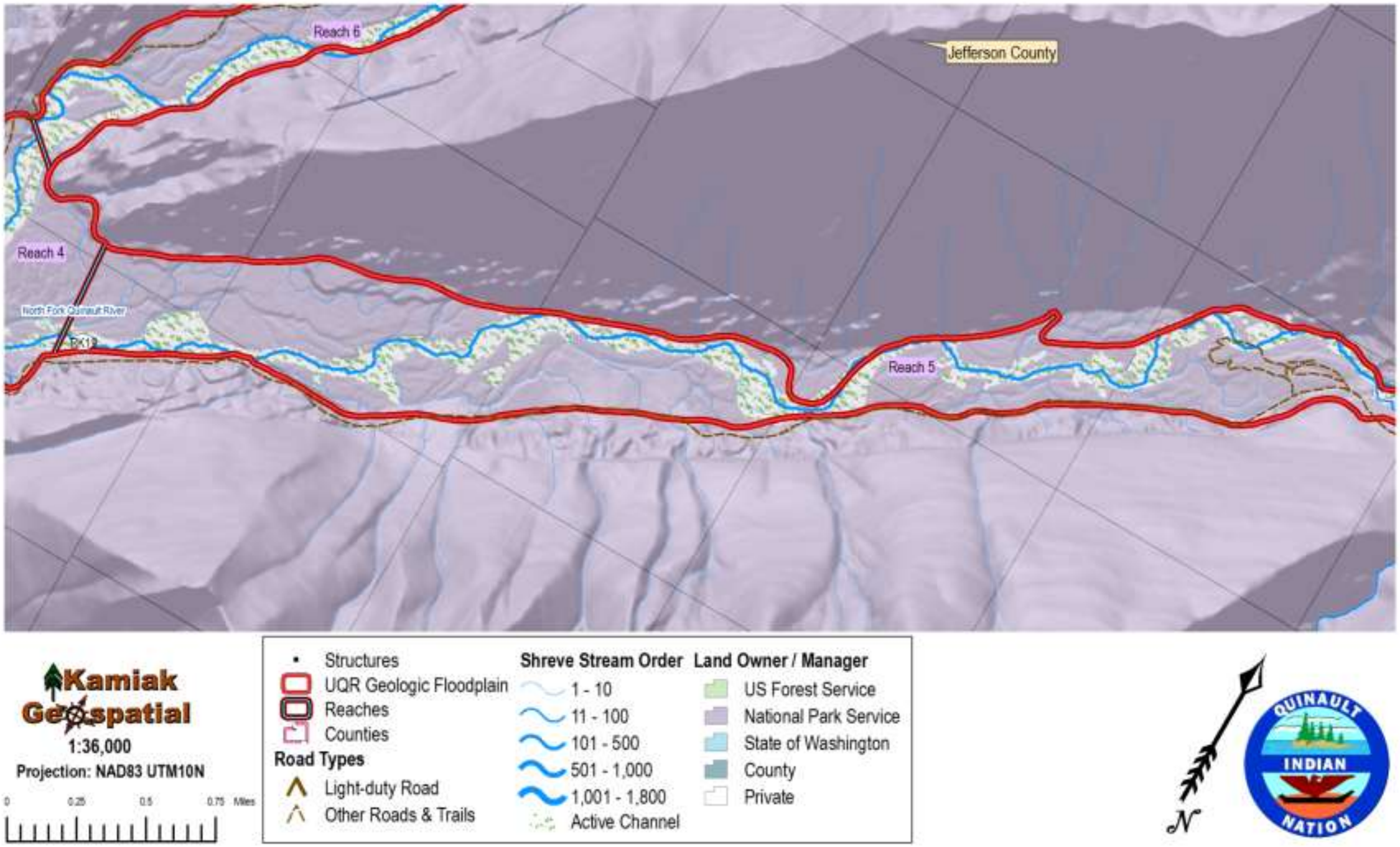


Figure 57. Reach Area 5 land ownership and floodplain (1% Probability).

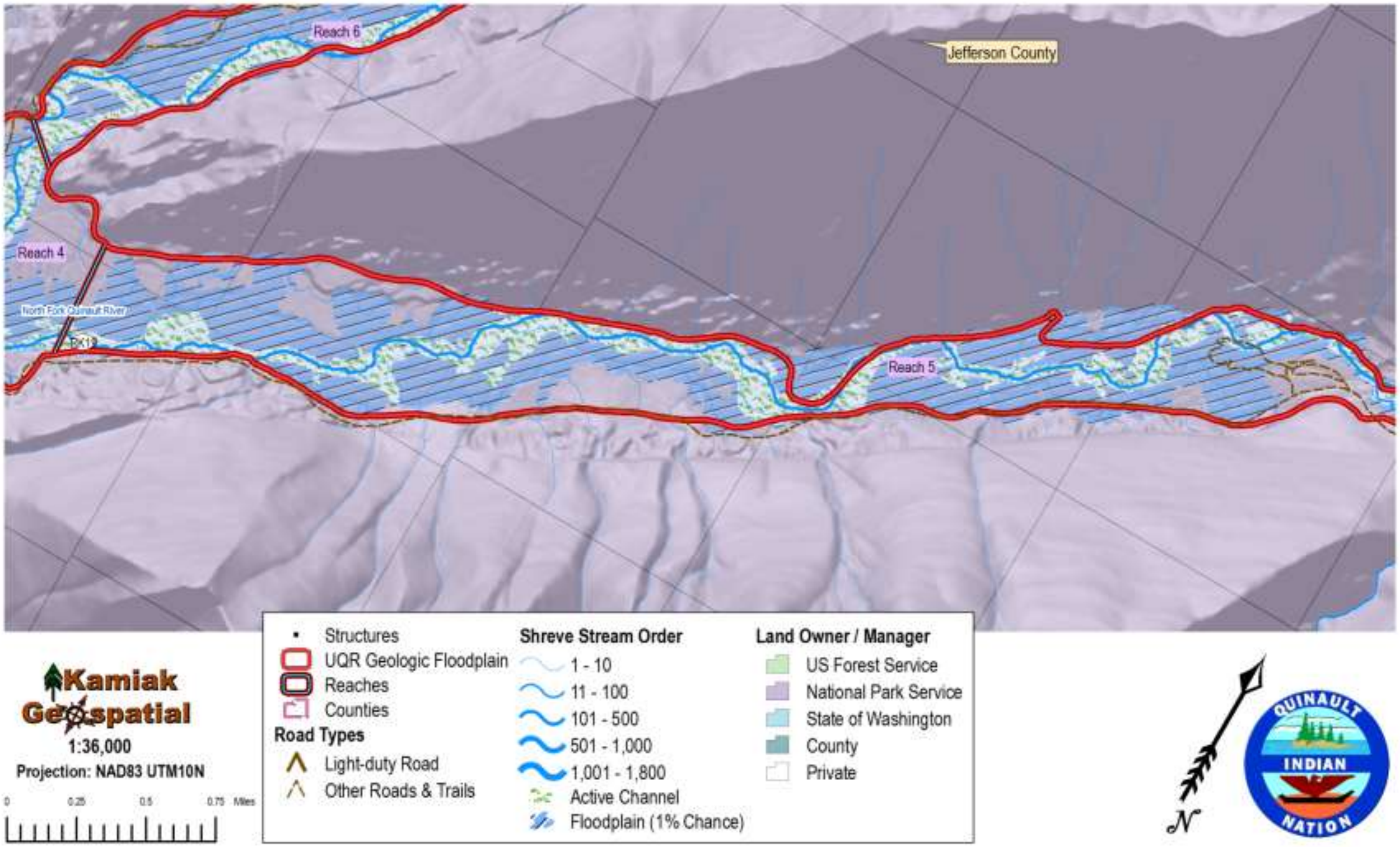


Figure 58. Reach Area 6 NAIP aerial imagery (2009).

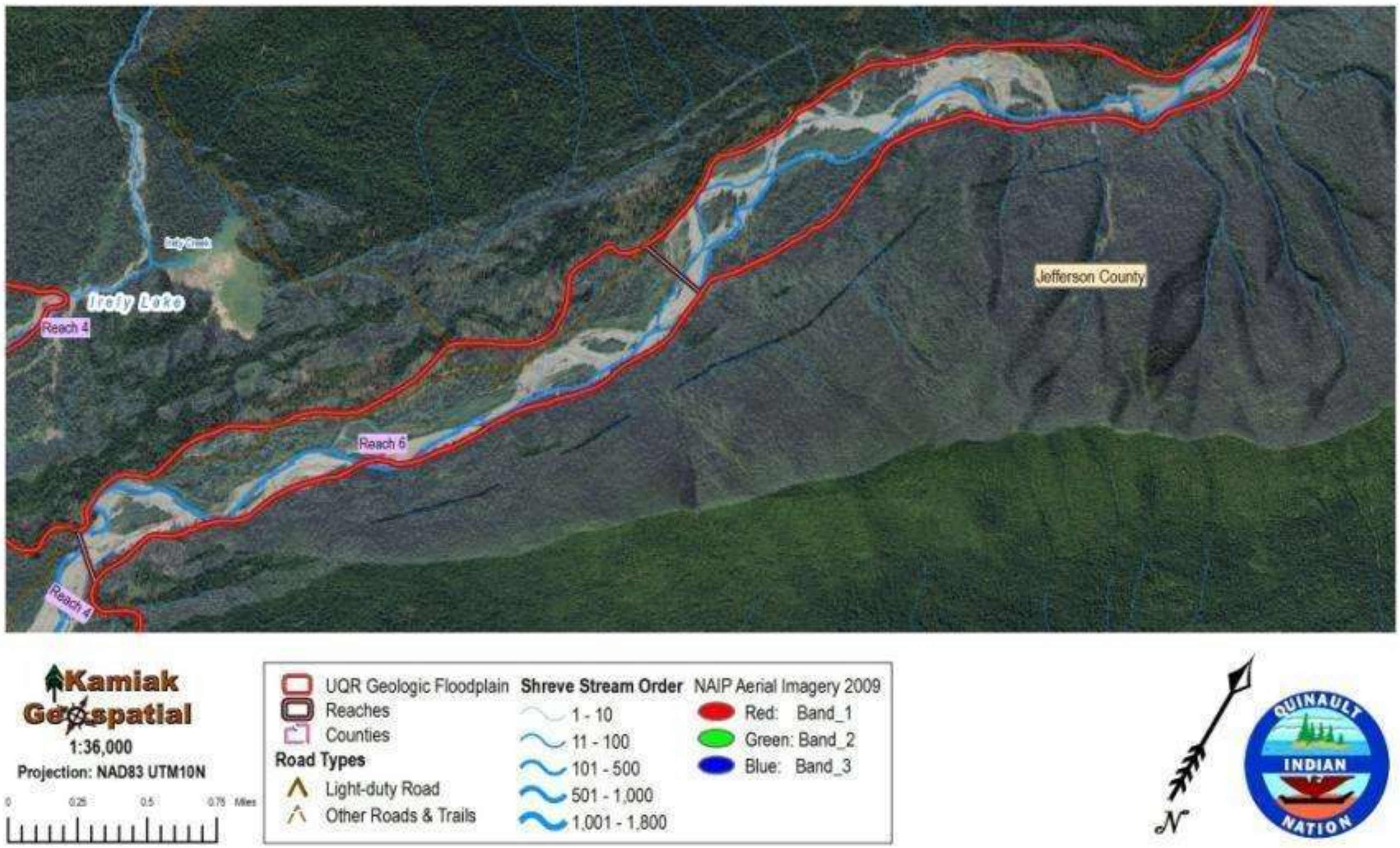


Figure 59. Reach Area 6 land ownership.

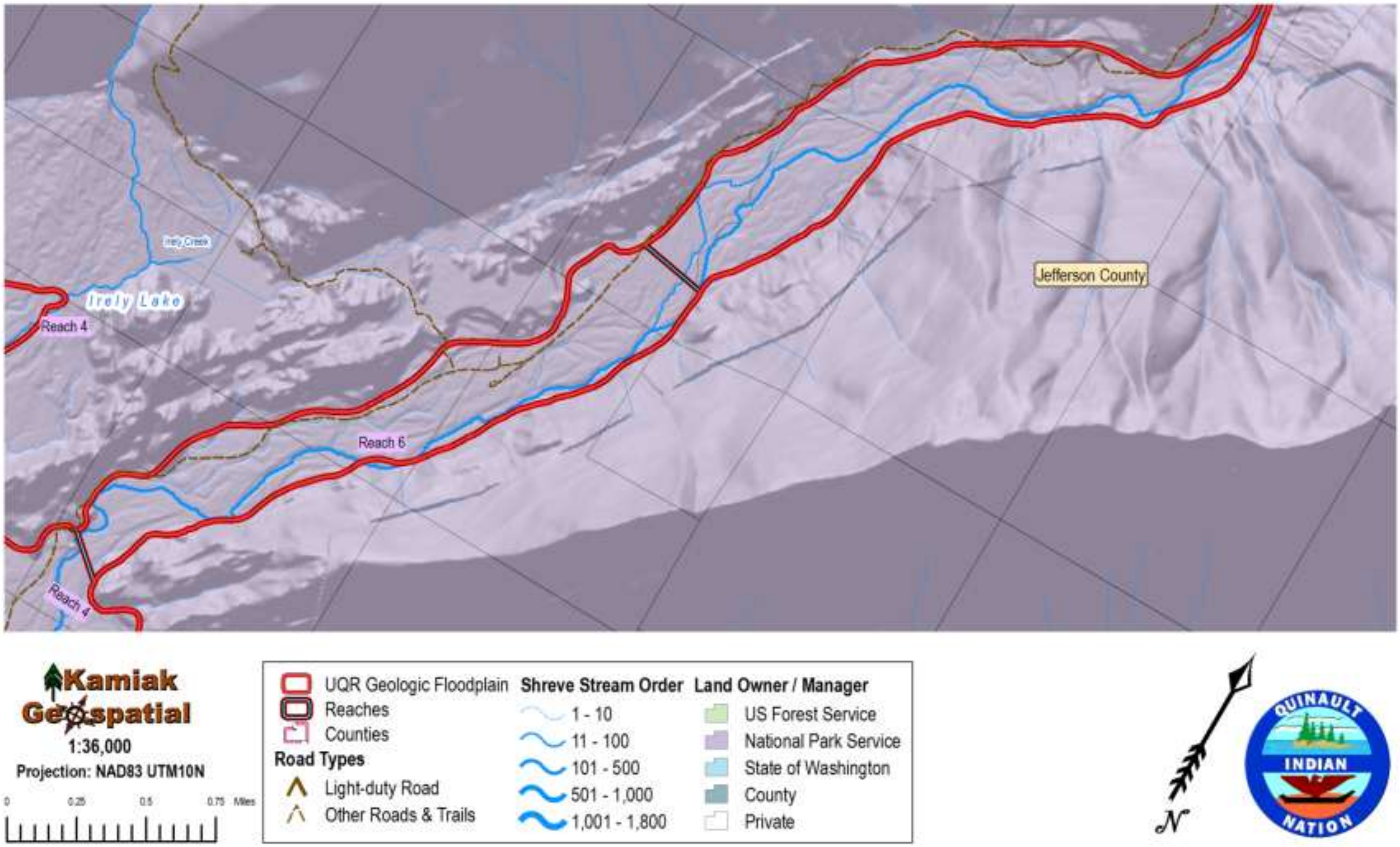


Figure 60. Reach Area 6 land ownership and Active Channel Migration Zone.

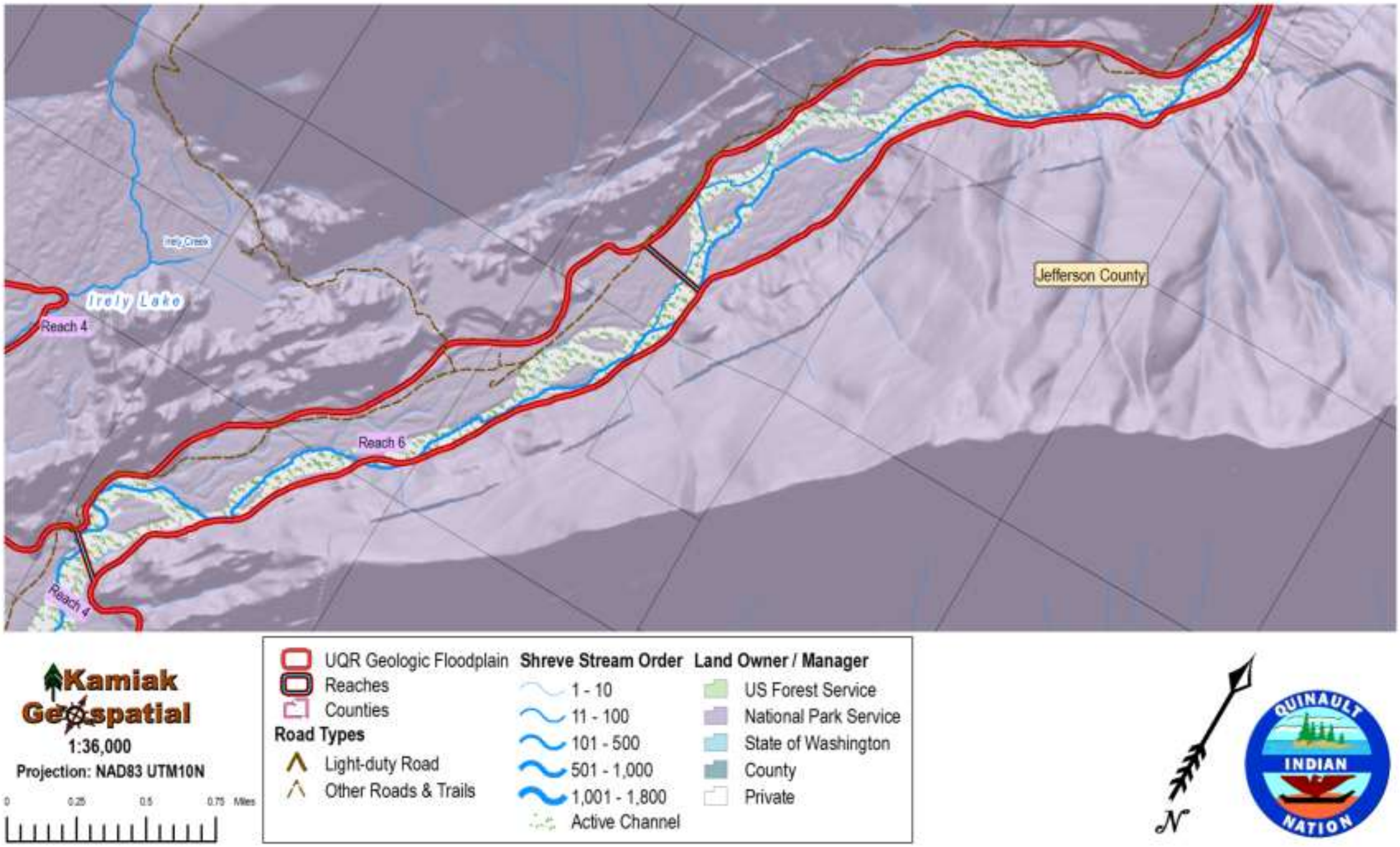
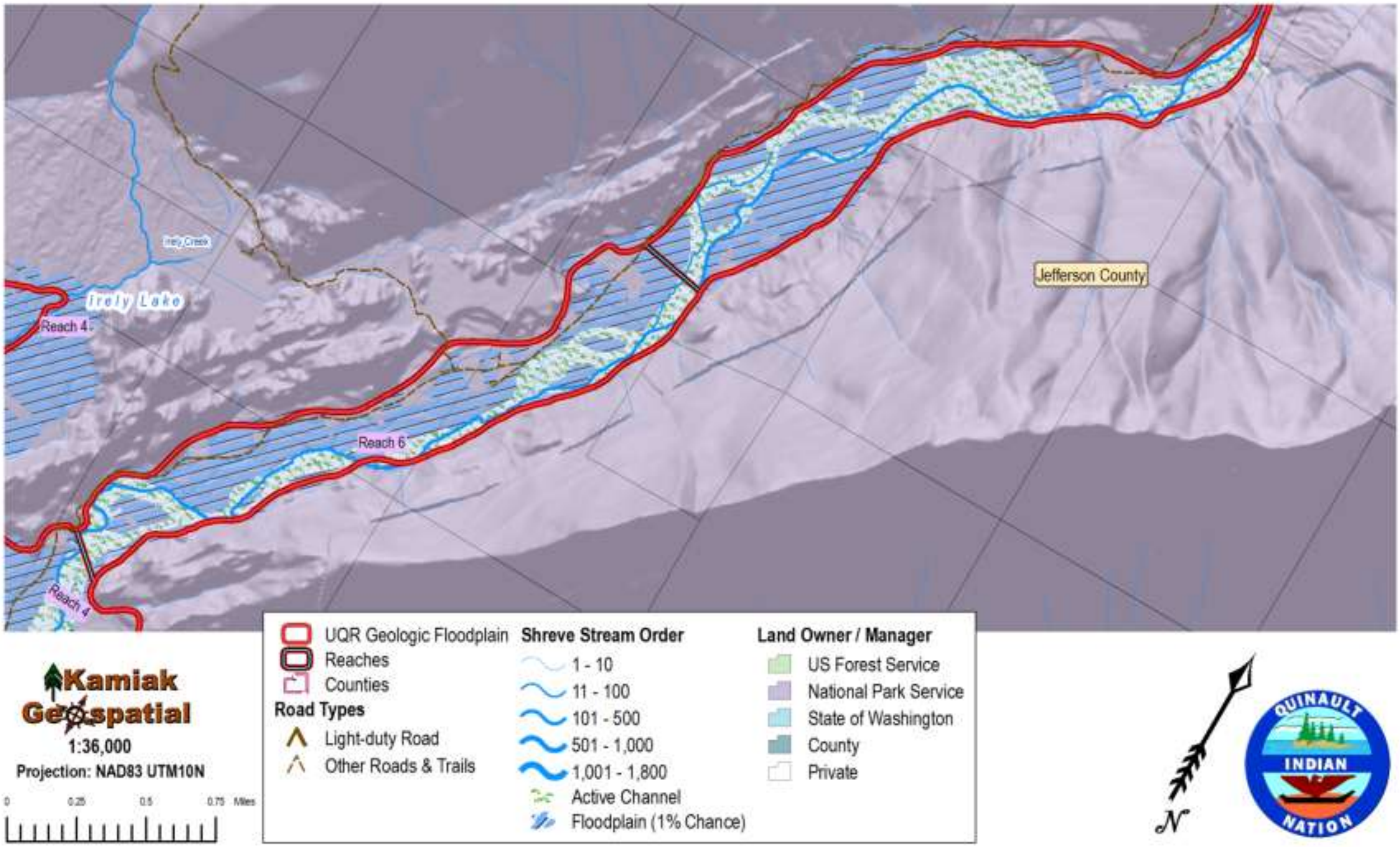


Figure 61. Reach Area 6 land ownership and floodplain (1% Probability).



13. Appendix F: Typical Site Plans (ELJ & Planting)

Figure 62. Typical Site Plan

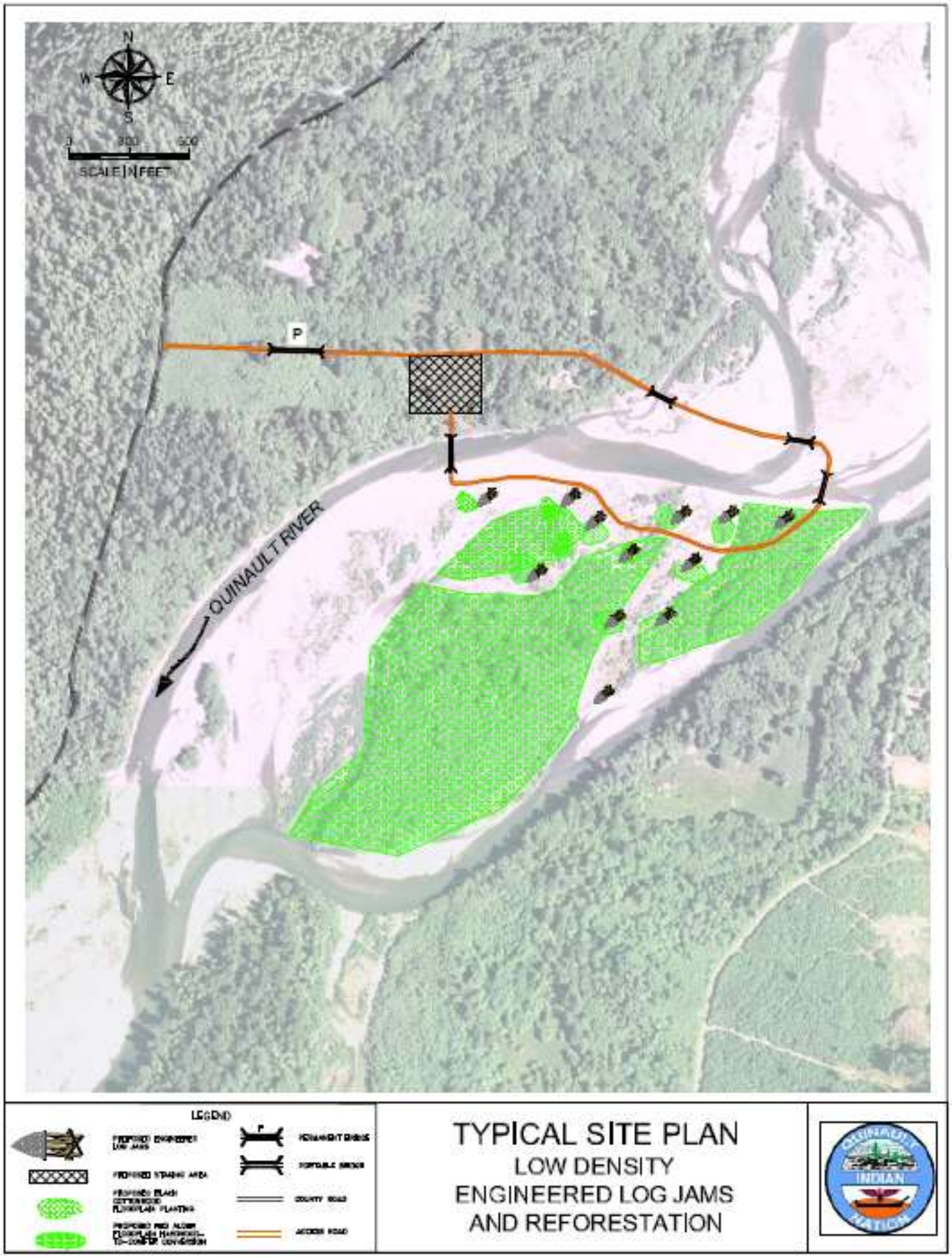


Figure 63. ELJ & Reforestation Site Plan Sheet 1.

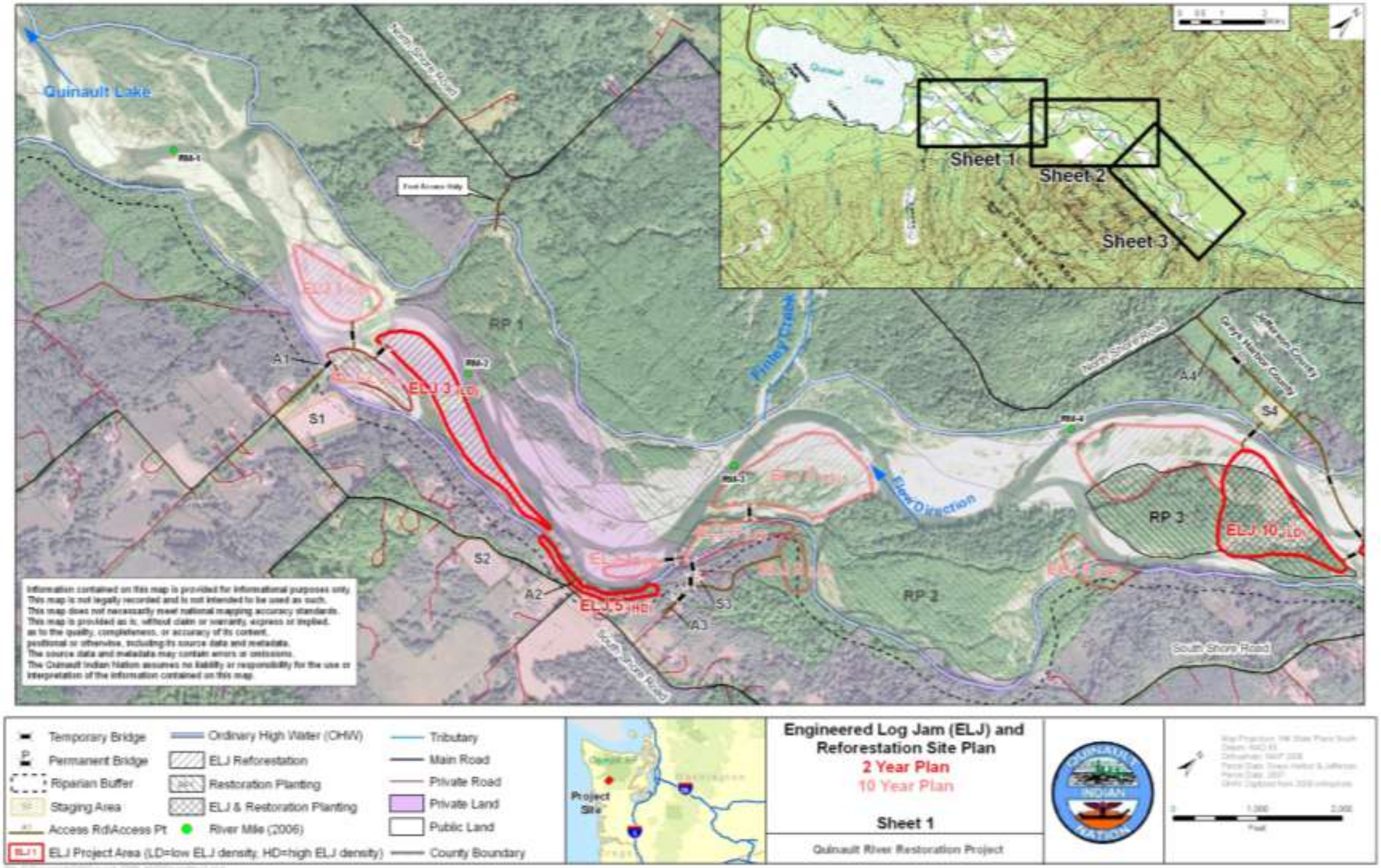


Figure 64. ELJ & Reforestation Site Plan Sheet 2

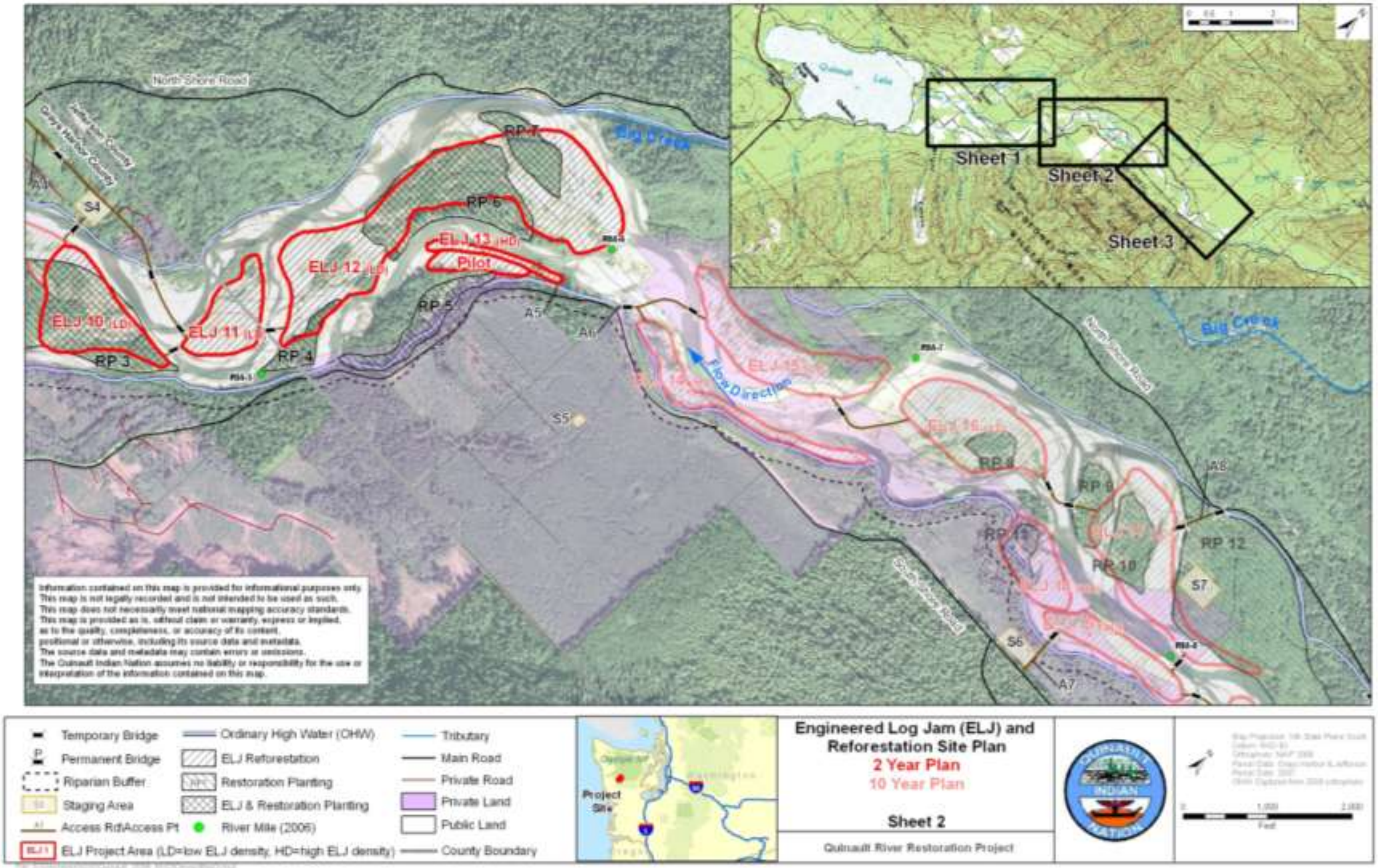


Figure 65. ELJ & Reforestation Site Plan Sheet 3

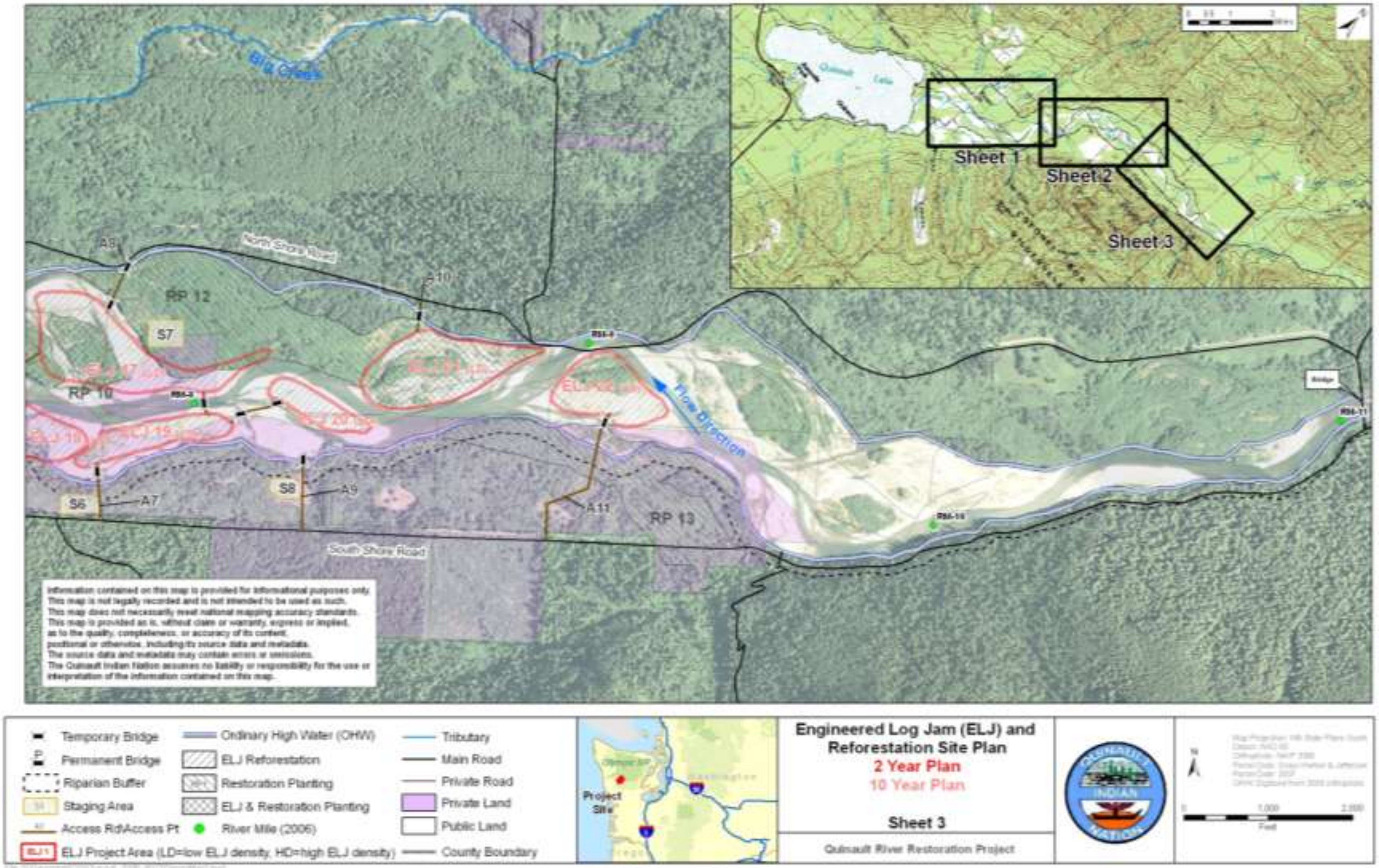


Figure 66. Typical concept plan for location of preferred alternative elements in the Quinault restoration area.

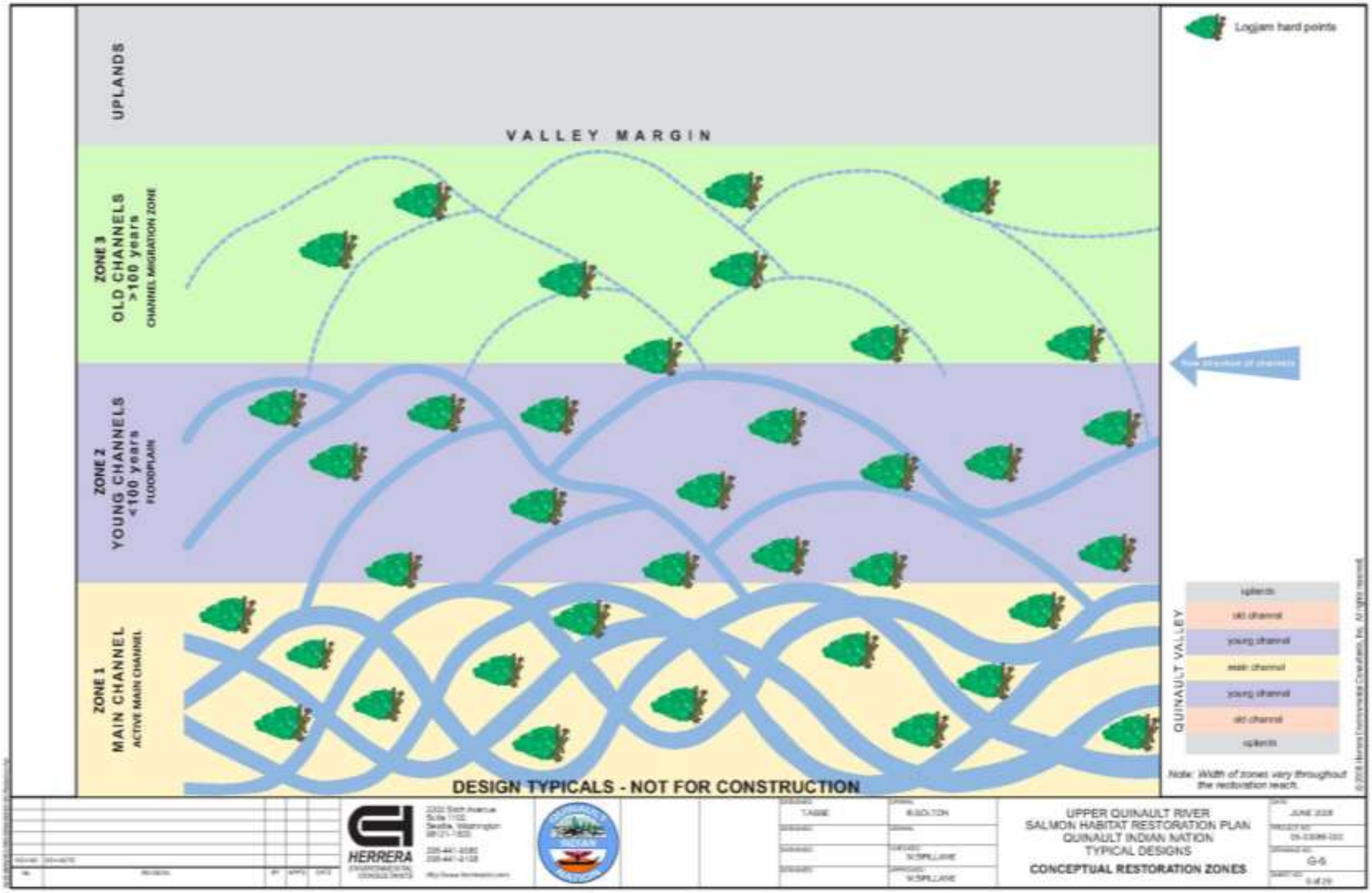


Figure 67. Example: Existing Habitat and Geomorphic Conditions.

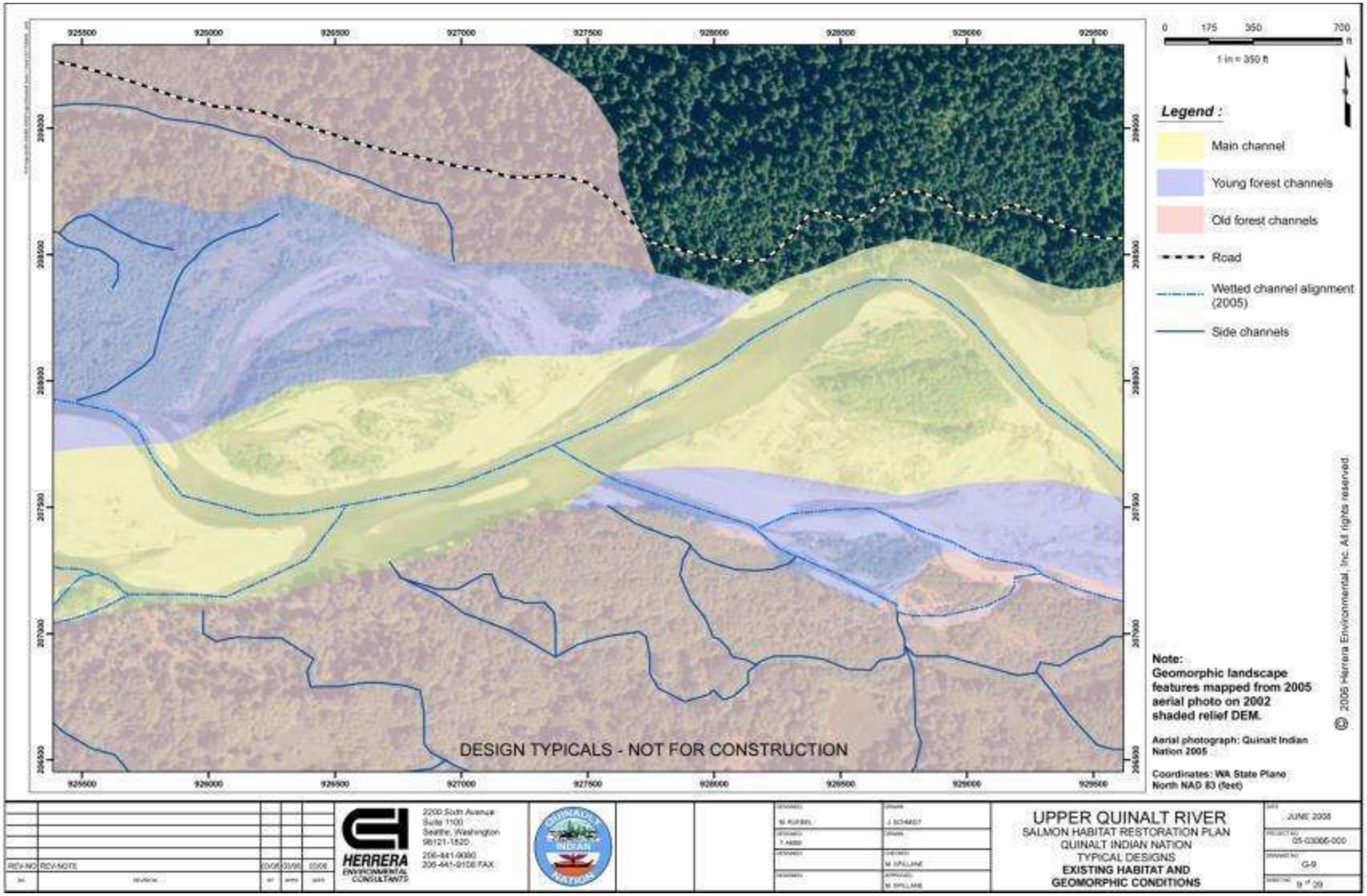


Figure 68. Example: Proposed Habitat and Geomorphic Conditions.

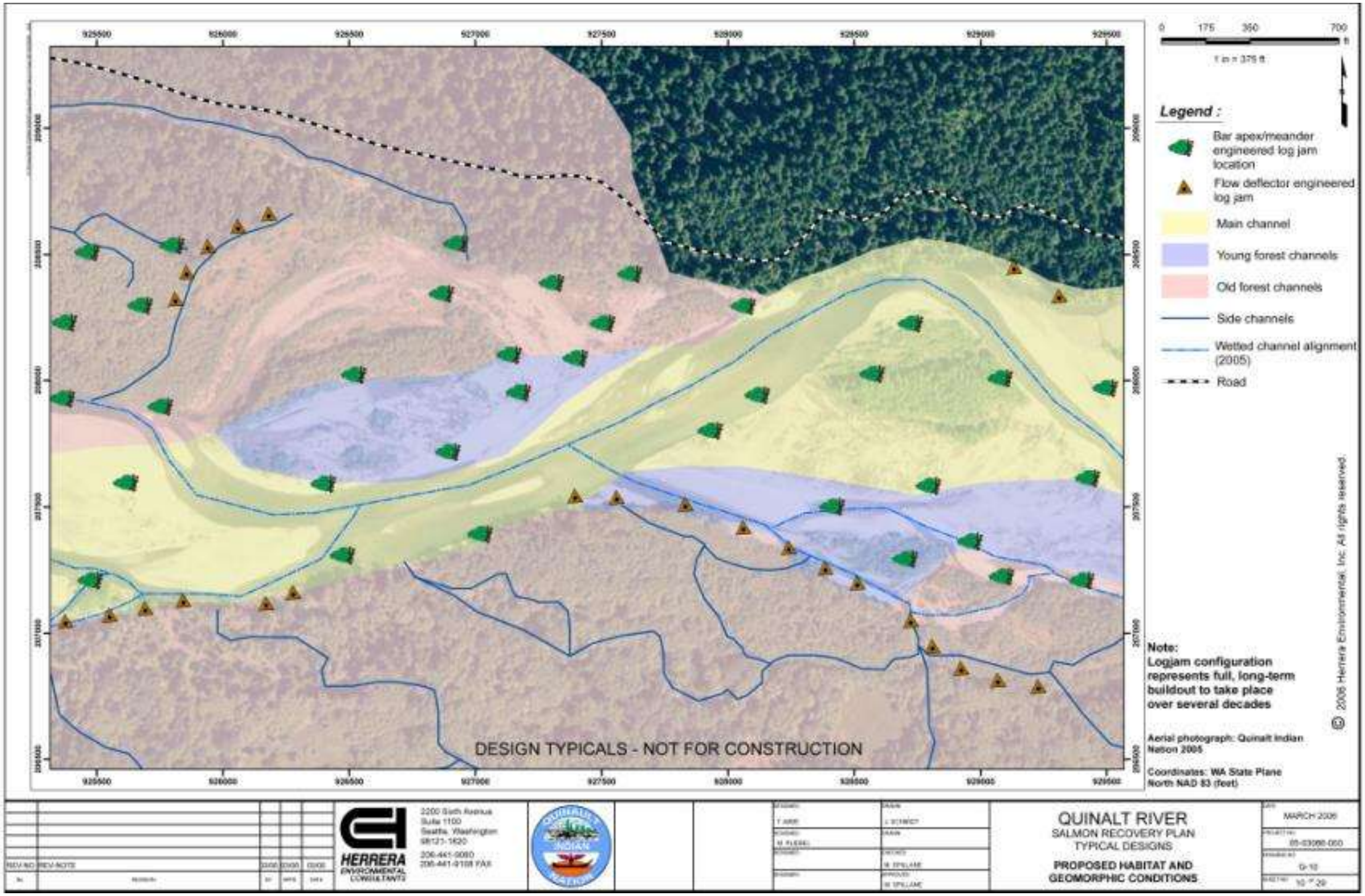


Figure 69. Example: ESC Plan.

Figure 70. Example: Temporary Facility BMPS 1.

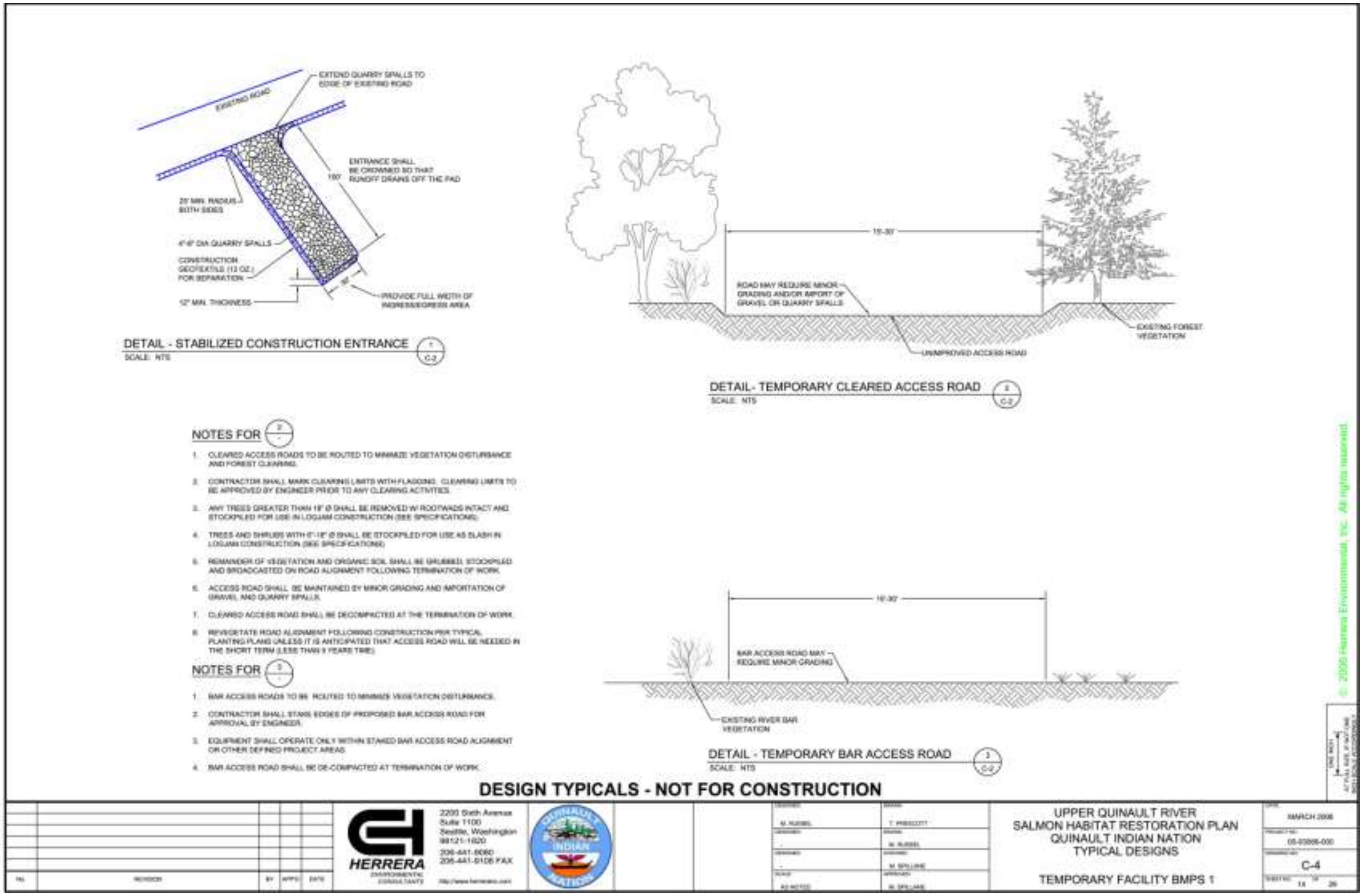
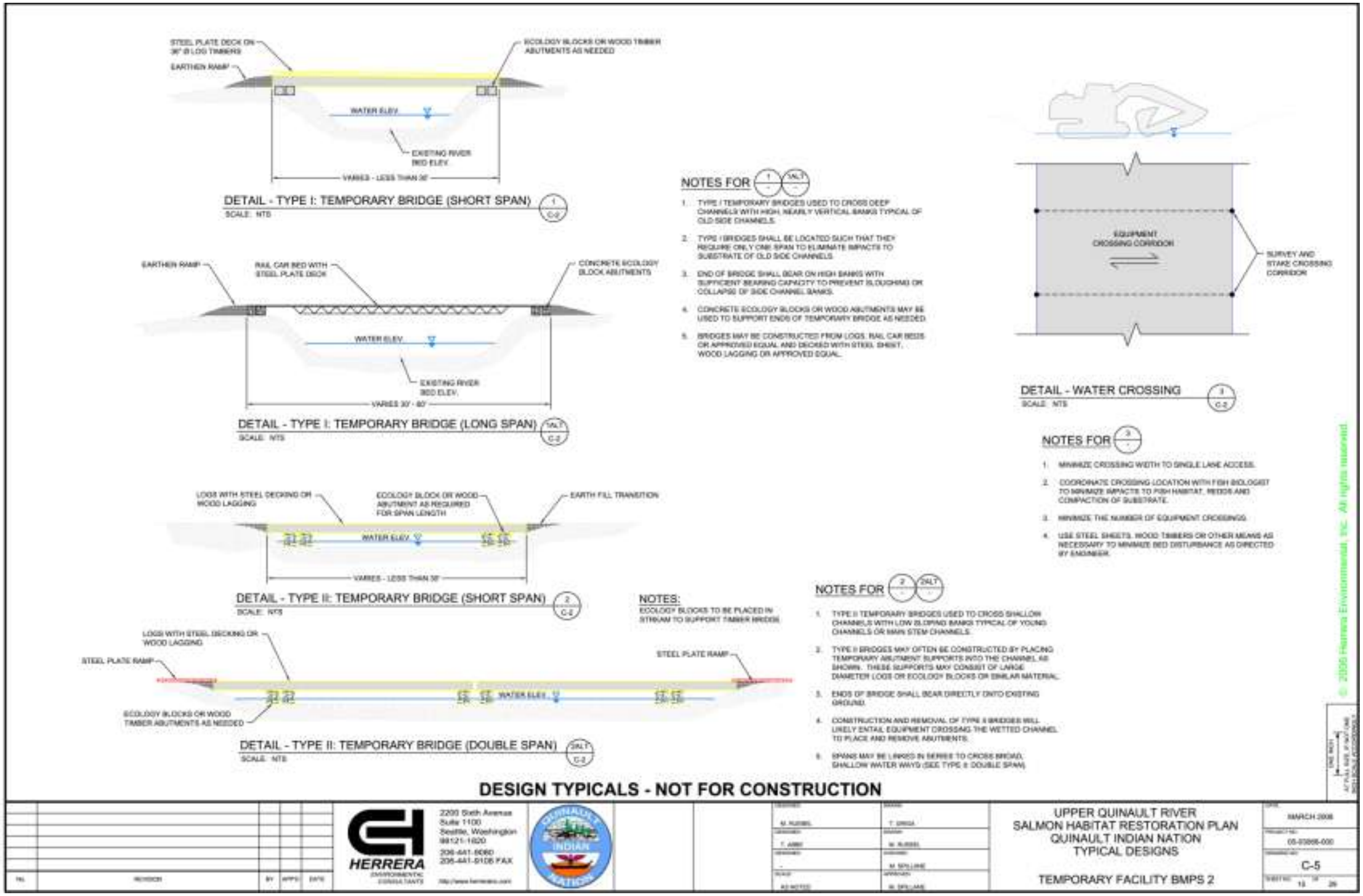


Figure 71. Example: Temporary Facility BMPS 2.



14. Supporting Information

14.1. Latin and Common Names

Latin and Common Names

14.2. Abbreviations Used

14.3. Works Cited

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15. Approvals

Finding of No Significant Impact (FONSI)

Prepared and signed by the Bureau of Indian Affairs.

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