

Quileute Tribe



Nonpoint Source Pollution Management Plan

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revised from 2014

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Quileute Natural Resources

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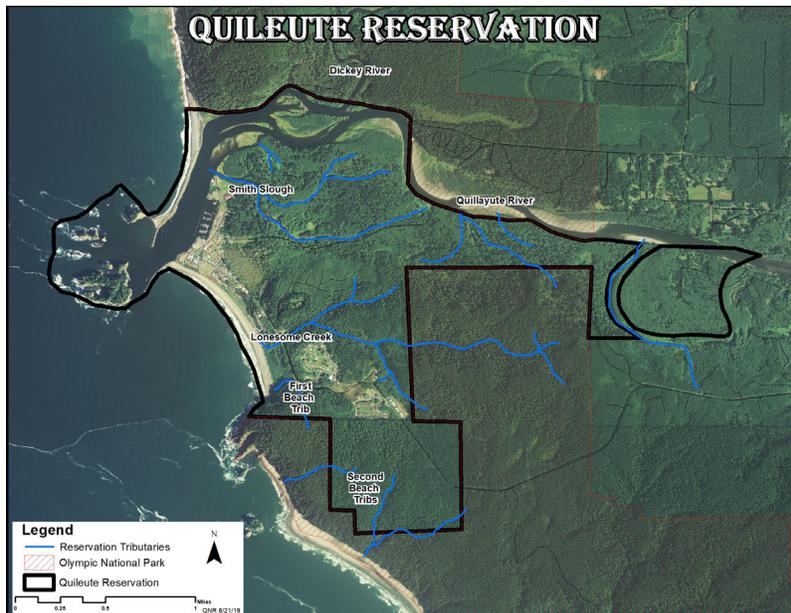
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1.0 Overview:

This document is an update of the Quileute Tribe's Nonpoint Source Pollution Management Plan (NPSMP), which is designed to control point source pollution in the Quillayute River, where it passes through the Quileute reservation, under Treatment as a State for Water Quality and Clean Water Act Section 319. It sets forth programmatic presentations to implement certain key findings in the Tribe's 1999 Nonpoint Source Pollution Assessment. It is the conclusion of that Assessment that sediment problems arise from the Usual and Accustomed Treaty area in the four rivers that flow into the 5.5-mile Quillayute Mainstem, of which the last mile is in the reservation before the Quillayute flows into the Pacific Ocean.

There are three primary sources of this sediment. First, highlands in Olympic National Forest and Olympic National Park are subject to natural mass wasting. Second, clear-cutting and other timber harvest activities including road building and maintenance expose soil to the 140-inch annual rainfall in the Quillayute Basin. Even when operators replant in a timely fashion, the seedlings cannot possibly take in all the rain that mature trees did. Clearing also disrupts the groundcover, which takes time to grow back. Most of the acreage of the 627 square miles of Quillayute River Basin are forest land, and of that over half is private or state timber that is being harvested from time to time. Third, invasive plants are compromising the native vegetation ecosystem and function. Especially, the knotweed that has invaded the riverbanks in the Basin and been treated since 2003 by Quileute Natural Resources. Knotweed displaces native plants that do a more efficient job of providing shade and securing the riverbank. Since 2003 the Quileute have assessed, mapped, taken training and certification, and eradicated knotweed in much of the Basin, with the partnering of Clallam County, Olympic National Park, 10,000 Years Institute, and others. The rivers are surveyed for emerging rhizomes and treated annually, but the lower Quillayute River remains an issue with large patches of knotweed. We have the knowledge and trained staff, but we need more funds to implement the eradication. These three main sources of pollution will only worsen with climate change aggravating the conditions (increased winter precipitation and local flooding, leading to increases in suspended solids from runoff).

One result of sediment influx in the tributary system is an increased sediment load in the Quillayute estuary, which has greatly shallowed it and changed its ecology. The marina function is impaired due to the sediment deposited in the mouth of the river and in the marina. The waters near sandbars and banks will become warmer, especially at low tide. The ten runs of salmon, the smelt and anchovies, the pelicans and eagles, the ducks, and the marine mammals all can be impacted by this change in river ecology. Therefore, dredging is necessary to keep boat access to the marina and estuary. The Tribe owns the rights to the river bottom on the Reservation, pursuant to the federal case, *Moore v. US*, 157 F.2d 760 (9th Cir. 1946). When the River is dredged, some of this material, with EPA approval, is brought to Rialto Beach of Olympic National Park, to keep the gravel locally on the beaches for smelt spawning and habitat.



Map 1: The Quileute Reservation was expanded in February 2012 as a result of the federal tsunami legislation PL 112-97 and now includes portions of two small watersheds that drain directly to the Pacific Ocean near Second Beach, the mouth of the Dickey River, and land to the east of the original reservation boundary near a historical oxbow of the Quillayute River.

The tribe depends on healthy salmon for both economic (commercial), subsistence and ceremonial reasons. The Quillayute River System is one of the last in the Pacific Northwest that still has no ESA-listed salmon. The Tribe wants to keep it that way and ensure the future generations have salmon. The biggest concern upstream is the impact from federal, state, and private timber harvests. Removal of vegetation cover and sedimentation shallow streams and can lead to increased stream temperature and reduced dissolved oxygen. (Present forest practices allow two years to replant trees after harvest.) Warmer waters can also be the cause of certain fish diseases and stress fish resulting in mortality. The sediment, besides causing channels to become shallower, can fill interstices in gravel and interfere with salmon egg respiration. Silt can also impair gill function. Stream restoration is high on the tribal list of habitat programs, as is monitoring of the effectiveness of such restoration. We have new potential concerns now—will changes in precipitation pattern from climate change create even more erosion where trees have not yet been replanted after harvest? Will flooding increase and impact the lower river system, threatening the spawning grounds?

On the Reservation, sound management of municipal wastes occurs through our Utilities Department, which in the 1990s established wastewater treatment with funding from federal and state programs. Sewage design is compliant with Department of Ecology requirements. Drinking water comes from a site 4.6 miles away (aquifer), again through federal and state funding, because the local groundwater is too high in manganese and may from time to time have salt

water intrusion The Lonesome Creek basin supplies water for our hatchery on the reservation, as does Settling Ponds, which is a ground water source that is tapped and collected in a settling bath. Lonesome Creek, Settling Ponds, the marina, and Smith Slough (shown in maps above) are monitored for water quality (CWA 106), along with the Quillayute River (at Thunder Field) and 37 locations in the Quillayute Basin that are off reservation, but on the Quileute Usual and Accustomed (U&A) land.

2.0 Introduction

The Quileute Tribe understands that funds provided through section 319 of the Clean Water Act (CWA) are to be used only to address nonpoint source pollution as it impairs or threatens the quality of the Reservation waters.

Treaty: The Quileute Tribe’s ancestors were signatories of the Treaty of Quinault River of July 1855, reauthorized as the Treaty of Olympia in January of 1856. The Quileute were originally assigned to live on what is today the Quinault Reservation, but in 1889 were provided with their own reservation. The Tribe has allotments on the Quinault Reservation, but those allotments are not included in this program. Also not included in this program are the scattered small trust lands, basically surrounded by non-tribal treaty-rights lands and the tribal U&A fishing grounds in the Ozette Basin or certain independent drainages to the Pacific. This plan only addresses the Quillayute Basin and Lonesome Creek Basins.

Culture, Geography, Geology, and Biology. The Quileute Tribe has been in this area since “time immemorial” (certainly thousands of years, including the last Ice Age advance, based on oral history, artifacts, and on Ice Age displays at the Victoria, B.C. Museum of Natural History). The people subsisted on fishing (including salmonids), whales, seals, shellfish, roots and other edible plant material, and hunting of elk, deer, and small mammals and birds. Fishing, including the gathering of shellfish, is still key to the tribal economy and culture.

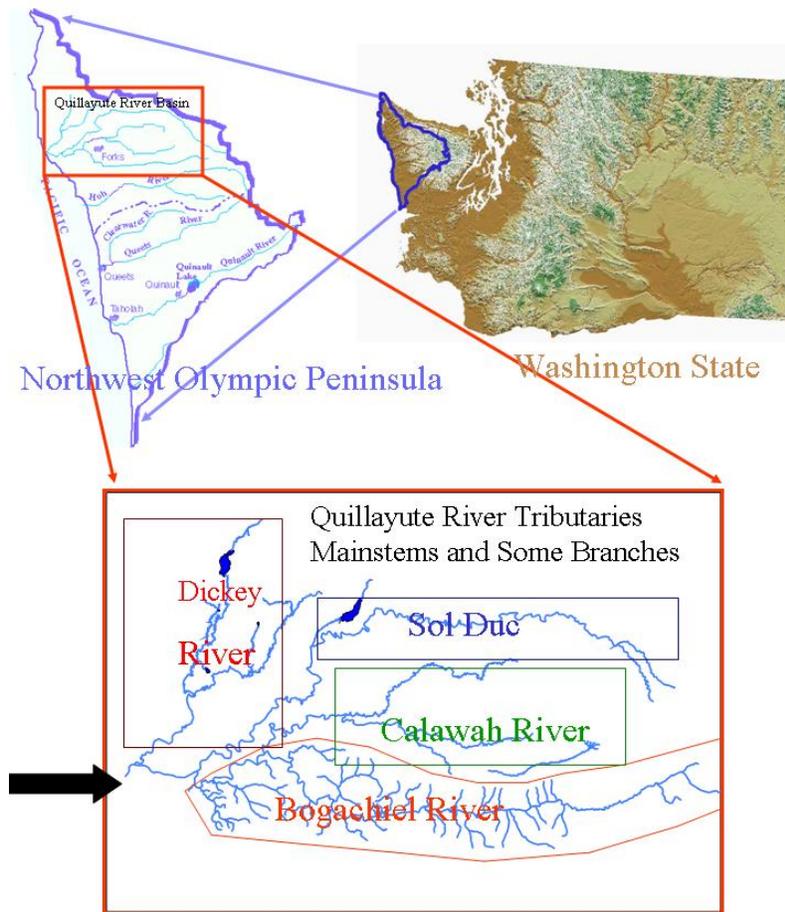
The terrain is gently rolling along the Pacific Coast to approximately 20 miles inland. However, the Olympic Peninsula of Washington is dominated by a steep and relatively active young mountain range, the Olympic Mountains. These mountains trap most of the moisture from the Pacific, resulting in rainfall of 110 inches annually in the city of Forks and 200 inches annually in the Olympic Mountains. The area lies within one of three temperate rainforests in the world, the others being in Chile and New Zealand. Native conifer forests that cover the landscape, both lowlands and highlands, are cut by numerous streams that flow into major river systems. There are four major deciduous tree species that dominate – red alder, large-leaf maple, vine maple, and black cottonwood. Important plants to the Quileute include red cedar, grasses, medicinal herbs, and berries. The cedar and grasses were used for clothing, canoes, baskets, harpoons, and other tools or weapons; and are still used for ceremonial canoes, basketry, and regalia. Berries, herbs, and mushrooms are still gathered for food and medicine. Camas used to be an important starch but is no longer a mainstay of the diet.

Water Quality Monitoring: In 2000-2001, the Army Corps of Engineers monitored the Quillayute

River for inorganic criteria as part of an updated Environmental Impact Statement (EIS) for dredging. The Quileute Tribe received General Assistance Program (GAP) funding to continue this as CWA 106 training in 2002-2003, and emulated Corps protocols. Since then, we have greatly improved and enlarged our water quality program with Treatment as a State for CWA 106 and 319. Since 2012, the Tribe has an active Water Quality Strategy, Quality Assurance Project Plan (QAPP), and Work Plan under CWA 106 at present. On reservation the Tribe monitors the Quillayute River at Thunder Field, the marina, Lonesome Creek, Settling Ponds, and Smith Slough for Dissolved Oxygen, Temperature, pH, conductivity, and turbidity; and 37 additional sites throughout the Quillayute Basin in our U&A. The tribe also added macroinvertebrate sampling, in-situ turbidity sensors, stream temperature monitoring, low-flow discharge sampling, suspended sediment sampling, and oversight of the Sol Duc River flow gage. The current general water uses and criteria for surface waters for fish spawning, rearing, and migration under Washington State are cited in WAC 173-201A-200. It states that temperatures cannot exceed 17.5°C 7-DADMax, Dissolved Oxygen cannot exceed 8.0 mg/l, pH value shall be in the range of 6.5 to 8.5 mg/l, and turbidity cannot be 10 NTU over background when the background is 50 NTU or less.

Partners: The Tribe has for decades vigorously pursued partnerships with stakeholders concerned about water quality in the Tribe's U&A and other entities that have jurisdiction over lands impacting the quality of waters for which the Tribe has treaty-protected rights. These partnerships include local governments (City of Forks, and counties of Clallam and Jefferson—especially as to controlling invasive plants), the State of Washington (Department of Natural Resources and Department of Fish & Wildlife—fisheries co-manager, and Ecology), the US Forest Service, the US Fish & Wildlife Service, the National Marine Fisheries Service (fisheries co-manager), the Army Corps of Engineers (dredging the Quillayute), and the US Coast Guard (spill issues, and helping advocate dredging). To the extent that NPSP flows into the area of the Olympic Coast National Marine Sanctuary (OCNMS), the OCNMS Advisory Council and the Intergovernmental Policy Council are also partners. We have cooperated with Olympic National Park (ONP) in stream typing (ONP typed the streams above the boundary line and we below), and in controlling knotweed in the riparian zones. In fact, ONP trained us in foliar spray technique. Of course, USEPA has been a major contributor to tribal grant programs, as has the Bureau of Indian Affairs.

Quillayute River Basin

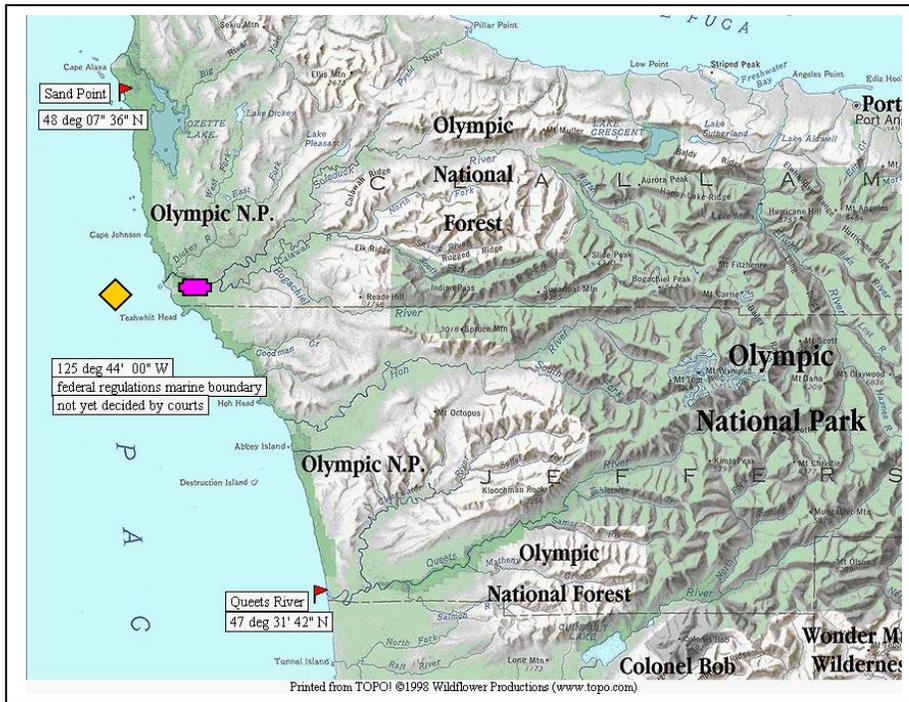


BLACK ARROW SHOWS QUILLAYUTE MAINSTEM 5.5 RM

Map 2: The purple line represents the entire treaty area of Treaty of Olympia. The bottom image shows the major rivers of the Quillayute Basin.

State programs: The tribe was an initiating government under WRIA 20 Watershed Planning (and now Implementation) body (under ESHB 2514, codified at RCW 90.82) The Watershed Management Plan, Implementation Plan, and maps are online at <http://www.ecy.wa.gov/programs/eap/wrias/Planning/20.html>. Since inception in 1999, the Tribe has been a participating government in the North Pacific Coast Lead Entity (NPCLE) under ESHB 2496, codified at RCW 77.85. That state-funded program deals with salmon habitat restoration. In 2008 the state determined to coordinate four lead entities through an umbrella “coastal restoration entity” called Washington Coast Sustainable Salmon Partnership (which subsequently shortened its name to “Coast Salmon Partnership”). Quileute participates in the governance of Coast Salmon Partnership through its membership in NPCLE. Through these mechanisms, which both include local private citizen landowners as well as non-profit organizations and governmental entities, a broad base of public involvement is achieved.

Funding sources are pooled and leveraged. Decisions are made in a coordinated and collaborative manner.



Map 3: Topo map of the Quillayute River drainage and showing the surrounding Olympic National Park. ONP occupies the green band along the Pacific Ocean and the highlands of the Olympic Mts. Between it lie private timber lands (lowest), WA DNR forests (next), and then USFS (near ONP Mountains). Timber operations (roads, cut trees, and sediment delivery) are NPSP potential issues. The Pink Block indicates City of Forks (population 3000). Three Rivers is shown by Yellow Diamond.

Salmon: The Quillayute River provides ingress and egress for ten runs of salmonids that migrate through an extensive watershed of approximately 627 square miles. These include chinook, oho, steelhead, and sockeye. None of the runs is listed under the ESA, either as threatened or endangered.

Quillayute River Periods of Occurrence:														Rev 12.16.10											
Species	Life Stage	Jan		Feb		Mar		Apr		May		June		Jul		Aug		Sept		Oct		Nov		Dec	
		1-15	16-31	1-15	16-28	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-31	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-30	1-15	16-31
Chinook: Spring/Summer and Fall	Adult migration																								
	Juvenile rearing																								
	Juvenile emigration	0+	0+	0+	0+	0+	0+	0+	0+	0+															
Steelhead: Summer and Winter	Adult migration																								
	Juvenile rearing																								
	Juvenile emigration																								
Coho: Summer and Fall	Adult migration																								
	Juvenile rearing																								
	Juvenile emigration																								
Chum	Adult migration																								
	Juvenile emigration																								
Pink	Adult migration																								
	Juvenile emigration																								

Fish use data summarized from pers comm with Quillayute Tribal staff, Salmon & Steelhead Habitat Limiting Factors in the North Washington Coastal Streams of WRIA 20- March 2000, Biological Summary Fish Runs & Out-Migration Quillayute River System- 1992. Darker shading represents primary fish use periods, lighter shading represents periods of less use.

Table 1: Life stage of migrating species of fish through the Quillayute River.

The Quillayute has a 5.5 river mile mainstem that begins at Three Rivers (an unincorporated cluster of homes and businesses about 8 miles west from US 101 on State 110), and ends on the Reservation, where it meets the Pacific.

At Three Rivers, the Quillayute is formed by the confluence of the Sol Duc and the Bogachiel. The Bogachiel mostly winds through lowlands, some of which are agricultural. Not far from the City of Forks, the Calawah River System joins the Bogachiel. The Calawah (North Fork, South Fork, and Sitkum) start in high lands and have extremely cold water in some locations. Part of the North Fork goes subsurface leaving fish stranded in dry winter months and the entire summer season. The Sol Duc starts high in the Olympic Mountains, south of Lake Crescent, and is fed by numerous tributaries and small lakes – it is home to sockeye, chinook, coho, steelhead, and resident trout.

Just past the reservation boundary, only one mile upstream, the Dickey River enters the Quillayute. The Dickey flows through lowlands and some 10% of its watershed are wetlands. This system is an important watershed for sockeye, steelhead, chinook, coho, and resident trout. The Dickey has significantly high sediment and turbidity in many locations, some due to forestry, erosion, and some due to the unconsolidated nature of its river banks. Dickey water naturally is tannic in some locations. Like the Dickey, Calawah, and Bogachiel, extensive timber harvest has occurred throughout the Sol Duc watershed outside of the ONP. Both the Calawah and to a lesser extent the Sol Duc may have steep-slope mass wasting that contributes to the sediment load on occasion. Most sediment is anthropogenic. Many of the rivers and streams have been listed as impaired waters (temperature, sedimentation, DO) in all the basins.

The Quillayute has no distinct estuary, but tidal influence and measurable salinity can extend up to Three Rivers. While the tributaries of the Quillayute are off-reservation, they must be considered in this plan because they all flow into the Quillayute River and their water quality and quantity directly affect the waters of the reservation.

Other Resources: On the Pacific Coast, tribal members gather shellfish for subsistence. Clams

are found at the high tide mark on coastal rocks and in the sand between the high and low tidal zones. Crabs for subsistence are captured in crab pots at the mouth of the Quillayute, and also by tribal fishermen, commercially, in the marine treaty waters. These shellfish may all ingest biotoxins from marine algae during harmful algal blooms. The conventional way to test is to capture specimens and send their flesh off for diagnosis at WA Department of Health. The sources of such marine biotoxins are produced by certain kinds of algae.

“A goal is a general statement of purpose; objectives are specific, measurable actions or intentions that lead to achieving the goal(s).” EPA Handbook for Developing and Managing Tribal Nonpoint Source Pollution Programs Under Section 319 of the Clean Water Act, February, 2010.

3.0 Vision, Goals, and Objectives

Sedimentation, increasing summer water temperatures, and invasive weeds that contribute to sedimentation and temperature problems and otherwise impair habitat functions continue to be the primary water quality concerns for the Quileute Tribe. As documented in Quileute’s 1999 water quality assessment, timber harvest and silviculture-related road construction and maintenance issues on private, state and federal forest lands constitute the primary non-point source of sediment and temperature impacts, and these activities also create the habitat disruption and transportation vectors that facilitate the spread of invasive weeds throughout the Quillayute River watershed. While timber harvest and road maintenance practices have improved significantly under the Forests and Fish Report, the State Department of Natural Resource’s Habitat Conservation Plan, and the federal government’s Northwest Forest Plan since Quileute’s assessment was completed, the legacy impacts of timber harvest combined with new impacts from ongoing timber harvest operations means that silvicultural activity upstream of the reservation boundary continues to be the primary nonpoint source of the sediment, temperature, and invasive weed concerns addressed in this plan. Construction and hydromodification activities regulated under programs such as Clallam County’s Shoreline Management Program, and the effects of climate change, also have the potential to contribute to the sediment, temperature, and invasive weed concerns of the Tribe. Because of their interrelated and synergistic affects, sedimentation, temperature and invasive weeds and their sources defy easy categorization as “pollutants,” “parameters,” “categories,” or “sources” under the Clean Water Act, and the Quileute Tribe endeavors to implement holistic approaches that address multiple concerns and sources through a variety of activities. Many of the goals, objectives and milestones identified in this plan are therefore presented as programmatic goals, objectives and milestones rather than tracking specific nonpoint sources or categories of pollutants.

3.1 Vision and Long-term Goals:

The Quileute Tribe has a vision and long-term goal of protecting high quality waters and restoring impaired waters throughout the Quillayute River watershed to ensure fishable, swimmable and safe waters that support an abundance of fish and wildlife for current and future generations. Quileute’s vision and long-term goal include the complete eradication of invasive

weeds and the reduction of pollutants throughout the Quillayute watershed and Quileute Reservation that impair water quality.

3.2 Goals of this Five-Year Management Plan:

- To create a general reference which the Quileute Tribe can use to coordinate and maximize the effectiveness of its internal and external efforts to prevent, reduce, and eliminate nonpoint source pollution of waters throughout the Quillayute Basin.
- Reduce infestations of selected invasive weeds by at least 20% per year in treated areas within the Quillayute watershed and on the Quileute Reservation.
- Implement a sufficient quantity, quality and scale of habitat restoration and fish-friendly stream bank stabilization projects to at least neutralize, and ideally reverse, increases in sedimentation and summer water temperatures in the mainstem Quillayute River.
- Continue to implement a robust water quality monitoring program capable of detecting trends and changes regarding sediment and temperature that may constitute a threat to salmonids and/or violation of applicable water quality standards.
- Reduce the amount of sediment and turbidity that currently exists that is harmful to fisheries.

3.3 Objectives to Achieve the Goals of this Five-Year Management Plan:

Invasive weeds:

- Secure EPA competitive CWA 319 funds for QNR to expand window of current seasonal weed inventory and treatment activities and/or add additional crew.
- Expand efforts from single species to multi-species inventory and management of invasive plants.
- Enhance partnerships with 10,000 Years Institute, Olympic National Park, Clallam County, and other partners working to eradicate invasive weeds.

Silviculture and land use:

- Work with other the tribes, the Northwest Indian Fisheries Commission, state and federal agencies, forest landowners, and stakeholders to revitalize the Cooperative Monitoring, Evaluation, and Research (CMER) Committee in order to implement adaptive management activities to better address invasive weeds, sedimentation, and other aspects of silviculture contributing to water quality problems.

- Participate in Washington Department of Ecology proceedings regarding Clean Water Act “assurances” for state forest practices rules.
- Evaluate community forestry, carbon sequestration, and other non-regulatory approaches to improving forest practices in a manner that enhances water quality.
- Analyze evolving science on the relationships between silviculture, industrial forestry, evapotranspiration, timing of snow melt, infiltration and run-off, and other factors that potentially affect stream flow, sediment transport, water quality, and temperature.
- Evaluate Washington Department of Ecology actions regarding Clallam County Shoreline Master Program (currently under review by Ecology) and participate in further proceedings to be undertaken by Clallam County in response to Ecology’s decision whether to approve, modify, or require revisions to the County’s proposed Shoreline Master Program Update.

Roads and culverts:

- Provide technical assistance and quality control as needed for Washington State Department of Transportation projects in the Quileute Tribe’s U&A in compliance with the federal court injunction in the U.S. v. Washington “culverts case”.
- Monitor activities by nonprofit organizations and local government, and assist with securing funding and implementing projects to identify and correct fish passage barriers on city and county lands within the Quileute U&A.
- Monitor and assist private landowners in meeting 2021 deadline for Road Maintenance and Abandonment Plan compliance.

CWA 303(d) and TMDLs:

- Complete ongoing work to organize existing water quality data in new data management system allowing for enhanced trend analysis and easier reporting of water quality data.
- Analyze existing data, and evaluate desirability or need for petitioning any additions or modifications to CWA 303(d) listings.
- Evaluate desirability and need for development of TMDLs.

Monitoring:

- Work with partners to secure funding sufficient to maintain operation and data retrieval, compilation, and analysis from all flow gages and monitors currently operating within the

Quillayute watershed, including the currently at-risk funding for USGS gage # 12042800 Bogachiel River Near Forks, Washington.

- Work with USGS to evaluate potential for adding new gages in the Quillayute watershed.
- Expand monitoring of macroinvertebrates.

Habitat Restoration and Stream Bank Stabilization Projects:

- Complete 30% design for potential engineered wood structure to stabilize cut-bank and eliminate avulsion threat at Thunder Field.
- Secure funding and move to 100% engineering for Thunder Field project and implement associated stabilization structure(s).
- Complete Quillayute River Geomorphology and conceptual habitat restoration designs.
- Utilize a rapid bioassessment protocol to characterize habitat within the Quillayute watershed to develop future restoration projects.
- Complete Salmon Recovery Funding Board funded project on Rayonier Timber road 5050 (remove culvert and decommission road adjacent to culvert).
- Collaborate with partners (e.g., Olympic National Park on Mora road project, annual North Pacific Coast Lead Entity proposals to Salmon Recovery Funding Board, bi-annual Washington Coast Restoration and Resiliency Initiative process) to secure funding to implement additional habitat restoration to perpetuate fish and wildlife populations.

Climate Change:

- Track emerging science regarding climate change and its potential effects on precipitation patterns, stream flows, temperature, erosion, invasive species, and other water quality parameters.

4.0 Management Program Summary:

The Tribe needs the fish to remain at sustainable and harvestable levels. This plan is intended to provide a framework partnering with the state, federal, and local or private entities that share in jurisdiction of adjacent lands and waters. It is essential to maintain the water quality of the Quillayute Basin, and in particular, the Quillayute River. With that, the Quileute Tribe is focusing on three NPSP priority issues: invasive plants, sediment, and temperature.

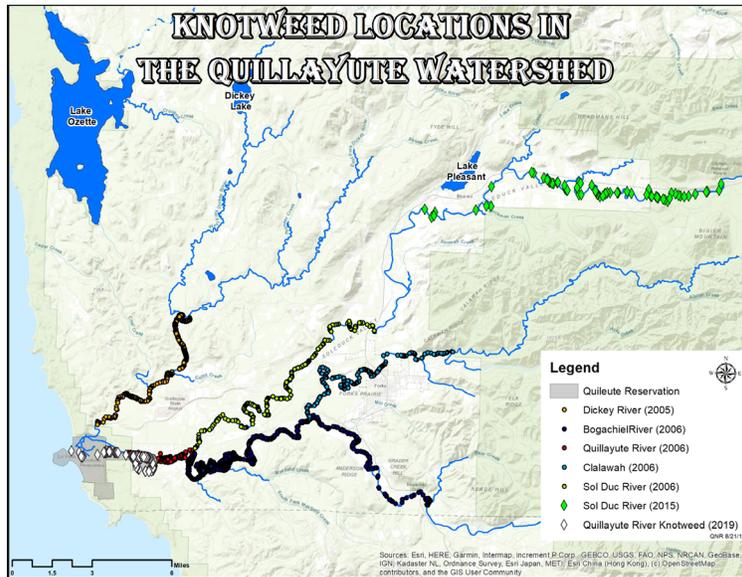
4.1. Invasive plants

In 2005-2006, QNR Staff mapped, the occurrence of knotweed throughout the Quillayute Basin using GPS and GIS (see Map 4). Staff uses aquatically certified herbicide to treat the knotweed in the riparian zone and has worked from the top of the watershed downstream. Knotweed is persistent and treating it for only one year is rarely effective. However, QNR staff returns to the site to back for recurring shoots from underground rhizomes or new shoots from a variety of sources. This is done at a minimum every other year on the Bogachiel, Sol Duc and Calawah; and every year on the Dickey and Quillayute. We have “controlled” knotweed in the Dickey, Sol Duc, and Calawah watersheds through repeated treatments, but without bi-annual survey and treatments the knotweed would return in full.

The tribe has treated the entire Bogachiel basin for knotweed multiple times, but still needs to deal with some of those emerging shoots in certain locations. Patches that started out on the Bogachiel that were once an acre large could only be sprayed successfully on the outside perimeter without breaking stalks. If the stalks get broken, the plant will not absorb the chemical and it will keep growing/spreading. However, with multiple years of treatment, the patches are smaller and can all be treated in one visit (see Photo 1 below for example). Knotweed has been treated on the 5.5 mile mainstem of the Quillayute River in sections due to access. The main target for the future is our reservation, near the mouth of the river, where the seeds, rhizomes and cane-cuttings are deposited and have the potential to start new infestations on sandbars, beaches, floodplains, and river riparian zones.



Photo 1: The aerial photo on the left shows the bright yellow-green colored knotweed plant in the 2009 throughout the floodplain of the Bogachiel that could only be treated on the perimeter without breaking stalks. The aerial photo on the right is the same area in 2016 showing the knotweed is not visible after treatment, and is now just treated for maintenance (new canes emerging from rhizomes).



Map 4: Knotweed was mapped extensively in 2005-2006 from known locations. Other locations were marked with GPS points in 2015 in the Sol Duc and 2019 in the Quillayute. Additional GPS work and updated mapping would produce a more complete dataset to show the significant progress that has been made in controlling knotweed, as well as the scope of the problem remaining to be addressed.

For the reasons mentioned above, and because of continued presence in the Dickey, Bogachiel and the Quillayute mainstem, there will still be a need for funding from EPA. One thing we have not used funding for is revegetation because the native plants come back so quickly in our area. Photo 2 below shows a series of three aerial photos on the same location in the Bogachiel River. From left to right, a 0.2-acre knotweed patch in 2009, the same area where knotweed was completely eradicated by 2011 after many treatments, and the photo on the right showing native alder trees dominating the riparian zone in 2016.



Photo 2: Shows the 0.2-acre patch of knotweed described above.

As QNR has treated knotweed from 2003-2016, and with this experience, it has been shown that

native plants will reestablish in treated areas. However, areas that are treated that are distant from a native seed source (such as large river bars on the Quillayute or Dickey River) have been filling in with other invasive plants, such as Canada thistle. These areas would benefit from spending resources and time on replanting with native seed.

QNR is increasingly shifting from a single species (i.e. knotweed) focus to a multi-species strategy to address invasive weeds in the Tribe's watersheds. Overall, the long-term goal is to have the invasive plants that are listed on the Clallam County's Noxious Weed List (<http://www.clallam.net/Weed/doc/WeedList2019ClallamFinal.pdf>) eradicated in the Quillayute Basin. QNR has started with inventorying and treating a list of invasive plants on the Quileute Reservation lands in summer of 2019 to start heading towards this the long-term goal. This work was funded under Natural Resource Conservation Service (NRCS) and is treating the knotweed (Japanese, bohemian, giant), blackberry (Himalayan and evergreen), purple loosestrife, tansy ragwort, Canada thistle, Scotch broom, English ivy, and herb Robert. These species, and others listed on the County's weed list, negatively affect our ecosystem and can have detrimental effects to our fish and wildlife populations. They are often outcompeting and replacing native vegetation, and some can alter soil composition. This can result in a decrease of fish and wildlife habitat, less forage for wildlife, and loss of bank stability leading to degraded water quality among other things. The closer the proximity to the river, the more the risk increases of these species spreading.

4.2. Sediment

Work to address increasing sediment loads is done by working with other agencies or grant funding sources to supplement programs for either culvert repair, road decommissioning, road improvements, riparian planting, or bank reinforcement with large woody debris, to improve stream conditions and reduce nonpoint source pollution. Quileute staff looks for grant opportunities and partnering throughout the U&A. They are active in interagency programs to that effect. QNR did an extensive assessment of restoration needs in the Quillayute Basin in 2006 in collaboration with a consultant named John Hunter and many of the stakeholders. That assessment generated a list of priorities derived from local knowledge and watershed analyses, many of which were culvert and road decommissioning projects, with a few identified large wood placement projects, alder conversion, off channel rearing, and sediment control projects. As noted above, we are part of the Lead Entity that develops salmon habitat restoration projects and grants in WRIA 20. Several projects in the Quillayute basin are in the strategy for restoration. That strategy is updated annually by the Lead Entity technical committee. The most current one is downloadable/viewable at <https://www.coastsalmonpartnership.org/north-pacific-coast-lead-entity/> along with coverage of the Lead Entity's strategy and purpose itself.

Since a majority of the Quillayute Basin is traversed with Forest Practice Roads, the road construction and use are the primary source of NPS pollution on the forested lands. These roads contribute to 90% of the total sediment from forestry operations (EPA 2016). In addition to other water quality impacts, an excessive quantity of sediment in a water body can reduce the ability of aquatic organism to successfully live, forage, and spawn.

4.3 Water temperature or “thermal pollution”

An area of interest by QNR, USFW, CSP, and other entities is to identify where there are water temperature exceedances and cold-water refugia. Water temperature can impede the biological function of aquatic organisms. The warmer the water, the less dissolved oxygen it can carry; therefore, higher temperatures result in stress for fish and other aquatic organisms. If high water temperature is sustained for long periods, it can completely change the biological diversity of a stream.

The temperature of a stream is generally regulated by several factors, including the amount of ground water inputs and sun exposure the stream receives. In each basin of the Quillayute, the habitat alteration from bank erosion, timber harvest, or housing developments have influenced streams by removing trees and shrubs from the area adjacent to the stream or rivers (in the riparian corridor). When the stream’s riparian corridor is vegetated with bushes and trees, the shade can help regulate the water temperature and support a healthy biological community.

5.0 Nonpoint Source Pollution Management Plan

5.1 Description of BMPs and measures to reduce pollutant loadings from each category. Impacts on groundwater, if any.

Reduce Impact from Timber Operations in the U&A.

The Quileute Reservation is 2,172 acres, with approximately one-third of the reservation being non-forest lands that are developed, open water, rivers and beach acreage (PFM, 2015). With the 2,172 acres of reservation land, around half is forested with 713.6 acres of that are set aside for conservation. A total of 658 acres are in commercial timber and 120 acres are non-stocked (islands, meadow, wetland, cliffs, etc.). Active timber sales have occurred and are currently underway to move the village to higher ground and create more housing for tribal members. All harvest units must follow the BIA forestry plan recently completed through meetings of the Aberdeen BIA office with the QNR staff in the Timber Fish & Wildlife (TFW) program.

The sedimentation load in the Quillayute River is coming from areas upstream of the reservation boundary in the Usual and Accustomed Area, mostly from timber operations. We acknowledge there is occasional natural mass wasting in the highlands, road related landslides/failures, or sediment delivery due to hauling logs. Because Quileute is not the operator or landowner of the U&A timberlands, it can only use programs discussed below, to control the sediment. The leads are the TFW manager and his technical support staff, and the policy analyst/attorney, all staff of Quileute Natural Resources (QNR).

The TFW staff reviews all proposed harvest applications on state and private lands, though

notices from the WA Department of Natural Resources. There are Road Maintenance and Abandonment Plans (RMAPs) showing the work proposed. They also attend interdisciplinary (ID) team meetings to examine proposals on site. Our technicians provide support for all of this. The TFW staff provides comment to the agency from the Quileute perspective. Additionally, QNR staff reviews Hydrologic Permit Applications (HPAs) for work to be done in streams and reports comments back to WDFW on these, with the Quileute perspective. Frequently, QNR staff is asked unofficially to go to a field site and provide input to the WDFW biologist, forester, or operator.

Sometimes there are violations (e.g., a contractor hauls during a storm event or uses the improper rock source and pollutes a stream through runoff). Quileute first talks to the operator or landowner to stop or correct the delivery of sediment. If further action is needed, Quileute meets with the agency and offending party to go over acceptable mitigation. QNR staff also goes over the state rules for forest practices on a regular basis and contributes to the public comment when they are revised.

With respect to U.S. Forest Service (USFS) lands, that agency has greatly reduced harvest under the Northwest Forest Plan, but when it does plan commercial thinning harvests, it advises us of proposed sales and the TFW biologist reviews these and provides comment. Thinning operations have provided funding under the USFS Stewardship Program (revenue can be used for salmon habitat grants). Our LEG and the CSP are working with the USFS on directing stewardship funds to such projects. This is a program under the Resource Advisory Committee (RAC) which is led by USFS and appointed Quileute to hold the seat to represent Native Americans. It can take up to two years for thinning funds to make it down to on-the-ground projects. The Calawah watershed was the subject of a focus study (see attached Appendix B) which resulted in a publicly reviewed and approved plan for restoration (USFS, 2011). The plan has a list of potential projects on USFS lands that would reduce sediment delivery and reduce risk of road-related mass wasting.

There are WA Department of Natural Resources Habitat Conservation Plans for both state and private timber lands and when aspects of those are to be implemented (e.g., effectiveness monitoring) the Tribe is brought into the process and the TFW team and the attorney/policy analyst may provide comment. Annually we also have a meeting with the regional office of the WDNR to discuss issues and provide comments for co-management of the resources. The Tribe can assist the operators with compliance insofar as it may involve work such as culvert replacement and road decommissioning. These are perceived as salmon habitat endeavors and the tribe has access to various grant programs for that purpose. We have no engineers on staff but help the operators by writing grants when these are available, and the grants include engineering studies and implementation, by those with expertise (generally a match of operator in-house expertise or else hiring a contractor), as well as providing for materials (e.g., culvert or bridge).

A direct way of reducing impacts of sediment is through habitat restoration. With the help of the Coast Salmon Partnership, Washington State Recreation & Conservation Office (RCO), and the Nature Conservancy (TNC), a State initiative was formed to fund projects on the Washington Coast. The competitive source of funding is titled Washington Coast Salmon Restoration and

Resiliency Initiative (WCRRI). In 2019, QNR received WCRRI funding to hire a consultant to do a comprehensive geomorphologic assessment of the Quillayute River and identify habitat restoration and bank stabilization projects in the 5.5 miles of the mainstem Quillayute. This assessment and identified list of projects will ultimately lead to many restoration phases using LWD to slow down velocity, trap sediment, reduce the risk of bank erosion, and ultimately reduce the pollution of sediment while creating fish habitat.

In the past, the Tribe has been able to assist with habitat enhancement programs and can do more in the future with additional staff. These projects in the past have been replacement of alders with conifers on the riverbanks, and large woody debris placement to help trap sediment in rivers where the stream bed is scoured because of inadequate LWD. Again, these are areas where we would have to pay a contractor for engineering design and bring in contractors for equipment, like devices to remove or move trees. In the case of very small creeks QNR technicians have used ropes and saws to bundle woody debris with cables and attach it to stream bank trees or rocks, to help trap sediment, but we need to engage the experts for larger creeks.

Reduce/eradicate/control invasive plants in the U&A, prevent infestation of reservation

Historically, homestead or logging camps were the original source of the problem for many invasive plants. The knotweed specifically has spread throughout the lots, not only along the streambanks. Many lot holders just cut down invasive plants and toss the clippings along the bank of the river to allow it to wash downstream. This creates a larger problem not only within the community, but throughout the rest of the watershed as it floats down during high water events and lodges along the banks to re-grow. The Quileute Tribe assists and educates the lot holders in the proper control of the invasive knotweed.

Other significant sources of invasive weed infestations include timber harvest practices, failure to properly clean vehicles and equipment moving between watersheds, and contaminated gravel pits. Quileute works to educate landowners and land managers, advocates for vehicle washing protocols and “weed-free” certification of qualifying gravel pits and requires construction vehicles working on the reservation to follow proper washing protocols and use only gravel from certified “weed-free” sources.

The Tribe has a strong in-house program for knotweed removal, led by the TFW Manager. Several years back, Clark County officials removed the weed successfully and engaged other counties to train on what chemicals and technique could safely do this, for the ecosystem and the applicators. Clallam County, home of the Quileute, has a strong Noxious Weed Control Program. Clark and Clallam trained Quileute on use of EPA and Ecology-approved chemicals to use, and our applicators took WA Dept. of Agriculture certification training. The knotweed treatment protocol is lengthy and attached as an Appendix A. One general procedure to note here for all invasive plants is that in order to achieve best control, ideally treatment of the species must be done from upstream to downstream. This is to ensure that the invasive plants upstream do not keep reseeding the downstream habitat and counter act the work done downriver. This is not always achievable but is best practice management to control an invasive species. Landowner

education is part and parcel of this. Cuttings must never be thrown in the river where they can re-infest and re-establish.

What's been done; what remains to do; Quileute experience. Quileute has been actively engaged in assessing and restoring salmon habitat for decades. In 2003, as the impact of knotweed became known through the advocacy of Clallam County's Noxious Weed Control Board, Quileute wrote a pilot grant for knotweed eradication in the Dickey River System. The invasion in the Dickey extended into forest land above the riparian zone due to floodwaters overbanking during storm events and wildlife tracking it into the forest floor. During phases of the Dickey project, Quileute worked with Olympic National Park to control the weed to treat large patches. To get knotweed under control in the Dickey, it took some four years and still needs treatment yearly to keep it from spreading. Since that effort, Quileute has become active in an association of agencies, tribes, universities, and concerned citizens called the Olympic Invasives Working Group (OIWG). This group shares knowledge, equipment, chemicals, personnel time, and other resources in advancing control of the knotweed species. It also provides valuable training in technique for control, and its meetings provide hours for licensed certification of herbicide application, required by the state of Washington Department of Agriculture.

With Clallam County and other cooperators, in 2006, Quileute did an assessment of knotweed in the remaining three rivers (after Dickey in 2005) in the Quillayute Basin. QNR mapped the assessment on GIS (see Map 4). We used the OIWG data dictionary. The county helped us to GPS and treat knotweed in the Sol Duc in 2015, and now is down to controlling new stalks. With BIA funding QNR was able to intensively treat the knotweed in the Calawah watershed, and now staff floats the river to look for new emerging stalks and treat any found. Many years, QNR has worked on the Bogachiel watershed with EPA and USFWS funds and only certain persistent areas remain to be retreated. The 10,000 Years Institute has treated the Bogachiel River with WCRRRI funding in 2018-2019, which allows QNR to focus on the Quillayute.

The main tasks remaining lie in the Quillayute mainstem and the lower part near or on the reservation. As noted above and detailed in the table in Section 5.2 below, in 2019 the Tribe implemented an innovative new program with funding from NRCS to treat eleven key invasive species on the reservation instead of just a single-species focus on knotweed. A key objective of the Tribe during this five-year plan is to expand this multi-species approach to lands off the reservation. However, the multi-species approach, not surprisingly, requires significantly more time and personnel, so expanding from a knotweed focus to a multi-species approach on off-reservation lands is entirely dependent on additional funding.

5.2 Description of Programs to achieve BMPs identified above. Regulations, Funding, Education, Training, Technology, Demonstration.

Monitoring & Research:

We have a **CWA 106 grant Tier One** and are surveying the Quillayute River at the marina, the

mouth of Smith Slough at the Quillayute, Lonesome Creek (the primary source for the hatchery), and Settling Ponds (a secondary water source for the tribal hatchery), monthly for dissolved oxygen, temperature, turbidity, pH, and conductivity. After obtaining PPG status in 2012, QNR started to monitor Quillayute River (Thunder Field) and off-reservation in the Quillayute Basin, for a total of 37 locations currently.

We also survey for macroinvertebrates in the U&A in partnership with Clallam County Streamkeepers and other partners. QNR has been monitoring macroinvertebrates since the 1990's and uses the Benthic Index of Biological Integrity (B-IBI) as a scoring method to track trends of stream health and can be correlated with stream temperature. The Director of Streamkeepers and other volunteers trained QNR staff on the protocol that all Western Washington uses under the Puget Sound Stream Benthos. Funding and staff time limit the number of sampling sites done each year, but in 2013-14 all 15 sites that were originally sampled in the 1990's and early 2000's was sampled. Each year following, 2 of the 15 sites are selected to sample to keep the data and track trends.

In addition to the Long-Term Ambient Water Quality Monitoring & macroinvertebrate sampling, the Quileute Tribe has purchased and installed 24 Hobo Temperature Pro V.2 Loggers to record continuous stream temperature data. The loggers are taken out over the winter and re-installed each summer (July 1st -September 15th) to obtain the seven-day average daily maximum temperature (7DADMax). The Hobos monitor continuously for water temperature each hour and QNR follows the TFW Method Manual for Stream Temperature Monitoring.

In 2013, the Quileute Tribe purchased three Forestry Technology Services DTS-12 turbidity sensors, designed to be left in-situ, that record continuous turbidity measurements and transmit them by satellite to websites. We started by installing the sensors on the Dickey, Sol Duc, and Bogachiel. One DTS-12 is installed on the Dickey River upstream of the tidal confluence to avoid corrosion (the Dickey's mouth is within a mile of the Quillayute estuary) and on the nearest state-owned land adjacent to the river. This location is off the Mina Smith Road upstream of the mouth of Larger Creek and is outside of flood-prone areas. The second location is at the Sol Duc River RM 6.5 at the Quillayute Prairie Road in conjunction with WA Dept. of Ecology (DOE). This location was selected because it is near the lower end of the 78-mile river and can detect turbidity downstream of the stretch that contains several logging roads and abundant fish use. The third location is at the Bogachiel River located at Hwy 101 crossing at RM 7. This site contains a USGS river gage and the abutments for the bridge that helped with installation. In 2018, we added a fourth site on the Calawah River at the Hwy 101 crossing in conjunction with a USGS river gage as part of the research project to get a better understanding of turbidity, sediment, and sediment load in the watersheds.

Additionally, QNR staff uses an OTT MF Pro Flow Meter (OTT Current Meter) and collect discharge data during low flows at selected sites in the U&A. The OTT MF pro computes discharge automatically based on USGS and TFW methods, and it comes with a color display that graphs velocity in real-time. Unlike the turbidity sensors, which will be left in-situ, this is a

lightweight and highly portable device. All the training was done by Northwest Indian Fisheries Commission (NWIFC) and are overseeing the low-flow project in partnership with USGS.

QNR staff started researching suspended sediment in 2018 with United States Geological Services (USGS) looking at the Upper Calawah and Bogachiel River. The same methods and data were collected in 1978 by USGS, and by collecting discharge, turbidity, and suspended sediment concentration (SSC) they could calculate sediment load (Nelson, 1982). All the training was provided by USGS under the sediment leadership team to the Water Quality Biologist and on-site training to other QNR Staff, to ensure accuracy of the samples to allow the data to be published. By September 2021, the USGS will have a report with the results on the sediment load calculations, type of sediment, and comparing the sediment conditions since 1970's. Excessively high sediment loads can smother submerged aquatic vegetation, fill in riffle pools, and contribute to increased levels of turbidity and nutrients. This report will help us better understand the geomorphic channel change in the two rivers and the sediment issues as a pollutant.

Restoration & Land Management:

Quileute Natural Resource addresses NPSP in the Quillayute Watershed in forest practices, stream erosion control, sediment, and participation in the Salmon Funding Recovery Board (SRFB) and the Coast Salmon Partnership (CSP). We have written several successful grants for stream restoration and culvert repair under the SRFB program.

Besides restoration projects, working with landowners and agencies on land use/management can move towards a long-term solution to reduce sediment as a pollution. QNR has been deeply involved in the Road Maintenance and Abandonment Planning (RMAP) that addressed many sediment sources in Forest Practice Roads and with WA State Forest Practices in reviewing timber sale proposals to reduce impacts to stream health. However, QNR staff has not been deeply involved with the committee that researches Washington forest practice impacts, called Cooperative, Monitoring, Evaluation, and Research (CMER) on private timber land, not has QNR staff been able to fully engage with research being conducted on WDNR's Olympic Experimental State Forest, which encompasses significant portions of the western Olympic Peninsula lowlands. Now that QNR has more staff, attending the meetings and collaborating with their research, we can be a part of the science that could change policy to reduce impacts to stream health.

Technology & Training:

The advancements on GIS have allowed for monitoring land use, resource management, and environmental change. QNR staff has the capacity to do such work and have received training by Environmental Systems Research Institute (ESRI). The GIS users have all requisite software, hardware, printers, etc. and are fully integrated with all the state data sites regarding streams and forest practices. GIS allows for tools, such as LiDAR, to look at a large-scale area and pick out issues, such as erosion, landslide, road failures, etc.

Technical assistance exists in the form of support from Northwest Indian Fisheries Commission (NWIFC) staff. NWIFC funded by BIA appropriations under PL 93-638 and have provided training, database assistance, tools for communicating natural resource concerns, etc. They review the RMAPs, HPAs, and other forms of application for the forestry or stream bed activities.

Training for QNR Staff comes in a variety of forms, from an occasional seminar from University of WA or NWIFC, or a state agency; to salmon habitat restoration conferences. All the trainings or conferences are funded under TFW grant, EPA GAP/PPG grant, or BIA Fish Management grant.

Forest Practices on Reservation Lands:

The Tribe has no water quality standards for the Quileute Reservation, and relies on state standards, as mentioned before. For Army Corps of Engineers dredging, we rely on the EPA water quality certification (see Part C, below). For any wetland activity (dredge/fill), we defer to Army Corps of Engineers and are not seeking TAS. We rely on the Corps to do dredging of the Quillayute under the Rivers and Harbors Act.

On the reservation we use the updated 2015 Forest Management Plan (FMP) for Quileute Reservation, prepared with BIA (see Appendix C). Quileute is obligated to use this plan. The Quileute Reservation is 2,172 acres, with 657.7 acres being commercial that can be managed for harvest. The Tribe has setup one timber sale for the new Tribal School that was harvested in 2017, and contracts are in place for harvest in 2019 to clear land for housing, senior center, and Head Start/daycare facilities. Quileute within the confines of the FMP plan (p. 8-9, Harvest Policy) must follow this protocol [bullets added for clarity; this was written in long paragraphs originally]:

- All harvesting methods must comply with 25CFR 163 and 53 IAM chapters 3 and 4 (refer to FMP Appendix 5), and state of the art logging practices similar to those practiced on other lands held in trust for timber management purposes. Timber harvest will occur at the request of the Tribe. Tribal staff will be part of the planning for harvest unit layout.
- Roads will be constructed as part of the harvest operations and maintained until a new stand has been established. The road can then be closed subject to the approval of the Tribal Council.
- On even the gentlest slopes, depending on the road surface, tire ruts will provide the quickest drainage route for water, and become significant sources of sediment. Roads on the QIR will need to be monitored and maintained to prevent deterioration and sediment transport.
- All property corners and lines must be established prior to harvest operations. Most areas have slopes less than 30% and can be yarded with hydraulic shovels or other ground-based harvesting systems that may be approved by the Tribe and BIA. Cable yarding

should be used on steeper slopes. Tree retention of a mix of both "hard" and "soft" snags at a rate of at least 3 stems per acre should be considered.

- Riparian Management Zones (RMZs) will be established on existing streams as part of any forest management activity. The RMZs will mirror the Washington State guidelines for stream zone protection and provide both stream protection and wildlife habitat.
- Streamside management zones will be established and managed to protect and improve the riparian habitat.
- On Lonesome creek, a minimum of 80 feet will be excluded from harvest activity except where species diversity is prescribed by a Tribal Biologist. Under that prescription, selective harvest may occur to create openings to plant desired species.
- Equipment will be excluded from operating in this Zone. All other stream zones will be managed for protection as determined by the Tribal resource staff and Olympic Peninsula Agency (OPA) forestry working together using guidelines developed for similar land classifications.

On trust land the Tribal requirements are coordinated with the BIA during the development of the Environmental Assessment and incorporated in the BIA Contract/Permit for the project. The Tribe may also issue a Permit prior to the start of any activity. The Bureau of Indian Affairs along with the Tribe will work cooperatively to provide for the best management practices for all involved complying with all federal laws that impact forest management.

An Environmental Assessment was done as part of the above plan. On page 4 of that addendum it is noted to protect/monitor the water in Lonesome Creek (this serves our hatchery). On page 7 of the EA, under Potential Impacts, it is stated that “timber harvest activities will be planned to avoid active channels and associated wet areas. Depending on the site, ground-based harvest operations will occur during periods of dry conditions to avoid potential impact to ground water. There should be no other restrictions to forest management activities...”

Quileute has reviewed the Yakama Tribe examples of BMPs. To the extent that these may be applicable and advisable, Quileute can implement below:

- Ground cover maintenance
- Limiting disturbed areas
- Log-removal techniques—per BIA management instructions using current FMP.
- Pesticide-herbicide management—not used on reservation except for knotweed.
- Slash management –per BIA management instructions using current FMP.
- Forest Site Preparation –per BIA management instructions using current FMP.
- Forest Stand Improvement –per BIA management instructions using current FMP.
- Riparian zone management - –per BIA management instructions using current FMP.
- Road management (see above BIA policy)
- Tree/shrub establishment in new housing development and MTHG planning.
- Quileute will work with BIA in operations that might impact water and follow the EPA site for guidance: <https://www.epa.gov/nps> and other links available and current on the EPA website for nonpoint pollution when conducting federal trust land forestry. BIA has oversight, under the above-discussed plan. Our plan has a specific CFR cited within.

Forest Practices on State and Private Lands:

Quileute has no jurisdiction on state lands, other than co-management of the fishery. Even with respect to water, we can only work with state agencies to improve water quality and instream flows and cannot exercise jurisdiction ourselves. We can only monitor water quality on land with permission from the landowner or private timber company, who rely on tribal monitoring data.

The Quileute Tribe has purchased land along the Quileute and Bogachiel River that is surrounded by private and commercial or DNR timberlands, but it is very minimal amounts. Therefore, Quileute cannot directly intervene in state harvest programs. The Timber Fish Wildlife department can and do attend ID teams after learning of forest practices applications (FPAs) and they can point out if any proposed activity would harm the habitat from the tribe's perspective of fisheries and/or water quality, and if the practices are not in compliance with state requirements. The Tribe through the ID teams and through review of all FPAs and Hydraulic Permits for work in streams has input on state timber in such manner.

The regulatory program operating in the Usual and Accustomed Area is the forest practices regulation of the Washington Department of Natural Resources: Forest Practices Act RCW 76.09 and 76.13 (Stewardship of Nonindustrial Forests and Woodlands), as well as the regulations promulgated thereunder: Forest Practices Title 222 (Forest Practice Board) Washington Administrative Code (WAC). Also operating: Washington state timber's Habitat Conservation Plan and private timber's Habitat Conservation Plan, each under Section 10 of the Endangered Species Act. Also, operative the WDFW rules and policy for Hydraulic Permit Applications. One application by the state for culvert correction is the Stream Simulation method espoused by WDFW and other state agencies. This is a model that applies the best culvert to a situation because the habitat inside the culvert mimics natural stream gradient and substrate.

The programmatic objectives identified in Section 3.0 above represent the other major tools the Tribe will use to address forest practices on state and private lands.

Invasive Weed eradication.

WAC Title 16 "State Noxious Weed List and Schedule of Monetary Penalties" and RCW 17.10 "Noxious Weeds – Control Boards" covers the regulations for removal of noxious invasive weeds. The EPA goes through an extensive process to review and approve any herbicide or adjuvant and states the label direction must be followed to abide by the law. QNR ensures the labels are followed and meet the requirements to safely apply foliar spray and handle the aquatically certified herbicides and adjuvants. QNR uses protocols adopted by the local governments and agencies in the Olympic Invasives Working Group, and training from the Clallam County Noxious Weed Control Board to appropriately use the chemicals. We use GIS and GPS to map invasive weeds, and we use a data dictionary developed by the staff to record species, stem count, date, etc. All field technicians are trained on how to operate the handheld

GPS units, and daily checks on data entry are done for quality assurance.

Continuous education and training, and recertification of applicators, comes from bi-annual meetings of Olympic Invasives Working Group, usually in Port Angeles, sponsored by Clallam County Noxious Weed Control Board. The state of Washington has an extensive testing procedure to be state qualified and aquatically certified to treat invasive weeds in riparian areas. Additionally, EPA has an independent license requirement to treat invasive weeds on federal land, including the reservation due to independent federal regulations. QNR has a minimum of one staff member who is license on site during application to meet the requirements.

QNR is required to submit a “Notice of Intent” before treating any invasive weeds. All treatments must be recorded by filing spray records, which state the amount of herbicide and details (environmental conditions) about the treatment for each day. These spray records are required to stay on file for seven years, and EPA has a different spray record than the Dept. of Agriculture (for off-reservation).

Funding can come from a number of sources to treat invasive weeds. In the past, QNR has received USFWS funds for knotweed removal, and Title II for projects on USFS land funds. Currently, QNR utilizes the 319 EPA funds for five weeks of knotweed treatment and also has two years’ worth of funding from NRCS to GPS and treat a list of 11 invasive weeds on the reservation. The 10,000 Years Institute has stepped up to treat invasive plants in WRIA 20 and focus on the Bogachiel knotweed with RCO funds. QNR would like EPA to fund invasive weed treatment to the extent possible, because 319 money has been consistent and necessary to control knotweed. However, \$30,000 only reaches some of the spots affected in the Quillayute basin, and not all of the affected infestations. Partnerships with ONP and the County have helped with manpower in treating large areas with known infestations of knotweed, but still is not enough to treat the entire basin yearly.

Thanks to the NRCS funding, the Tribe was able in 2019 to inventory and treat the following species on the reservation as follows:

Species		Treatment:
Japanese knotweed	<i>Polygonum cuspidatum</i>	Foliar application of 1% imazapyr (Polaris)
Bohemian knotweed	<i>bohemicum</i>	Foliar application of 1% imazapyr (Polaris)
Giant knotweed	<i>Sachalinense</i>	Foliar application of 1% imazapyr (Polaris)
Himalayan blackberry	<i>Rubus armeniacus</i>	Foliar application of 1% imazapyr (Polaris)
Evergreen blackberry	<i>Rubus laciniatus</i>	Foliar application of 1% imazapyr (Polaris)
Purple loosestrife	<i>Lythrum salicaria</i>	Foliar application of 1% imazapyr (Polaris)
Tansy ragwort	<i>Senecio jacobaea</i>	Pull, treat any residual plant with 1% imazapyr (Polaris)
Canada thistle	<i>Cirsium arvense</i>	Remove and collect seed head, Foliar application of 1% imazapyr (Polaris)

Scotch broom	<i>Cytisus scoparius</i>	Cut stump and treat with glyphosate (aqua neat)
English ivy	<i>Hedera helix, H. hibernica</i>	Cut stump and treat with glyphosate (aqua neat)
Herb robert	<i>Geranium robertianum</i>	Foliar application of 1% imazapyr (Polaris)

One of the Tribe’s top priorities is to secure additional funding to expand this multi-species approach to areas off the reservation.

Additional BMPs regarding invasive weeds include:

- Requiring all gravel and fill material used in on-reservation habitat restoration projects or other projects to come from sources certified to be weed-free.
- Educating and advocating for landowners and land managers to use gravel and fill from certified weed-free sources and to implement appropriate vehicle washing protocols to prevent inter-basin transfers of weed material.
- Advocating that the Clallam County Shoreline Master Program (SMP) designate invasive weed materials as a pollutant and advocating that the SMP require gravel and fill to be free of invasive weed materials.

5.3 Schedule of Milestones for Implementation of the BMPs identified above.

A. Invasive Weed Milestones

Activity	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5
Inventory, GPS, and treat QNR list of multi-species invasive riparian plants on-reservation	x	x	x	x	x
Inventory, GPS and treat knotweed off-reservation in the Quillayute & Dickey Rivers to reduce infestation by 20% each year.	x	x	x	x	x
Inventory, GPS and treat knotweed off-reservation in the Bogachiel, Sol Duc & Calawah watersheds for spot knotweed reoccurrences and any new stalks to control the spread.		x		x	
Trainings, meetings, and necessary paperwork to keep herbicide application license current. Including attending the Olympic Invasives Working Group bi-annual meetings.	x	x	x	x	x
Explore options about inventorying invasive plants other than knotweed in the Quillayute watershed that detrimentally impact fisheries			x		x
Treat other invasive plants in the Quillayute watershed that detrimentally impact fisheries					x

B. To reduce NPSP impact from legacy impacts of timber operations in the U&A:

Quileute has been working with stakeholders, landowners, and operators to prioritize restoration projects. With a majority of fish barrier culverts being replaced under RMAP on private timber and the WA State Culvert Case for state barriers, we are getting to other type of restoration projects. Road decommissioning, non-fish culverts with potential road related mass-wasting, small landowner fish barriers, road betterment, riparian conversion, riparian planting, and LWD placement are a few examples. QNR Staff is working with NWIFC to analyze the water quality and fisheries data to see where bioassessments should be done, to know what type of restoration activities need to occur and where. Simultaneously, QNR is starting a multi-phase restoration of the Quillayute River.

QNR Staff Milestones

Activity	Yr. 1	Yr. 2	Yr.3	Yr. 4	Yr. 5
QNR Staff submits reports , as required by EPA, Staff will submit 6-month reports and the annual Tribal Assessment Report	x	x	x	x	
ID Team Meetings - Monthly or more often, Timber Fish Wildlife (TFW) Quileute biologist has opportunity to network with the timber operators/landowners when doing ID teams in the woods for their forest practices and can determine likely partnering for projects.	x	x	x	x	
Salmon Recovery Projects Identified - Annually in the spring, Quileute’s Lead Entity (LE) representative meets with other salmon restoration parties in the watersheds of WRIA 20 and we discuss potential projects and partnerships. (This is the Salmon Funding Recovery Board process.)	x	x	x	x	
Salmon Recovery Projects Scored - Annually in the summer, Quileute’s Lead Entity representative advises grantees in the process from a technical standpoint, scores grants, and participates in the regional process to forward grants in the Quillayute Basin that protect water quality and fishable rivers.	x	x	x	x	
Grant Applications - Apply for grants to protect the stream from non-point source pollution. <u>The opportunities and schedule are up to the granting agency, but QNR will consistently apply for EPA PPG (every 2 years) and could also include Competitive 319 Grant, WCRRI, SRFB, NRCS, BIA, USFWS, NFWF, & NOAA Grants</u>	x	x	x	x	

Water Quality Monitoring - Staff monitors water quality, flow, discharge, temperature, and macroinvertebrates for trends and analysis for impacts due to NPSP.	x	x	x	x	
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Sediment NPSP Milestones

Activity	Yr. 1	Yr. 2	Yr.3	Yr. 4	Yr. 5
Quillayute River Geomorphology Assessment (Phase 1)	x				
Suspended Sediment Research with USGS <ul style="list-style-type: none"> ▪ collect SSC, turbidity, and discharge data 	x				
Suspended Sediment Research with USGS <ul style="list-style-type: none"> ▪ analyze data & produce published paper 		x			
Thunder Field Bank Stabilization & LWD Project - (Phase 2) Design to 30% for review, ONP approval, and permitting	x				
5050 Road Project with Rayonier – funded in 2019 from SRFB to remove undersized pipe that is at high risk of road related mass-wasting.	x				
Implement Thunder Field Bank Project - (Phase 2), if grant application is awarded and permitted to get 100% designs and implementation funding is received			x		
Implement Mora Road Bank Project - (Phase 3), partnership with Federal Highway Administration and ONP to implement a fish-friendly approach to stabilize the road.			x		
Bogachiel River Geomorphology Assessment- (Phase 1) if funding is received			x	x	
Engineer Designs – (Phase 3) for Quillayute River Restoration Plan if grant funding is received, the next phase would be to engineer and permit the next step in the plan.				x	x

Rapid Bioassessments on selected streams that are identified having turbidity and erosion issues	X	X	X	X	X
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Temperature NPSP Milestones

Activity	Yr. 1	Yr. 2	Yr.3	Yr. 4	Yr. 5
Data Analysis of existing data with NWIFC & QNR Staff to identify the impaired waters	X	X			
Rapid Bioassessment on selected streams that are identified having temperature impairments	X	X	X		
Draft Quileute Restoration Plan based on findings from bioassessments				X	X

5.4 Certification by Independent Legal Counsel that laws of the tribe provide authority to implement these programs, or description of what is needed to do so. Schedule and commitment by tribe to seek such additional authority.

Quileute Tribe has been approved for TAS for CWA 319.

6.0 List of federal and other assistance/funding [other than 319(h)] available for supporting implementation identified.

The Quileute Tribe has access to PL 93-638 funds for matching. However, it is significant to note that since the *US v Washington* decision of 1974 that first caused Congress to appropriate these funds for the tribal fishery, they have not kept pace with salary increases and changes in cost of living. Tribes can barely keep adequate staff to do the spawner surveys required by that case. Funds specific to timber management and shellfish biology have been added and are line items for that purpose. While the Tribe does not have PL 93-638 funds that are dedicated specifically and exclusively to water quality, many of the BMPs and programmatic activities identified in this NPSP management plan are funded through the Tribe’s PL 93-638 contract.

NRCS has just funded Quileute for two years of invasive plant inventorying, mapping, and removing on the Quileute Reservation in the riparian zone. This has a cap of funds and length of duration. We have easily 3-5 more years of work on this extensive project to control invasive plants on the reservation.

The state Recreation and Conservation Office (RCO), which runs Salmon Funding Recovery

Board and Washington Coast Restoration & Resiliency Initiative funding, also funds restoration work on the ground.

The Quileute have written and been awarded SRFB grants for stream restoration where contractors are used because the tasks require skilled planning and labor (e.g., culvert replacement, culvert to bridge, and large woody debris projects, geomorphology reports, etc.).

We know of funds for lands crossing USFS drainages under the Title II program, but this funding is minimal and goes to partners in the watershed, like Clallam County Noxious Weed Control Board. The Quileute water quality biologist sits on the USDA FS Resource Advisory Committee that awards the grants within each county.

The state Centennial Clean Water Fund goes to utilities. Our Utilities Department has not been in need of these funds. The state Revolving Loan Fund—same as above.

7.0. Identification of any federal assistance programs and development projects to be reviewed by the tribe for their effect on water quality or inconsistency with the tribe’s NPSP Management Plan.

The Quileute Tribe routinely reviews US Army Corps of Engineers plans and environmental review documents concerning dredging of the Quillayute River for consistency with Quileute’s NPSP plan.

8.0 Appendices.

8.1 References:

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17. Quileute Tribe water quality monitoring data from reservation sites under GAP and CWA 106. 2002-2003, and 2008, respectively.
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22. Wilson, S. 1998. Channel. In Sitkum and South Fork Calawah Watershed Analysis. Olympic National Forest, Olympia, WA. (Lead agency US Forest Service, Quileute a partner)

8.2 Examples of cooperative partnerships and processes in place

Olympic Invasives Working Group

MOU with USFS

MOU with Olympic Natural Resource Center of University of Washington

WRIA 20 Watershed Planning/Implementation

North Pacific Coast Lead Entity

Washington Coast Sustainable Salmon Partnership

8.3 Acronyms

ACOE

Army Corps of Engineers

BIA	Bureau of Indian Affairs
BMP	Best Management Practices
BOR	Bureau of Reclamation
CSP	Coast Salmon Partnership
CWA	Clean Water Act
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
GAP	General Assistance Program of EPA
GIS	Geographic Information System
GPA	Global Positioning System
ID Team	Interdisciplinary Team
LEG	Lead Entity Group (state-chartered local entity coordinating salmon habitat restoration)
LWD	Large Woody Debris (logs, root wads)
MOU	Memorandum of Understanding
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NPCLE	North Pacific Coast Lead Entity
NPSP	Nonpoint Source Pollution
NPSPMP	Nonpoint Source Pollution Management Plan
NRCS	Natural Resources Conservation Service (USDA)
NWIFC	Northwest Indian Fisheries Commission
OCNMS	Olympic Coast National Marine Sanctuary
ONP	Olympic National Park
PPG	Performance Partnership Grant of EPA
QNR	Quileute Natural Resources
RCO	Recreation and Conservation Office (WA)
SRFB	Salmon Restoration Funding Board
TFW	Timber-Fish-Wildlife (WA process)
TNC	The Nature Conservancy
U&A	Usual and Accustomed treaty-reserved fishing area
USDA	US Department of Agriculture
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WRIA	Watershed Resources Inventory Area
WSA	Watershed Analysis

8.4 Attachments

Appendix A: Knotweed Protocol

Appendix B: Calawah Watershed Plan (USFS)

Appendix C: Quileute Forest Plan (BIA)

8.5 APPENDIX: KNOTWEED PROTOCOL

(1) OBJECTIVES: The overall goal is to eliminate knotweed from the Quillayute watershed. To achieve this end, the tribe has (some objectives are overlapping):

- (a) Taken the prior assessment data of location, species, density, and such (using data dictionary of Olympic Invasives Working Group), and developed a schedule for staff. Since we have virtually completed the watershed work as of this writing, we will be periodically canvassing areas visually that need retreatment.
- (b) Hired needed staff/arrange for partner efforts
- (c) Continued to work with our LEG and others to alert landowners (outreach, planned work)
- (d) Made necessary purchases of chemicals, safety equipment, removal equipment, etc. (some equipment is on hand from prior grants)
- (e) Obtained permits for land entry (some of this is done immediately upon notice of the grant award). For timberland such as DNR or Rayonier's, permits/permission documents are obtained for entry. Quileute contacts landowners directly for permission to enter smaller tracts. (Over the years our reputation of working with Clallam County and City of Forks on knotweed has greatly facilitated this process.)
- (f) Removed the knotweed—Sequence: begin upstream, work downstream to remove the species. Foliar spraying is most effective on days of no precipitation; used where the stands are not adjacent to waterbodies.
- (g) Repetition 2-3 times after initial application, where and when needed, and if timing allows.
- (h) Year Two—follow-through with final “kill”. We find that at least 2 years are needed to eradicate because the second year we often see return of deformed and stunted plants. Repeating treatments is therefore necessary.
- (i) Interim and final reports when appropriate.

Other goals/objectives are to improve knowledge of knotweed control for both this tribe and the other entities who belong to Olympic Invasives Working Group. This has no particular timeline; it is ongoing. Throughout the 10+ years that the tribe has been eradicating knotweed in the Quillayute Basin, we have been an active part of the informal Olympic Invasives Working Group (OIWG), comprised of tribes, local government, state government, universities, and interested private citizens. We meet frequently, present Power Points on our projects, exchange data, and improve each year as a result. All the tribes benefit symbiotically from sharing their knowledge with each other: Quileute, Hoh, Makah, Quinault, Jamestown S'Klallam, and Elwha Klallam. The group includes federal, state, and local government agencies as well as non-profits and universities.

With Clallam County Noxious Weed Control Board, we have helped to educate the local residents how to control knotweed before it enters the larger ecosystem from people's gardens and they are beginning to respond. Some of these locals are tribal members, living in Forks, the Reservation, or between. On the Reservation, we have treated knotweed over successive years

and have educated the general public on this, so they advise us of outcrops when they show up. Unfortunately, because we are at the bottom of the huge watershed, the reinfestation has occurred, which are addressing as we treat the entire watershed. The benefit to the tribe is measured in salmon habitat preservation/restoration because the salmon are a traditional staple, culturally important for our ceremonies, and commercially a part of the tribal economy.

(2) PROPOSED TIME LINE: Before entering property we get needed licenses and agreements. It is understood that EPA has added NPDES as a new layer of authority before working in this arena. As mentioned in (g)-(h) above, two seasons are required at a minimum. We need to wait until mid-June/early July to start, so the canes mature enough to treat. We need to finish by September because then the canes die back and herbicide is not transferred through the plant. We estimate 10 weeks over two seasons will do the job, based on prior projects. This presumes two teams of two moving on each side of the stream. That having been said, at the downstream end of a huge watershed with a number of tributaries, re-infestation is a problem to watch for. We always begin with the most upstream invasions and move downstream since water is a vector and thus we treat it all effectively.

(3) METHODOLOGY: The methods have been honed over 15 years, by working with the Olympic Invasives Working Group, including training via that both association and Olympic National Park as well as some offered through agencies or universities. In the absence of precipitation and high wind or location in water, foliar applications is the best treatment available.

(a) Equipment and supplies needed: Rain gear, small protective field gear like gloves, facemasks, safety goggles, waterproof markers, paper towels, and insect repellent and such need annual replacement. We use Enterprise vehicles already leveraged under other programs to support the invasive plant work. The preferred chemicals are AquaNeet or GlyPro (herbicide) and Dyna Mark UV blue dye as well as surfactants. In the office we usually already have a desktop computer with GIS programs, map printer, 3 hand-held GPS units with 1-3 m. accuracy (one per team), and digital camera.

(b) Meetings: Meet internally to establish staff schedules (first month after award. Meet with landowners to secure agreements and determine convenient times. Participate in Olympic Invasives Working Group meetings (agencies, landowners, tribes, counties, universities) to coordinate strategies.

(c) Jobs involved: Quileute TFW Manager coordinates and supervises up to 4 technicians/biologists, works with landowners, obtains agreements, attends above meetings. We generally have at least two persons licensed to apply herbicides by WA Department of Agriculture. A team of two technicians handles a GPS unit. Each team of two goes on either side of a stream, upstream to downstream (walking or by raft. Spray crews are usually one licensed applicator and two technicians.

(d) Techniques/protocols: We are using the protocols developed by Clallam County Noxious Weed Control Board and Olympic National Park. We have taken training from both entities on

several occasions. The control products applied are deemed by the EPA to be “practically non-toxic to fish, aquatic invertebrates and honeybees” and binds immediately with soil. They biodegrade to water and carbon dioxide in two days. This type of work only contemplates land applications in periods of low water in the summer. In that situation the WA Department of Ecology, with primacy over permitting applications, does not require its usual NPDES permit. Herbicide license training is through Washington Department of Agriculture; Quileute has two licensed applicators. That person can lead non-licensed teams. Access: Local DNR assists us with SEPA/land use licensing, which they expedite for us. It takes under a month. We use signed agreements for private land. As applicable we will obtain NPDES permits from USEPA.

Safety considerations of protocol: Applicators use protective gear that includes rubber or latex gloves, goggles, chemical suits or rain gear/waders. We use the county’s spill plan. We carry a bee sting kit and first aid kit. Each team is led by a licensed applicator.

Locating the sites: Our riparian and roadside treatment sites have been previously located by GPS, during our assessment and have been mapped onto GIS (see the Appendix). However, if someone calls us in Forks with a private landowner site, we include it into our program and obtain signed agreement with this person.

Foliar spray applications.

We use Glypro or Aqua Neet® spray, diluted to 5 – 6 % solution. The fluid is mixed with surfactant and Dynamark UV blue dye to aid in absorption and to detect where the spray has been applied. Care is taken not to apply in rain or significant wind and to avoid brushing recently sprayed plants. If gear requires cleaning, it can be washed off in areas where herbicide application is otherwise desirable. The chemical fixes to the soil and then biodegrades. Care is taken to loosen the cap of the container of spray mix, then retighten, to prevent pressure problems and potential spill in the truck bed.

We return a few weeks after initial application to ensure all plants have been treated/treat any plants missed initially. Sometimes large patches need to be treated in stages. The second year we go back and treat any new growth or missed canes. About 1-5% of canes will regenerate after initial treatment. We survey and treat again as may be needed

Applicable to both types of treatment: Record treatment site on GPS and enter data into Data Dictionary for downloading onto GIS map. This is to link treatment to the previously noted features in assessment. Care is taken throughout not to cut or otherwise create new vegetative pieces that can generate new plants. Herbicide will be contained in tightly sealed floatable containers so that the possibility of spills into the water will not occur. All backpack sprayers will be emptied of contents.

Rafting of stretches of streams may be necessary where there is a lack of drivable access points throughout the system. Where a stream is easy to traverse along its banks by foot, rafts are not necessary. Rafts are oared by QNR personnel with years of rafting experience on this system from doing salmon redd surveys. Two-man rafts are preferred over boats because of

their maneuverability in the low-water conditions that will exist in summer. Quileute has provided skilled rafting/boating personnel and equipment to assist Clallam County and Olympic National Park in their efforts to control knotweed in difficult to access reaches of their projects.

Quileute shares site data with other entities that need the mapping information; e.g., Clallam County Noxious Weed Board, or Olympic Natural Resources Center of the University of Washington in Forks (metadata center).

(e) Dealing with Land Ownership: While the treatment areas are usually not on tribal land, they are wholly within the Quileute's treaty area for fish and game management, co-managed with the state of Washington. Much of this infested area is private U.S. Forest Service land, and whenever we work on DNR land, we obtain a permit (it is routine by now). The private lands are covered by landowner agreements (example at end). We only work on such land after this is signed. In the many years of our work on knotweed we have become known in the community and have not had any problems accessing the lands. When we work around people's homes, our supervisor always assures that property concerns will be respected before we begin work. Each team always has at least one licensed herbicide applicator per Washington's Department of Agriculture.

(6) Monitoring Plan:

About 3 weeks after an application, the process is repeated to catch areas that might have been missed by foliar applications. In the subsequent year, we also monitor for regrowth and treat it. We also note and photograph returning native vegetation. Data are entered in the GPS. Salmon redd surveys also provide a means of monitoring for any occurrence after the project is completed (there is always a chance of reintroduction), although Clallam County Noxious Weed Control Board has done an incredibly fine job of outreach to the community, with presentations, brochures, and training.

Re Goal 4.1—Tribal government: This project will directly impact harvestable numbers, long-term, and its results will be integrated into program decisions and tribal regulatory management for fish and game. We have both fish and game regulations, and through them manage harvest numbers and times, gear, and many other considerations.

This department tracks the population, health, and habitat conditions; and also enforces the violation of regulations by its members (issues citations, handled in tribal court). Its program staff members make fish enhancement decisions, write grants for habitat restoration, survey population changes over the years and participate in harvest decisions on an intertribal, state, and federal level. They survey aerially and on the ground elk herd strength, calf-cow, and cow-bull ratios. They have checked for chronic wasting disease.

The tribal goal is to eradicate the knotweed in the Bogachiel to:

- (1) Create an environment that will allow native plants to return to the riparian zone.

- (2) Eliminate threat of return and harm to downstream treated Quillayute River areas—this project’s eradication will be logged on the GPS, quantified, and mapped. Olympic National Park is at the Quillayute mouth, and is also at risk if the Bogachiel knotweed is not removed; ONP has expended considerable effort in removing knotweed from locations near the river mouth.
- (3) Improve salmon habitat for the four commercial runs of salmonids—with healthier (native plant) banks, hyporheic zones support more macroinvertebrates for salmon; regrowth of native vegetation will ultimately restore stream channel shade, LWD, and nutritive leaf litter. The current populations will be better protected and future ones have a better chance at adequate spawning and rearing conditions. We survey redd numbers throughout this river system on index and supplemental streams, annually.
- (4) Improve riparian forage for native elk and deer and habitat conditions for other wildlife species—returning native vegetation nourishes cervids and improves habitat for small animals, birds, and amphibians. We conduct aerial surveys of the elk herds annually (total numbers, and ratios of cows/bulls, cows/calves). We also track herds by radio collar on land and keep track of mortality and presumed causes.

This type of work needs to be done over two summers for a respective area, to be sure we have thoroughly treated this stubborn invasive plant. We generally plan to apply herbicide eight weeks each season, with 2 techs full-time and with one supervisor, 16 hours/week. The practice has been the past several years for the Tribe to leverage vehicle use (we lease annually via other funds) and certain hardware, software, and durable small equipment (like visors).

Partners/Support: Since most work we do is off-reservation, the partner is always the landowner. Clallam County has funds to eradicate noxious weeds on its own and works with us, as well as other tribes, in the region.

Subsequently we did raft and walking assessments of all the other tributaries to the Quillayute and with GPS and data dictionary developed by Olympic Invasives Working Group (state, federal, and local governments, academia, counties, tribes) made a GIS map of knotweed occurrence in the U&A.

Grants provided funding for all but the Bogachiel River, which remains to be treated. This in theory could impact groundwater if we did not use biodegradable materials approved by EPA and Ecology and Dept. of Agriculture for knotweed eradication. Also, the work is not done in the water. It is done in the summer months when the streams have receded, and the work is on land.