

# Draft WRIA 20 Restoration Plan

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# Draft WRIA 20 Restoration Plan

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## Watershed Overview

The watershed of WRIA 20 includes all rivers and streams that drain into the Pacific Ocean from Cape Flattery to Huelsdonk Ridge on the south side of the Hoh Valley. This report assesses only the northern portion that lies within Clallam County. In general, the rivers of WRIA 20 have their origins in the high elevations of the Olympic Mountains and flow through lowland valleys to ultimately drain into the Pacific Ocean. The largest river system is often referred to as the Quillayute System and is comprised of four major subbasins: the Dickey, Calawah, Bogachiel and Sol Duc. Also within the Clallam County section of WRIA 20 are the Ozette and Sooes River systems. The shorelines that qualify as “of statewide significance” include 292 river miles and the following 6 lakes: Lake Ozette, Dickey Lake, Beaver Lake, Wentworth Lake, Lake Pleasant and Elk Lake.

The proximity to the Pacific Ocean results in frequent exposure to high winds and unusually heavy rainstorms, particularly in winter. These patterns contribute to erosion and mass wasting problems, which give rise to some of the most important restoration needs and opportunities in the WRIA. Timber salvage operations and associated road building in the wake of the Forks Fire in 1951 led to increased mass wasting and surface erosion. Timber harvest-related impacts have been a large contributor to restoration needs, but regulatory restrictions have been imposed that will reduce additional degradation of habitat. These rules are aimed at achieving sufficient shade and bank stability, allowing adequate large woody debris (LWD) recruitment, and limiting sedimentation impacts. In general, far greater care is now taken to minimize these alterations, resulting in recent improvements in shoreline conditions.

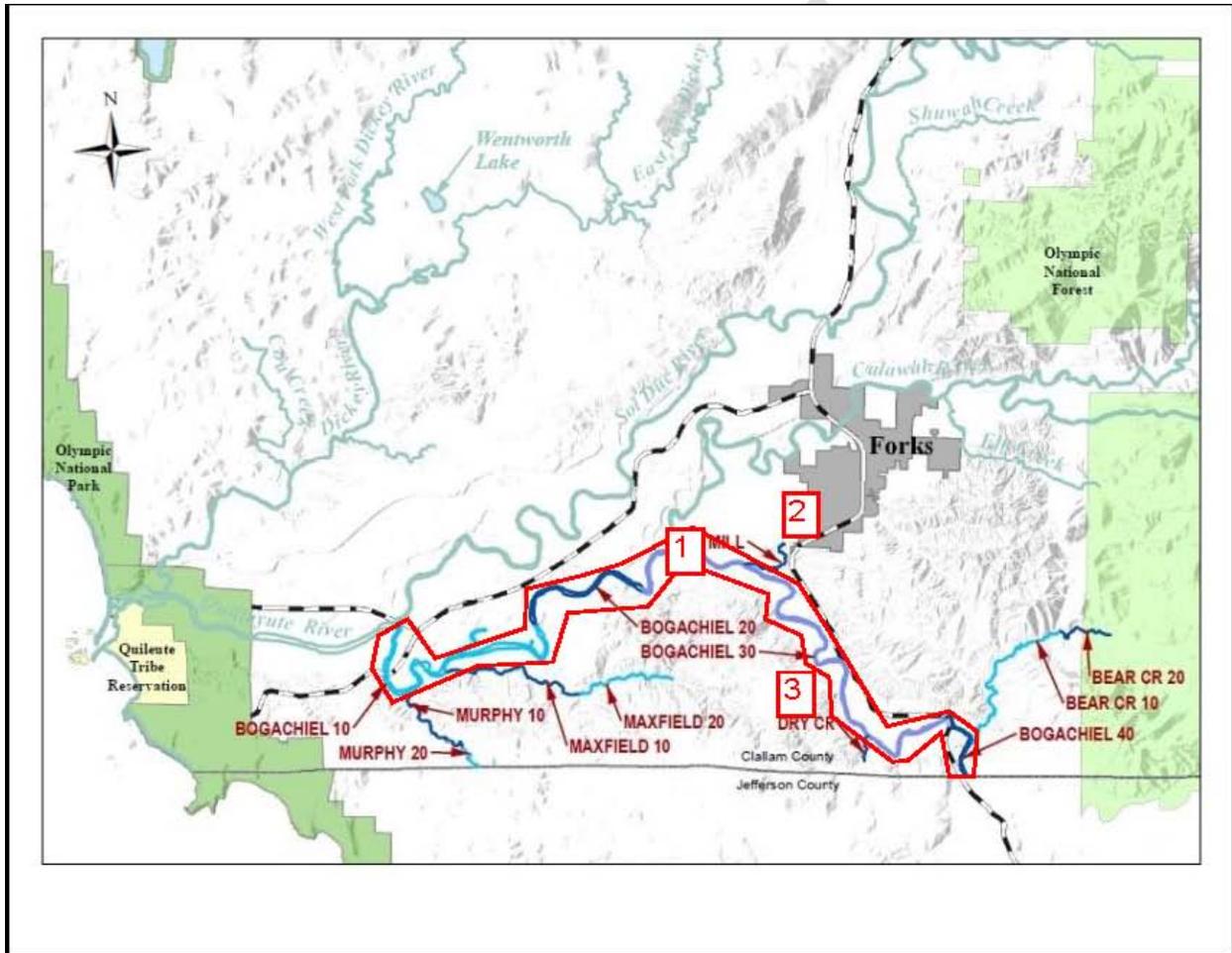
Overall, there is very little evidence of substantial impacts to ecological processes in WRIA 20. People have largely avoided building homes or businesses in critical areas such as wetlands, meander zones and floodplains. Few bridges were built across the major rivers and very little bank armoring has taken place, so channel migration continues to occur and supply LWD and gravel to downstream areas. Seasonal low flows and the lack of shade characteristic of wetlands and lakes provide the most likely explanation for most of the temperature exceedances documented in WRIA 20. The literature reported very limited grounds for concerns related to human alterations other than logging practices. The reported concerns were associated with water withdrawals and septic systems in Lake Pleasant. One of the best overall indicators of health are the wild salmon and steelhead runs that depend on functional habitat. With the exception of Lake Ozette sockeye, all the runs in the WRIA that have been evaluated are considered healthy, although not necessarily commensurate with historic stock levels.

A variety of restoration efforts have been carried out in WRIA 20 that have had beneficial effects within the SMP jurisdiction zone. In general, restoration priorities identified for the future and projects completed in the past oration projects and are located in the smaller streams that feed into rivers that qualify as shorelines of statewide significance. Few projects are proposed in the shorelines of statewide

significance because these rivers are generally in good condition. The exceptions are activities related to invasive knotweed and reed canary grass control, LWD placements and stream bank stabilization.

## Recommended restoration actions by river system:

### The Bogachiel System



Throughout almost its entire length, the Bogachiel River passes through private lands, much of which are dedicated to commercial forestry uses. Residences and farms occupy significant blocks of the north shoreline. Analyses report that the most significant concern with the lower Bogachiel system is channel incision which may be caused by the lack of LWD. LWD levels are reported to be low throughout the Bogachiel except for a segment upstream of the Highway 101 Bridge. Elevated levels of sediment have been detected and attributed to exposed unstable clay layers that result in bank collapses. Armoring associated with bridges is found in a limited number of Bogachiel segments. Erosion and mass wasting along the downstream end of the Bogachiel has required armoring to protect the La Push Road Bridge and WDFW boat ramp at Three Rivers. At the La Push Road Bridge, the river is eroding out an oxbow and

is likely to leave the Bridge and the nearby Kitchell property isolated in the next few major floods. The armoring that was installed is already being undermined by the river. The Limiting Factors Report made general recommendations and stated that outside the Park, problems include fish passage issues, loss of riparian area, lack of large woody debris, and collapsed banks.

General restoration actions that have been recommended throughout the mainstem system include: control of invasive weeds such as knotweed, improvement of riparian buffers to increase the supply of LWD, decrease inputs of coarse and fine sediments, increase channel complexity and roughness, reduce flow limitations to fish passage, and conserve and expand locally significant habitats.

Specific restoration recommendations based on the ICR findings include repair or replacement of failing culverts on DRY-BOGACHIEL and BEAR-BOGACHIEL.

#### *Known restoration needs and projects:*

- A Bear Creek culvert was identified by the Quileute Reach Assessment, but its location is not identified.
- The Quileute Tribe conducted several assessments (stream typing and fish passage status) for the Bogachiel River and its tributaries after the state watershed analysis process was no longer required by the state (1999). These assessments followed WDNR protocols. Permits to enter land were obtained from all applicable federal and state agencies and landowners and all data were shared with them. The projects used BIA funds.
  - In 2000, the Tribe completed a Mainstem Survey for blocking culverts and road sedimentation problem areas with the help of the state, Rayonier and private landowners.
  - In 2001, the Tribe completed a Fish Distribution Assessment in the lower Bogachiel tributaries following WDNR rules. The project included fish habitat and culvert assessments and mapping with the help of the state, Rayonier and private landowners.
  - In 2002, the Tribe completed a Fish Distribution Assessment in the middle Bogachiel tributaries following WDNR rules. The project included fish habitat and culvert assessments and mapping with the help of the state, the City of Forks, Rayonier and private landowners.
  - In 2003, the Tribe completed a Fish Distribution Assessment in the upper Bogachiel tributaries following WDNR rules. The project included fish habitat and culvert assessments and mapping with the help of the state, USFS and private landowners. The project stopped at the National Park boundary.
- The Quileute Tribe replaced two corroded and perched culverts with a bridge in the south fork of Maxfield Creek, a lower Bogachiel tributary. The project was completed in 2003 with engineering advice and partial funding from Rayonier, and the balance of funding from BIA.
- Two culverts along Dry Creek were reported to be potential projects in 2007.
- Knotweed control (See Bogachiel Reference Map- Project # 1) throughout the Bogachiel drainage was designated a top priority of the Quileute Reach Assessment. The CCNWCB and the Quileute Tribe have been working to control the knotweed on the Bogachiel River since 2008. They should complete this and move on to the Quillayute mainstem by end of 2011. Funding for Quileute has been through USFWS, EPA, and a Clallam County match.
- The NPCLE Strategy and the Quileute assessment for the Bogachiel system listed a project t(See Bogachiel Reference Map- Project # 2) hat lies beyond the shorelines of Mill Creek covered by

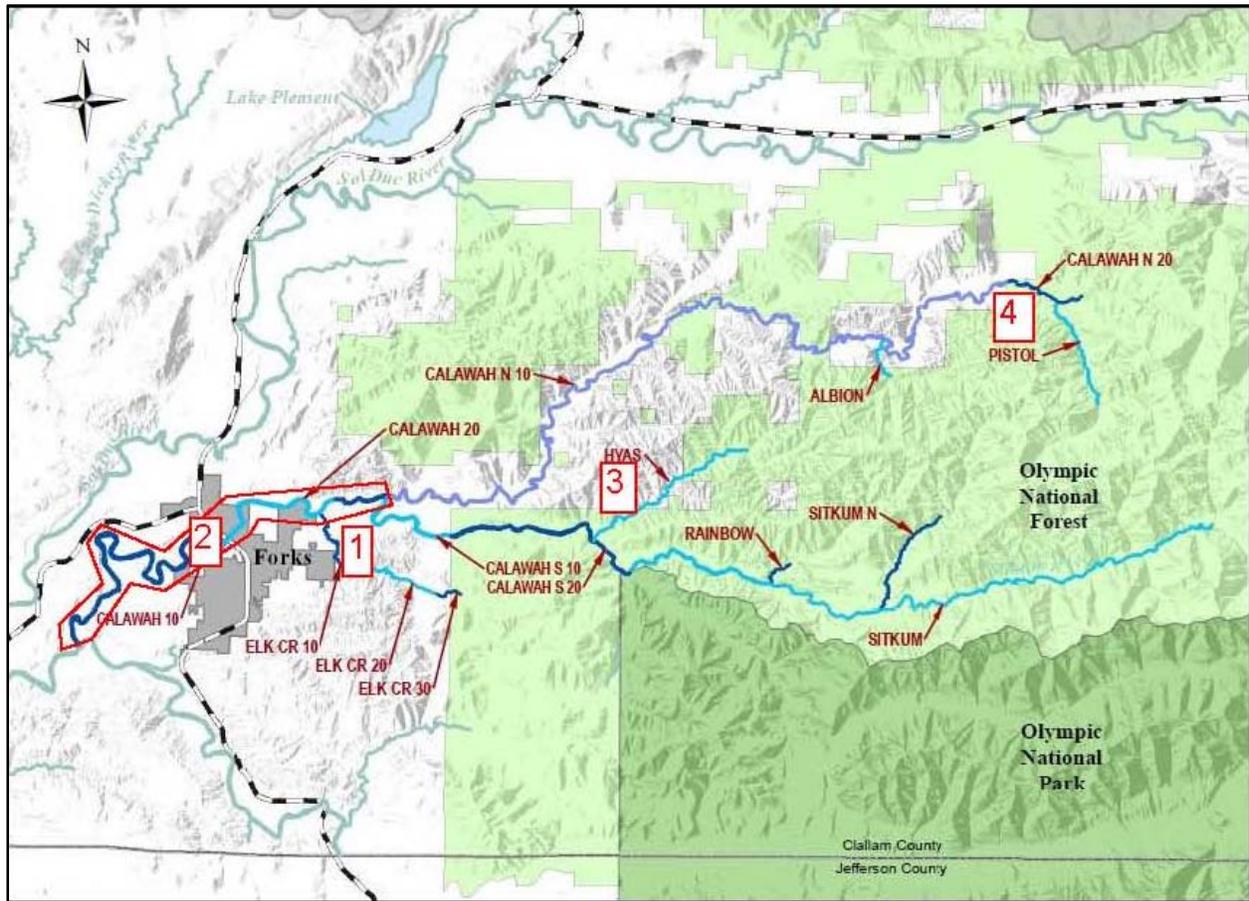
the Shoreline Management Plan (replacement of the Russell Road Mill Creek Culvert). This project is sponsored by the Pacific Coast Salmon Coalition and is currently in the preliminary design stage. The project is being funded by the US Department of Transportation in 2011.

- There are four barriers on Bogachiel tributaries(See Bogachiel Reference Map- Project # 3) that are on land owned by the McAvoy Family Trust. They are listed together as a single project in alternate application stage in PRISM.

### *Protection*

- As with most shorelines of WRIA 20, the proposals for new development along the Bogachiel have been limited in the past 20 years. However, one stretch of the mainstem should be given careful deliberation if development permits are sought. This area is the downstream portion that contains active channel meander zones. This portion includes active landslide and erosion zones and extremely valuable spawning beds. It is close to population centers of La Push and Three Rivers and has easy access to paved roads.
- The segment of the Bogachiel within the Forks UGA passes through a critical aquifer recharge area and may include associated wetlands at the mouth of Mill Creek. Though sparsely populated, this area is designated as appropriate for development within the UGA. Sufficient measures to protect these key zones should be instituted.
- The third segment requiring some focused attention is the mainstem portion that parallels US 101. The river's floodplain is wide with the river migrating over an expansive area. Associated wetlands may be present to the east of the mainstem and west of the highway. Almost all of the lands surrounding the river are privately owned and subject to RW5 zoning rules.

## The Calawah System



Almost all of the shorelines in the Calawah/Sitkum watershed are designated for commercial timber uses. Most of the shorelines zoned for residential uses are those that border and pass through the Forks Urban Growth Area. The North Fork of the Calawah is prone to channel instability and incision. Road failures have triggered mass-wasting events during peak flows. The lower reaches have low levels of LWD and LWD recruitment potential. The South Fork of the Calawah and Sitkum River have high road density, contributing erosion that is believed to advance the dewatering of several tributaries. Mass wasting events and channel instability are also major problems in the Sitkum, causing channel aggradation and debris flows that end up acting as barriers for anadromous fish. LWD levels and LWD recruitment potential are low in some segments of the Sitkum River and Rainbow Creek.

General restoration recommendations include road decommissioning, diversion of road runoff and sediment delivery to forest floor instead of tributaries, reconnection of disconnected habitats, development of off-channel overwintering habitat, restoration of native plant species and treatment of invasives, LWD placement and efforts to increase LWD recruitment potential by managing riparian zones for older age class conifers.

### ***Restoration recommendations:***

Specific restoration recommendations based on findings in the Integration and Characterization Report (ICR) are listed as follows:

- CALAWAH S 10 and SITKUM lack complexity in the riparian zone, affecting fish habitat and high sedimentation levels, affecting water quality. Restoration actions recommended: manage riparian zone for conifer growth to encourage LWD recruitment, late successional habitat, species diversity, riparian planting and conifer release; reduce road drainage by road decommissioning, culvert repair and replacement.
- RAINBOW lacks complexity in the riparian zone and has poor water quality due to altered riparian and channel conditions, affecting fish habitat. Restoration actions recommended: manage riparian zone in order to encourage LWD recruitment, late successional habitat, species diversity, riparian planting and conifer release; reduce sediment inputs and potentially reintroduce resident fish species.
- CALAWAH N 10 and 20 and ALBION lack coniferous LWD and LWD recruitment potential and have a high rate of catastrophic peak flow events. Restoration actions recommended: manage riparian zone in order to encourage LWD recruitment, riparian planting (especially in slide areas) and conifer release; reduce debris flow to a level that provides adequate amounts of sediment and LWD.
- CALAWAH N 10 and 20 have high sedimentation levels, affecting water quality. Restoration actions recommended: reduce road drainage by road decommissioning and culvert repair and replacement.

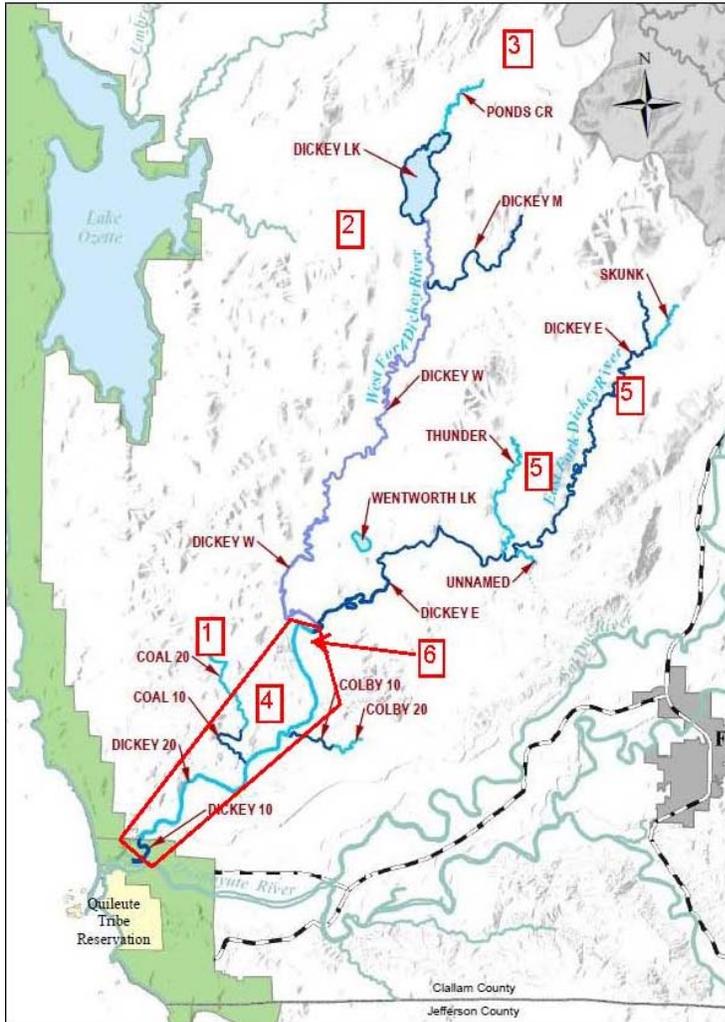
### ***Known restoration needs and projects:***

- In 1996, Rayonier initiated a Watershed Analysis for the North Fork of the Calawah, using a mixture of state and federal modules. Quileute co-led the fish module and led the cultural module, using BIA funds. The other participants and/or co-leaders for the 9 requisite modules (Sedimentation, Vegetation, Hydrologic, Stream Channel, Fish, Public Works, Wildlife, and Cultural—somewhat different from state modules by including Wildlife and Vegetation), plus hazard calls, and prescriptions for a federal WSA included the USFS, USFWS, and WDNR. The hazard calls identify conditions that can adversely impact resources during forestry operations and the prescriptions recommend future restoration actions. These are features of state watershed analyses.
- In 1998, another federal watershed analysis was initiated by the USFS with assistance by ONP and the Quileute Tribe, for the Sitkum and South Fork of the Calawah Rivers. State stream typing is not part of this process, but in the Fish Module, which Quileute co-led, the reaches are fully analyzed for fish use and mapped. Quileute also led the Cultural Module.
- The North Olympic Land Trust sponsored and helped fund a 220-acre land acquisition on Elk Creek in 2005. (See Calawah Reference Map- Project # 1) Elk Creek, a tributary off of the Calawah, provides spawning ground for up to a third of the total coho redds in the surveyed portions of the Calawah system (primarily the North Fork of the Calawah and the Sitkum River). This acquisition transferred the land from Rayonier timber management to WDFW, where it is

managed for protection of fish and wildlife. This acquisition is now the site of a public access trail along the creek.

- The Clallam County Noxious Weed Control Board and the Quileute Tribe started control of knotweed on the Calawah and in the City of Forks in 2006 (See Calawah Reference Map- Project # 2) . Most of the knotweed was eradicated by 2008, but the river continues to be monitored by the Quileute Tribe and new patches are treated as they are discovered. Funding is through BIA and a Clallam County match.
- The Watershed Restoration Plan for National Forest System Lands within the Calawah River Watershed lists several projects that have been completed in the North Fork of the Calawah, which include 12.4 miles of decommissioned Forest Service roads, two blocking culverts that have been corrected, several miles of riparian restoration along the mainstem and tributaries 0183A and 0184, and one mile of LWD placement done in partnership with the Pacific Coast Salmon Coalition.
- The Watershed Restoration Plan for National Forest System Lands within the Calawah River Watershed lists several projects that have been completed in the South Fork of the Calawah which include 7.4 miles of decommissioned FS roads, 1.5 miles of LWD placement in HYAS, and construction of an overwintering pond for off-channel habitat.
- The US Forest Service’s Calawah Focused Watershed Program reports that 8.7 miles of Forest Service roads have been decommissioned along the Sitkum and 1.3 miles of roads have been decommissioned in Elk Creek.
- The Quileute Tribe worked with the USFS to restore LWD in HYAS Creek in a SRFB project that was completed in 2010 (See Calawah Reference Map- Project # 3). This should restore channel complexity and curb velocity, allowing more cobbles for spawning to be retained.
- SITKUM has road and culvert deterioration around river mile (RM) 2-3. The NPCLE has called for road decommissioning on the unused roads and replacement of the damaged culvert.
- The Pacific Coast Salmon Coalition has a potential project prioritized by the Watershed Restoration Plan for National Forest System Lands within the Calawah River Watershed on the NF Calawah to replace a culvert (See Calawah Reference Map- Project # 4). This project is not yet approved for funding.
- The Watershed Restoration Plan for National Forest System Lands within the Calawah River Watershed lists priority projects for the watershed which include 24.4 miles of road decommissioning, 67 miles of restoration work on roads to remain open, and 10 miles of restoration work on intermittent service roads that will close to vehicles with the opportunity to reopen in the future.

## The Dickey System



Aside from a few limited residential and agricultural areas, the entire Dickey system runs through private lands designated for commercial timber use. Naturally unshaded wetlands and the presence of two shallow lakes in the system account for warm water temperatures in several streams in the subbasin. Windthrow is considered a particular problem due to the prevalence of strong winds and highly saturated soils. Seasonal low flows limit downriver transport of LWD. A major flood event in 1999 contributed to inadequate LWD levels and channel destabilization. Roads are a major source of sediment in the Dickey subbasin. Several roads adjacent to the streams function as dikes, blocking access to off-channel habitat. Clearcuts are another contributor through surface erosion events. The impacts of natural forces and forestry operations in the riparian zone have generated numerous additional opportunities for restoration work, particularly in upper PONDS Creek and parts of DICKEY E and M.

Specific restoration recommendations include LWD placement in DICKEY E, where LWD conditions are poorest, channel stabilization in DICKEY E from the 1999 flood damage, LWD placement and riparian

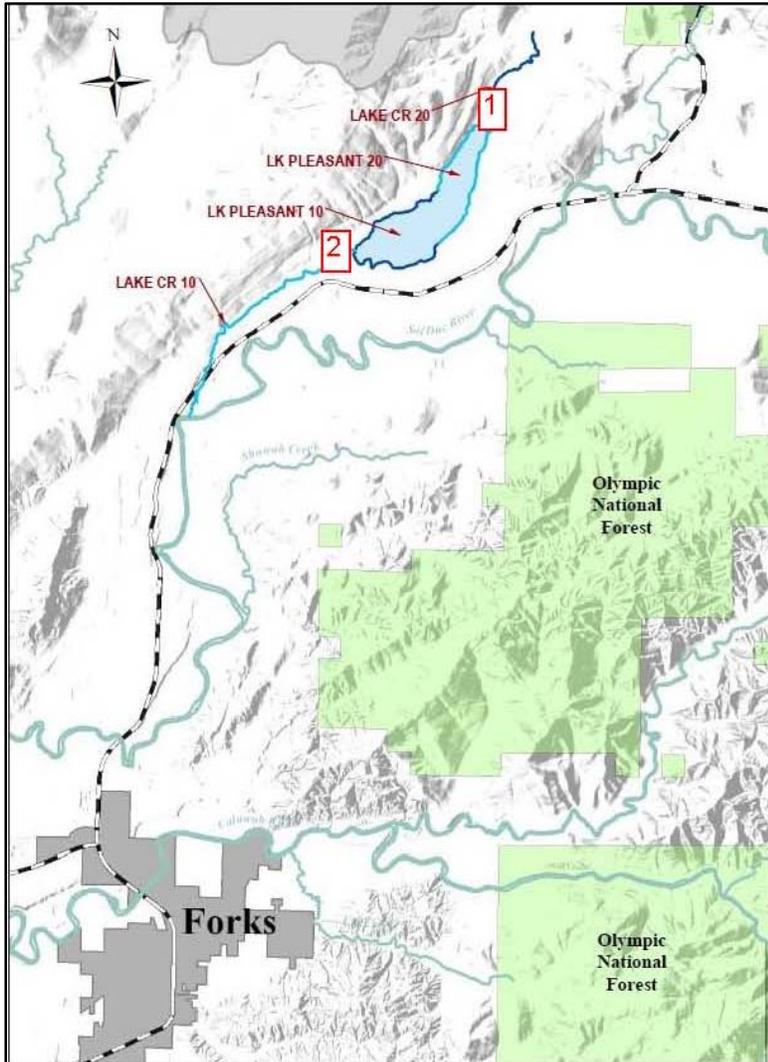
zone management to provide adequate LWD potential in lower THUNDER Creek where poor LWD levels in pool-riffled channels affect channel complexity and habitat. General restoration recommendations include continued control of knotweed riparian replanting and road decommissioning to reduce runoff.

#### *Known restoration needs and projects:*

- The Limiting Factors Analysis of 2000 listed nearly 40 culverts blocking fish passage. Most of the fish blockages were in tributaries off DICKEY E, W and M, with a few in PONDS tributaries. Due to some projects sponsored by the Pacific Coast Salmon Coalition as well as ongoing work by Rayonier and WDNR, there are only a few blocking culverts that remain on the list for replacement.
- Without specific references to locations, the Dickey Watershed Analysis identified low LWD levels and potential for LWD recruitment as key problems affecting channel complexity and habitat. Restoration actions were recommended including: logjam installation for riparian zone management to encourage tree growth and to replace alder with conifer for better long-term LWD recruitment.
- The NPCLE Strategy lists priority projects for the Dickey watershed, including the replacement of a culvert with a bridge on Coal Creek at the 5000 road crossing and a culvert replacement on Coal Creek at the 5602 road (See Dickey Reference Map- Project # 1). Both culverts are blocking habitat for fall coho, winter steelhead and cutthroat trout. A culvert on SKUNK is blocking habitat for the same species and requires replacement. The Pacific Coast Salmon Coalition listed the replacement of the culvert on the 5000 road as a project in PRISM. The project is currently in pre-application, not yet approved for funding. No known offers from other sponsors have been made for the other two projects.
- In 1998, Rayonier initiated a watershed analysis in the East and West Forks of the Dickey River. This was conducted using the state watershed analysis process; modules include Sedimentation, Cultural, Hydrologic, Riparian, Stream Channel, Fish Habitat, Water Quality, and Public Works, as well as Synthesis, Hazard Calls and Prescriptions. The Water Quality Module, a state pilot, was led by the Quileute Tribe, which also led the Cultural Module and co-led the Fish Module. Other participants included Washington Department of Natural Resources (WDNR), Washington Department of Fish and Wildlife (WDFW) and the Washington Environmental Council. Pentec was a lead contractor for Rayonier.
- In 1998, the Quileute Tribe completed a Wetlands Mapping project in portions of the Dickey watershed near the Quileute reservation, with access permission provided by ONP and private landowners. This project was done with funding from the EPA.
- The Quileute Tribe completed several restoration projects in the Dickey watershed with federal grant funds:
  - In 1999, the Tribe was awarded a SRFB grant to install cross-drains in a portion of the Dickey on Rayonier lands, in order to shift road-delivered sediment to the forest floor instead of the tributaries (See Dickey Reference Map- Project # 2). Rayonier provided the protocol, which was developed by them along state guidelines. The project was completed by 2003. This project included areas of the Ozette Basin (see that section, above) and installed a total of 30 cross-drains.

- In 1999, the Tribe replaced a blocked culvert with a bridge at Haehule Creek (See Dickey Reference Map- Project # 3). The project, funded by BIA, followed WDNR and WDFW protocol and was completed with help from Rayonier and WDNR.
  - In 2004, the Tribe completed a project that included LWD placement and alder suppression for long-term LWD recruitment potential in the Middle Fork of the Dickey River with help from Rayonier. This project was funded by BIA.
- From 2001-2005, the Quileute Tribe completed a Smolt Trapping project in Dickey tributaries. The project included smolt traps in the tributaries, a screw trap in the Dickey mainstem and attendant water quality sampling. It was done with National Oceanic and Atmospheric Administration (NOAA) funding and access permission from Rayonier, WDNR and private landowners.
- In 2005, the Quileute Tribe completed an Assessment of Fish Habitat (stream typing) in mainstem Dickey tributaries following WDNR protocol. Access for this project was obtained from Rayonier, WDNR, the City of Forks and private landowners.
- The Dickey was the first area targeted for knotweed control by the Quileute Tribe (See Dickey Reference Map- Project # 4). With training from CCNWCB and funding from BIA, Quileute worked in the Dickey tributaries and mainstem from 2002 through 2005 and completed eradication where Japanese and giant knotweed had infested riparian zones and adjacent wooded areas. However, Quileute monitors annually to check for any new or resurgent growth and eradicates it, should it reappear.
- Ecotrust is the sponsor and landowner for a project that lists several failing culverts on unnamed Dickey tributaries (See Dickey Reference Map- Project # 5). The project has been submitted in PRISM and is in pre-application stage, not yet approved for funding.
- A project that lists a failing culvert on an unnamed Dickey tributary is owned and sponsored by the private landowner (See Dickey Reference Map- Project # 6). The landowner has applied for funding from the Family Forest Fish Passage Program. The project has been submitted in PRISM and is in pre-application stage, not yet approved for funding.

## The Lake Pleasant and Lake Creek System



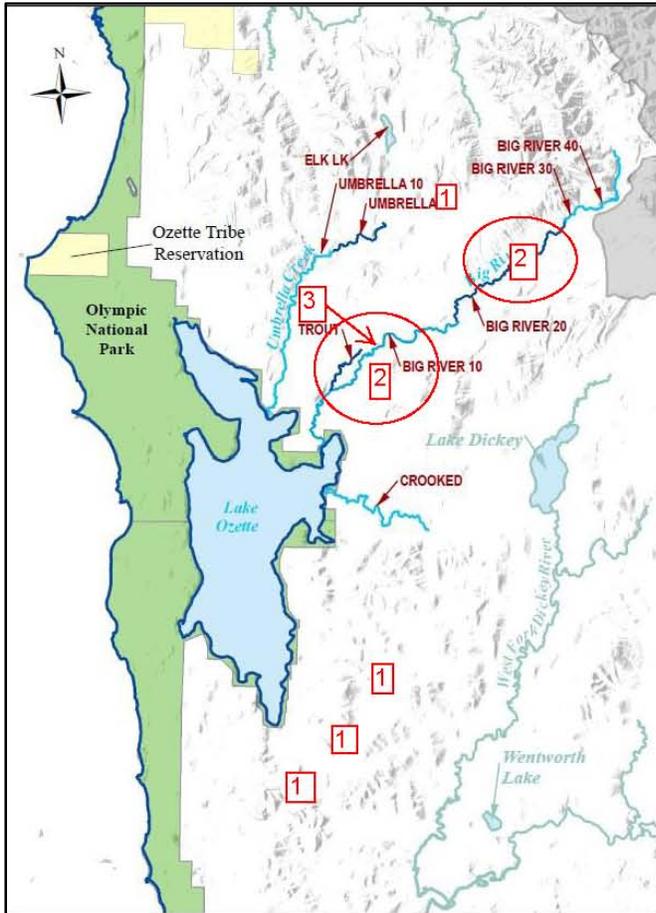
The Lake Pleasant and Lake Creek shorelines contain the widest mix of land uses in WRIA 20 outside of the Forks Urban Growth Area. In addition to expanses of commercial forest lands held in private ownership, the reaches also include densely populated residential areas and an industrial site. Lake Pleasant problems include high water temperatures and low dissolved oxygen levels possibly associated with housing septic systems. The west end of the lake has high fine sediment delivery due to high road density, the proximity of road to the shorelines, and the relatively heavy levels of truck traffic. Problems in LAKE CR—SOL DUC 10 include poor riparian conditions, lack of riparian shade, elevated water temperatures, seasonal low flows, seasonal flooding, increased water withdrawals, low levels of LWD, high fine sediment delivery, two failing culverts, and extensive knotweed infestations. LAKE CREEK—SOL DUC 10 has high fine sediment delivery. LAKE CR—SOL DUC 20 conditions exhibit low bank stability, high road erosion and loss of habitat due to a high rate of fine sediments.

Restoration recommendations include reduction of water withdrawals, repair of culverts, improved management of riparian zones for older age class conifers, repair of failing septic systems, placement of LWD to reduce fine sediment delivery, acquisition of conservation easements, reduction of road density, and control of erosion and runoff into stream channels along the west end of the lake.

*Known restoration needs and projects:*

- The 1995 USFS Pilot Sol Duc Watershed Analysis called for decreasing sedimentation problems in LAKE CR – SOL DUC 10 and 20, by LWD additions or recruitment.
- A property acquisition project on the north shore of Lake Pleasant was attempted in 2003 by the North Olympic Land Trust (See Lake Pleasant Reference Map- Project # 1). After the project was approved for funding by the Salmon Recovery Funding Board, the landowner abandoned the property acquisition. The property remains a high priority for salmon habitat protection.
- Knotweed eradication has taken place on LAKE CR – SOL DUC 10. The CCNWCB has been working toward eradicating knotweed in Lake Pleasant, Lake Creek and Beaver since 2006. Quileute continues to monitor the area for resurgence.
- The 2000 WRIA 20 Limiting Factors Report mentions two culverts in tributaries to LAKE CR – SOL DUC 10 that block coho habitat. That report also calls for restoration efforts aimed at failing septic systems, water withdrawals, and other human impacts.
- The Quileute 2006 Reach Assessment funded by BIA identified as a high priority a culvert (CL000729) on Lake Creek that blocks fish passage. Cleanout of a Lake Creek culvert (CL000729) was ranked as a significant but non-prioritized project. The Quileute Tribe's concerns with the effect of human development on Lake Pleasant sockeye runs called for acquisition of conservation easements in the area. NOLT was awarded such by SRFB but the landowners and the state could not agree on a price so the project did not reach fruition. The Tribe has also called for repair of failing septic systems.
- The outlet of LAKE CR—SOL DUC 10 has been blocked by rock and gravel entering from an unnamed creek that flows down from Tye Ridge (See Lake Pleasant Reference Map- Project # 2). Cleanup of this culvert has been identified as a priority by local landowners who report low flows in summer and increased flooding in winter. This reach, particularly the outlet, has been identified as prime sockeye and Chinook spawning habitat. This problem presents a potential loss of habitat and could potentially hamper the migration of sockeye adults in the fall due to low water conditions. There has also been extensive private property damage, as well as flooding of the Clallam County Park and West Lake Pleasant Road, during the flooding in 2010. Locals have been working with the Pacific Coast Salmon Coalition, Clallam County, the Quileute Tribe and WDFW to get the assistance and permits required for this project.

## The Ozette System



The Ozette system flows through lands in private commercial timber production, with limited areas of low density residences along Big River. Sedimentation is a major problem in the Ozette watershed, caused by road density, mass wasting and logging practices. Channel incision is also a problem, particularly in lower Big River and Umbrella Creek. LWD recruitment potential is low because the old growth conifers that historically dominated the riparian zones have been largely replaced by red alder. Temperature is the main water quality impairment for the Ozette watershed. The Ozette watershed has a high priority for restoration because of the ESA listing for sockeye and bulltrout.

In general, restoration recommendations include road maintenance and decommissioning, LWD placement, bank stabilization, riparian planting, invasive species removal (predominantly knotweed and reed canary grass) and measures to ensure LWD recruitment potential.

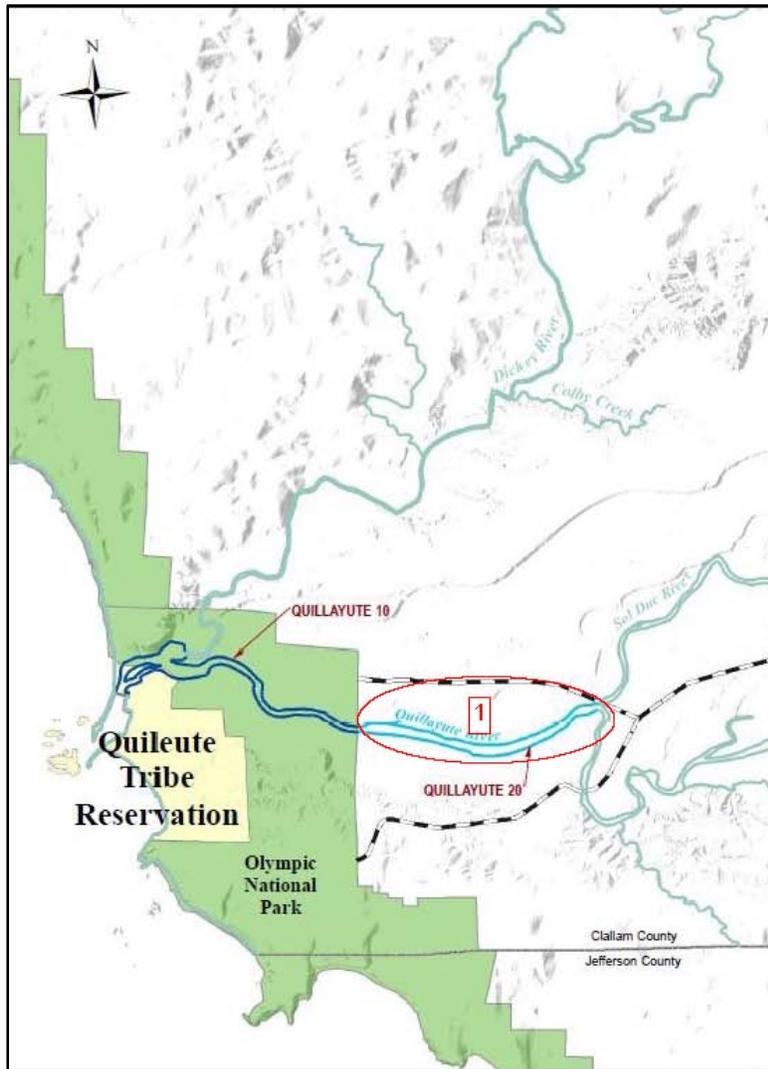
### ***Known restoration needs and projects:***

- In 1999, the Quileute Tribe was awarded a restoration project in the south Lake Ozette drainage, installing cross-drains in order to shift road-delivered sediment to the forest floor instead of Ozette tributaries (See Ozette Reference Map- Project # 1). The project was on land owned by Rayonier Timberlands Operating Company. Rayonier developed the protocol using

state guidance and designed the project, which was completed within several years. This is the same project as referenced below for the Dickey. The lands are adjacent and both were done under the same program funds. The funding was provided by the Salmon Recovery Funding Board (SRFB) through the North Pacific Lead Entity (NPCLE) and installed a total of 30 cross-drains.

- Knotweed eradication has been an ongoing priority of the Clallam County Noxious Weed Control Board (CCNWCB) and the Olympic National Park (ONP) since 2004 (See Ozette Reference Map- Project # 2).
- An acquisition project sponsored by the North Olympic Land Trust (NOLT) and the Makah Tribe is scheduled to be completed in 2012 and will protect 39 acres of riparian and floodplain habitat on Big River (See Ozette Reference Map- Project # 3). Funding was largely provided by the SRFB, with the Makah Tribe and NOLT providing the match funds.
- The Ozette watershed has a high priority for restoration because of the Endangered Species Act listing for native sockeye. In general, prescriptions include road maintenance and decommissioning, LWD placement, bank stabilization, riparian planting, invasive species removal and measures to ensure LWD recruitment potential are all of great importance.
- The Lake Ozette Sockeye Recovery Plan is in place with listed and prioritized projects. See <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/Recovery-Domains/Puget-Sound/Lake-Ozette-Plan.cfm> for the numerous documents on the Lake Ozette Sockeye Recovery Plan and restoration proposed.

## The Quillayute System



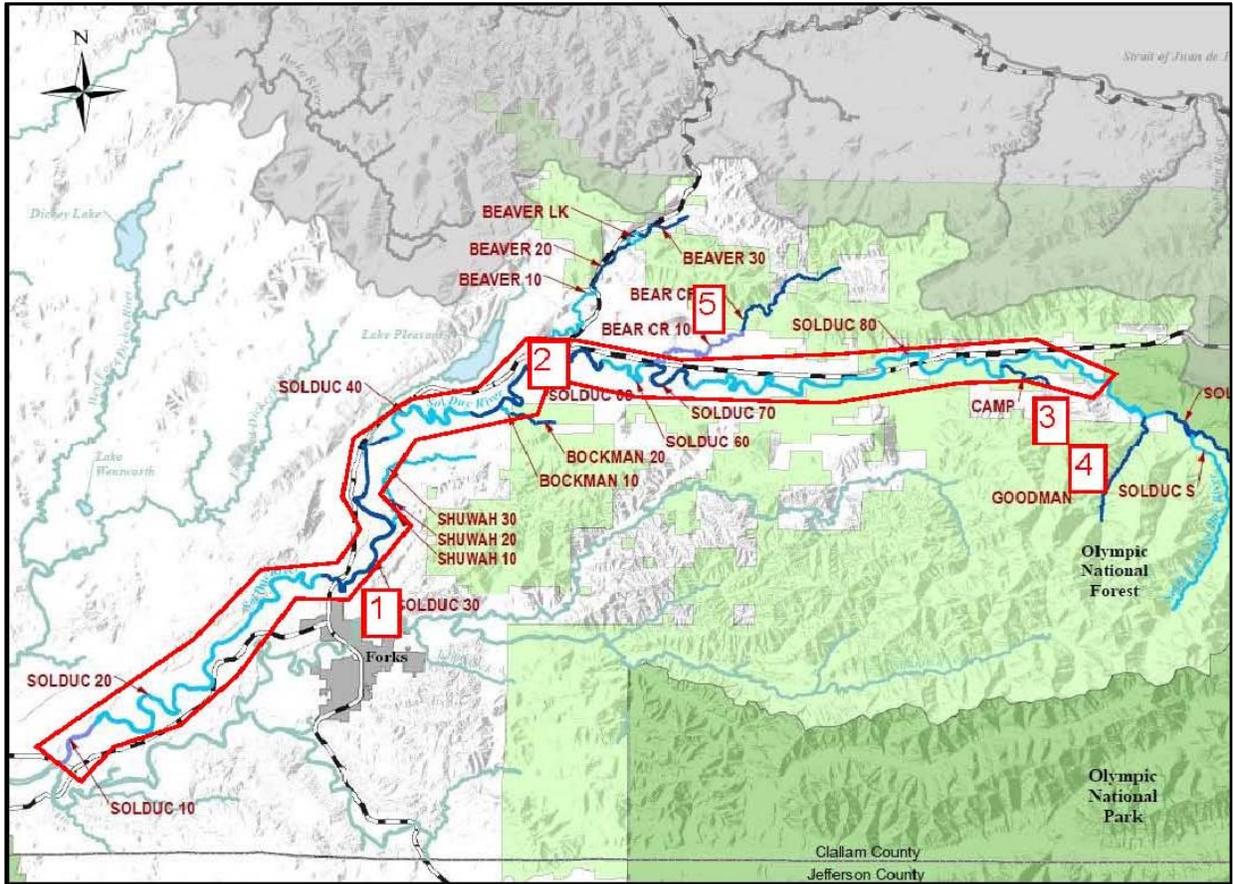
The Quillayute River is the terminal mainstem of a river system made up of the Bogachiel, Sol Duc, Dickey and Calawah Rivers and flows into the Pacific Ocean. Throughout almost its entire length, the Quillayute River passes through private or tribal lands, the majority of which are dedicated to residential uses with a portion devoted to commercial forestry uses. Analyses report that the most significant concerns in the Quillayute mainstem pertain to the lack of LWD and poor riparian conditions. Armoring is found at the Mora Road Bridge and at the resort property on the north shoreline to stabilize their waterfront.

General restoration recommendations include knotweed control, mitigation of damage from peak flow events, improvement of riparian buffers to increase the supply of LWD, sediment control projects and efforts to increase channel complexity and roughness. The one stretch of the mainstem that may be considered for added protection is the landward extension of the critical aquifer recharge area along the south shoreline at RM 3.6.

### *Known restoration needs and projects:*

- The Limiting Factors Assessment mentioned a project to reduce water velocity and impacts from peak flows.
- Since the 1970s, the Quileute Tribe has been conducting ongoing Escapement Surveys of redds in index and supplemental streams of the Quillayute Basin using Bureau of Indian Affairs (BIA) funds. This includes the tributary rivers: Dickey, Sol Duc, Calawah, and Bogachiel, as well as many of their respective tributaries.
- In the mid-1990s, the Quileute Tribe conducted a Baseline Water Quality Assessment in the Quillayute basin using EPA funds.
- Since 2002, the Quileute Tribe has been conducting ongoing Water Quality Sampling in the Quillayute mainstem using Datasonde by Hydrolab. The project uses EPA funding and follows an EPA approved Quality Assurance Project Plan.
- In 2002, the Quileute Tribe used a Water Resources grant from BIA in an effort to determine current water rights in the Quillayute Basin. This project was not successful because the general public, when contacted, did not respond with the exception of the Utilities.
- In 2006, the Quileute Tribe completed an Assessment and Prioritization of Restoration in Quillayute Basin (called Reach Assessment elsewhere in this document) project using BIA funds. The project was completed with cooperation and participation from all the major landowners, stakeholders and state and federal agencies within the basin and was used as the foundation for the NPCLE Strategy in the Quillayute Basin. It was designed specifically to update the watershed analyses and Limiting Factors restoration recommendations.
- Knotweed control throughout the Quillayute mainstem was designated a priority by the North Pacific Coast WRIA 20 strategy for 2010 and the Quileute Reach Assessment (See Quillayute Reference Map- Project # 1). The CCNWCB, ONP and the Quileute Tribe have been working collaboratively to eradicate knotweed. The Quileute Tribe is funded for knotweed work by US Fish and Wildlife Service and the Environmental Protection Agency (EPA) and is scheduled to complete the project in 2013.

## The Sol Duc System



The uppermost reaches of the Sol Duc River lie within the Olympic National Park and as such are in pristine condition. In the middle reaches, extensive uninhabited tracts and wide blocks of continuous forested land create good riparian conditions. In general, condition in the riparian zone are rated as more compromised in the lower reaches where buffers are narrow and residential development more common. Overall, commercial forestry and low intensity residential uses have limited impacts on the ecological functions and health of this river system. In the upper reaches of the Sol Duc, the major impacts reported included sedimentation, poor LWD levels, off-channel habitat loss, detrimental peak flows, bank erosion, gravel bar movement and loss of spawning gravel in the river bed. These impacts are related to extensive clearcutting, wildfires and road density. Problems in the middle reaches of the Sol Duc include bank erosion, elevated sediment from logging, pool habitat loss, low flows in tributaries and low LWD and LWD recruitment levels. Lower reach problems include erosion and mass wasting, poor riparian conditions, low LWD levels and elevated sediment from logging, pool habitat loss, and low flows in Shuwah Creek.

Restoration actions recommended from previous planning efforts generalize the types of beneficial projects needed in areas throughout the subbasin. They include: monitoring for any new knotweed control, improvement of riparian buffers to increase the supply of LWD, management of riparian zones

for older age class conifers, reduction of inputs of coarse and fine sediments, augmentation of channel complexity and roughness, removal of flow limitations to fish passage.

### ***Restoration recommendations:***

Specific restoration recommendations based on findings in the Integration and Characterization Report (ICR) are listed as follows:

- The Sol Duc mainstem (SOL DUC 10-80) has high road density and road erosion. Restoration action recommended: minimize road density, reduce road erosion and runoff into stream channels.
- SOL DUC S has high sedimentation and runoff from Forest Service (FS) Road 2920. Restoration action recommended: reduce road drainage by road decommissioning and culvert repair and replacement.
- GOODMAN has unstable sidecast, high sedimentation and runoff from FS Road 2920. GOODMAN also has increased runoff and instability from clearcuts along FS Road 2920 and from bank undercutting during peak flow events. Restoration action recommended: reduce road drainage by road decommissioning, culvert repair and replacement. Restore slope and bank conditions by managing riparian zones for long-term recovery by measures such as riparian planting, manage for short-term recovery by placement of log jams and other appropriate measures.
- SOL DUC 80 has bank erosion reported at Snider Work Center and Klahowya Campground. Restoration action recommended: reduce road damage by road repair and decommissioning. Stabilize stream banks by riparian planting, placement of log jams; manage riparian zones for long-term recovery.
- CAMP Creek headwaters have surface erosion due to past landslides. CAMP also has deteriorating culverts at the FS Road 2900-065 and 2929 crossings. Restoration action recommended: reduce erosion by bank and slope stabilization, riparian planting and other appropriate measures; culvert repair or replacement with bridge.
- BOCKMAN has low flows, high road density and high levels of sediment delivery and landslides are suspected. Restoration action recommended: reduce road damage by road repair and decommissioning.
- SHUWAH has high sediment delivery at the Shuwah Mainline Bridge. Restoration action recommended: reduce sediment delivery by road repair and decommissioning.

### ***Known restoration needs and projects:***

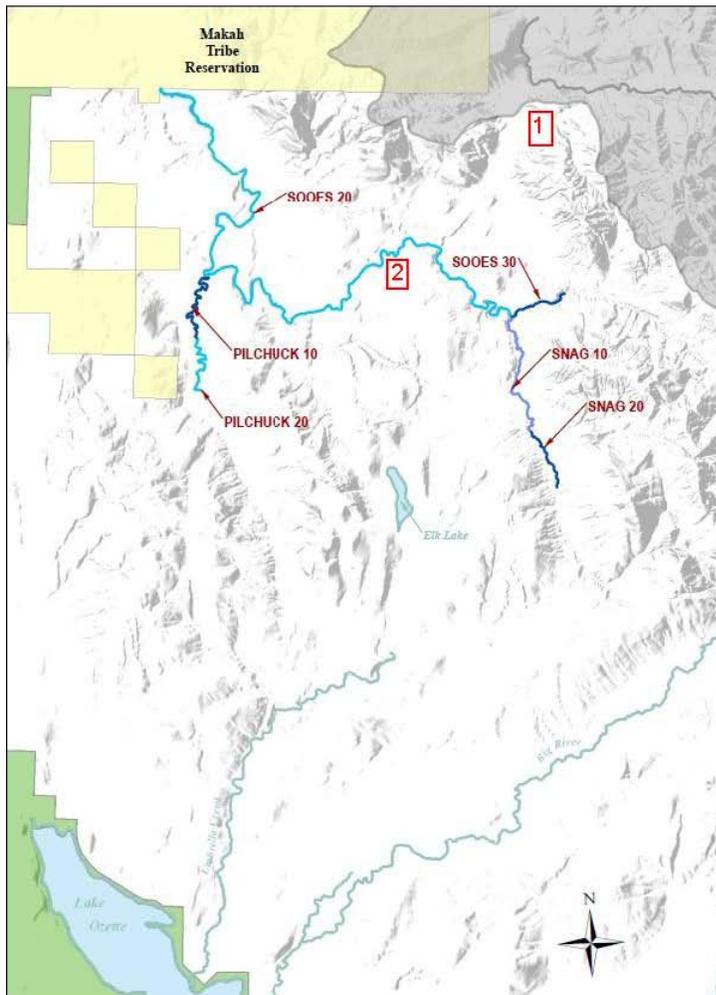
- No restoration priority projects have been identified in the NPCLE Strategy for the Sol Duc mainstem.
- The Limiting Factors Assessment made general recommendations, including improvement of riparian buffers to increase the supply of LWD; decrease inputs of coarse and fine sediments; increase channel complexity and roughness; reduce flow limitations to fish passage; and conserve and expand locally significant habitats.

- Riparian zone replanting and road decommissioning in SOLDUC S, CAMP and GOODMAN were identified as restoration priorities.
- In 1995, the USFS completed the Sol Duc Pilot Watershed Analysis using the federal modules (Channel Morphology, Riparian, Hydrology, Wildlife, Fish, Water Quality, Vegetation, Mass Wasting, Public Works, and Cultural Resources), as well as a lengthy prescriptions document (Recommendations for Restoration). Other participants included the Quileute Tribe (funded by BIA), WDNR, Pentec Environmental, Rayonier, USFWS, ONP, EPA, Merrill and Ring, Northwest Indian Fisheries Commission, Washington Department of Ecology(WDOE), and WDFW. Quileute led the Fish Module and Cultural Module.
- In 1996, the Quileute Tribe completed reconstruction of channel diversity at Bear Creek and LWD placement at several locations. The project was done with BIA funds and with access permission from the USFS, WDNR and private landowners.
- In 1997, the Quileute Tribe replaced culverts and completed riparian replanting at Powell Springs and Shuwah Creek, which project locations are on Rayonier lands. The projects were done with BIA funds, with match funds and advice from Rayonier.
- In 1998, the Quileute Tribe completed a stream bank enhancement project in Gunderson Creek, installing blowdown logs in the riparian zone. The project was done with BIA funds, with matching funds, permission and advice from Rayonier.
- In 1998, the Quileute Tribe, funded by the EPA and WDOE, completed a two-year Biocriteria Monitoring project in the Sol Duc watershed for water quality. The project largely took place in Bear Creek and was done with help from WDFW, with access granted by private landowners.
- In 1998, the Quileute Tribe worked with BIA funds on private land (permission granted) to replace a culvert at the 1010 Road crossing. The project was done for wetland protection and maintenance.
- In 2000, the Quileute Tribe completed installation of a culvert, rejoining for the first time in some 50 years the old stream channel of Prairie Creek. Since World War II, the Quillayute Road had blocked fish passage. The truncated stream had been known as Prairie Falls, flowing into the Sol Duc with a considerable drop after the road had rerouted it. The Prairie project was done with BIA funds and matching contributions from Rayonier, Clallam County and WDFW. Some of the land was private and access was granted for this project. Despite some 50 years of disuse, the salmon returned the next season to this rejoined Creek.
- In 2000, the Quileute Tribe completed reconstruction of channel diversity, bank stabilization and blowdown remediation in Shuwah Creek tributaries on Rayonier lands. The project was done with BIA funds and a match from Rayonier.
- In 2001, the Quileute Tribe sponsored a project to replace failing culverts with bridges on Tassel Creek and Fossil Creek, tributaries to the Sol Duc (See Sol Duc Reference Map- Project # 1). The project was completed with BIA funds and a match from Bloedel Timber.
- Knotweed control throughout the Sol Duc mainstem and drainage was selected as a top priority of the Quileute Reach Assessment and has been treated and monitored by the CCNWCB and the Quileute Tribe since 2005 (See Sol Duc Reference Map- Project # 2). The Tribe continues to monitor for re-infestations in order to treat it promptly. The CCNWCB has shifted its focus to local awareness and education, with the goal of having landowners treat knotweed on their own properties.

- FS Road 2918 was a large contributor of sediment runoff to GOODMAN and SOL DUC 80 due to clearcuts along the road and several failing culverts. The road has recently been decommissioned.
- In the upper reaches, a priority project is to replace a culvert with a bridge on CAMP Creek at the 2929 road crossing (See Sol Duc Reference Map- Project # 3). This culvert is blocking access to habitat for summer and fall coho, winter steelhead and cutthroat trout. The Pacific Coast Salmon Coalition is currently working on replacement and the project is scheduled to be completed by October, 2011.
- The Clallam Conservation District is finishing up four miles of decommissioned road on GOODMAN and is scheduled to complete the project by the end of 2011 (See Sol Duc Reference Map- Project # 4).
- A failing culvert on a tributary to BEAR-SOL DUC 10 is listed as a project sponsored by the private landowner (See Sol Duc Reference Map- Project # 5). The project has been submitted to PRISM and is in pre-application stage, not yet approved for funding.

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## The Sooes System



The Sooes River flows through mostly Crown Pacific timberlands until it reaches the Makah Reservation. All of the reaches are in private commercial timber production. Riparian roads are a major problem in the subbasin, contributing to runoff and sediment delivery. Channel incision is also a common problem in the Sooes. There has been little LWD in the Sooes mainstem and recruitment potential is poor due to historic logging practices that removed most of the conifers in the riparian zone. Riparian areas are now dominated by small alder, which offers the lowest LWD recruitment potential.

In general, restoration recommendations include reduction of sedimentation from riparian roads, improvement of riparian buffers to increase the supply of instream LWD and LWD recruitment potential and reparation of blocking and failing culverts.

### *Known restoration needs and projects:*

- The Clallam Conservation District is sponsoring a project on an unnamed Sooes tributary with Pacific Forest Management acting as the landowner agent for the private landowner (See Sooes Reference Map- Project # 1). There is a failing culvert blocking spawning and rearing habitat for

coho, steelhead and cutthroat trout. The project was scheduled to be completed in 2010 but is still active.

- Two failing culverts are listed as a project in pre-application on Sooes tributaries (See Sooes Reference Map- Project # 2). The land is privately owned with Pacific Forest Management acting as the landowner agent. If the project is funded, it will provide access for coho, steelhead and cutthroat trout.
- Restoration of adequate LWD and LWD recruitment levels has been identified as a restoration priority.

## **Current and past project partners, sponsors and funding sources**

The following organizations are potential partners, sponsors and funding sources for future projects: Bureau of Indian Affairs, City of Forks, Clallam Conservation District, Clallam County Noxious Weed Control Board, Community Salmon Fund, Department of Natural Resources, Ecotrust, Environmental Protection Agency, Green Crow, Makah Tribe, Merrill and Ring, National Oceanic and Atmospheric Administration, National Park Service, North Olympic Land Trust, North Pacific Coast Lead Entity, Pacific Coast Salmon Coalition, Pacific Forest Management, Rayonier, Quileute Tribe, Salmon Recovery Funding Board, US Forest Service, Washington State Department of Agriculture, Wild Salmon Center, WRIA 20 Implementation Body.

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