

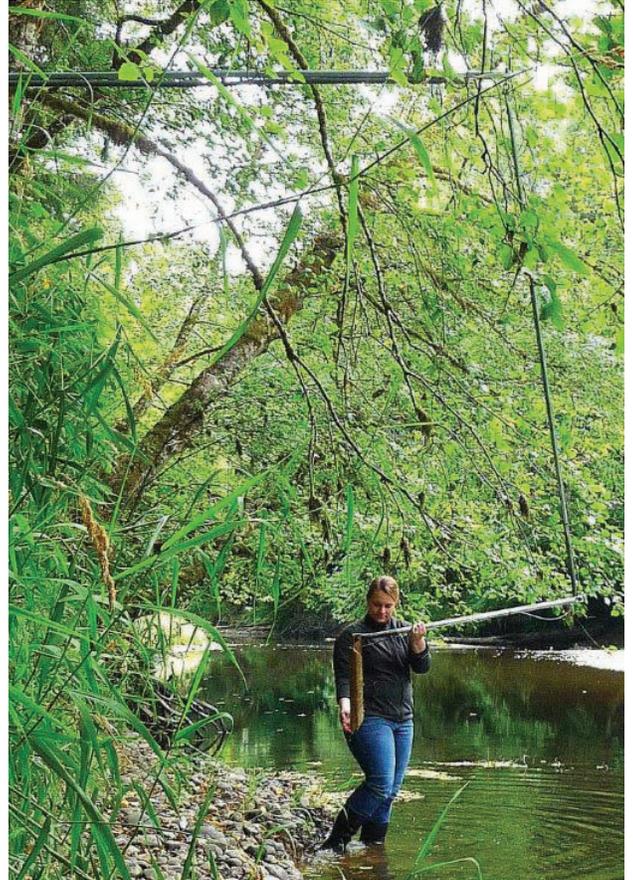
2016 State of Our Watersheds Report

Quillayute River Basin



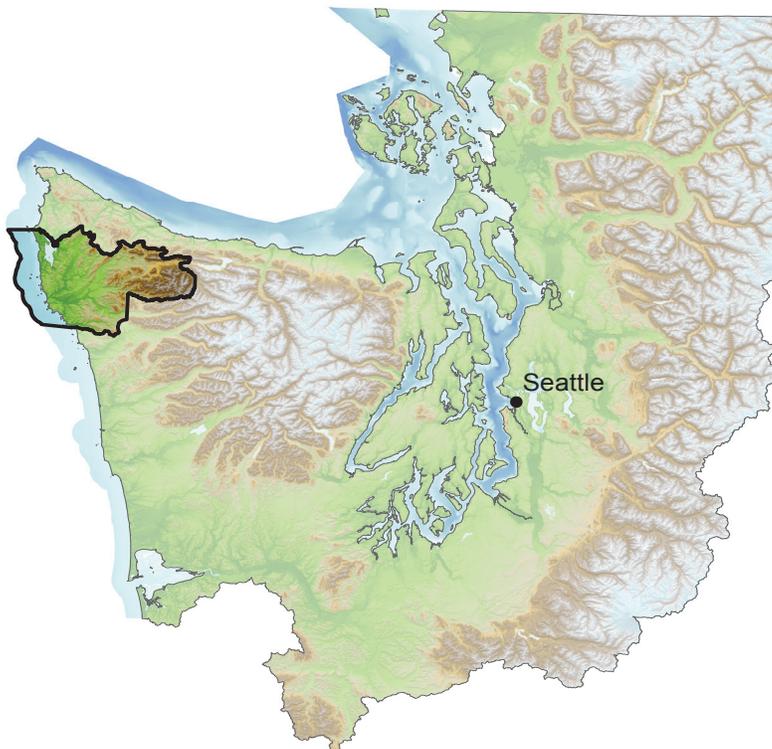
Habitat projects are vital to restoring the salmon fishery. We have successfully partnered on projects in the past but we need many more into the future.

**- MEL MOON,
NATURAL RESOURCES DIRECTOR
QUILEUTE TRIBE**



Quileute Tribe

The Quileute Tribe is located in La Push, on the shores of the Pacific Ocean, where tribal members have lived and hunted for thousands of years. Although their reservation is only about 2 square miles, the Tribe's original territory stretched along the shores of the Pacific from the glaciers of Mount Olympus to the rivers of rain forests. Much has changed since those times, but Quileute elders remember the time when the people challenged *Kwalla*, the mighty whale. They also tell the story of how the bayak, or raven, placed the sun in the sky.



Large Watershed Has Significant Subbasins

The Quileute Tribe's Area of Concern includes the northern portion of WRIA 20, from Lake Ozette to the Goodman Creek Watershed. The largest basin in the area is the Quillayute, with four major sub-basins: the Dickey, Sol Duc, Calawah and Bogachiel rivers. This part of the coastal region is a temperate rainforest with abundant waterfall and an annual rainfall that can reach 140 inches. The Quillayute River flows westerly from the confluence of the Sol Duc and Bogachiel rivers, and enters the Pacific Ocean at La Push, the ancestral home of the Quileute Tribe. The Dickey's confluence is at river mile 1 of the Quillayute. A number of smaller independent streams, such as Cedar Creek and Goodman Creek, drain into the Pacific Ocean.

The area supports Chinook, coho, sockeye, chum, and pink salmon, as well as steelhead and cutthroat trout. The Tribe does not manage the chum and pink salmon that are infrequently found in the area, nor the cutthroat trout. All the fisheries are

co-managed with the state of Washington, and the Quileute Tribe has a shared Usual and Accustomed area with the Makah Tribe in the Lake Ozette basin. The Lake Ozette sockeye is listed as threatened under the Endangered Species Act.

The area is heavily forested with relatively infrequent impervious cover caused by development and small population centers. A part of the Quillayute and Ozette basins lies in Olympic National Park, which has been protected from timber harvest and other major human impacts. Those lands outside the park include Olympic National Forest, state forests and private timberland and city of Forks.

Limiting factors for salmonid production identified within part of WRIA 20:

- A significantly altered estuary and armored banks;
- Increased sedimentation and water flow;
- Reduced levels of large woody debris;



Debbie Preston, NWIFC

Lake Creek chinook and coho surveys in the Quillayute River Watershed.

- Loss of maturity; and
- Predation by marine mammals.¹

Quillayute Watershed Salmon Recovery Plan

The development of the WRIA 20 Watershed Plan included many of the same parties as the original watershed analyses, with the addition of interested members of the public. Adopted in 2008, it sought (as one part of four statutory goals regarding streams) to protect fish habitat by recommending compliance with existing riparian protection regulations and through public education.²

The plan values the presence of stable salmon stocks, recognizes the need to protect commercially viable populations from pressure of reduced water supply, and establishes the objective to improve the abundance of healthy stocks, as well as restore those stocks already experiencing reduced populations. The overarching habitat goal was to maintain the viability of anadromous salmonid runs in all streams in WRIA 20. The approach focuses on establishment of instream flow rules, basin hydrology, water quality and sediment transport, stream channel complexity, riparian areas, noxious weed control, fish passage, and access. This group tried to include broad endorsement of water quality monitoring. However, that remains a subject for individual discussion with each landowner as to access. Further, no funding exists to pursue instream flow rules at present.

Since 1999, Quileute has been a part of local Lead Entities (LE), a state program for salmon habitat restoration/recovery, first with North Olympic Peninsula LE, and when the west end was severed from it, the new North Pacific Coast LE, which began in 2007. Each year the LE updates its restoration strategy and prioritized project list, relying on participants for local information. For every year, the restoration strategy is to maintain and improve ecosystem productivity and genetic diversity for all WRIA 20 salmonid species, by protecting highly productive habitat and populations, and restoring impacted habitat and populations with the potential to recover. Progress toward these goals has lagged through limited available restoration funding and delays in regulation implementation. Both the Washington Department of Ecology and U.S.



Tami Pokorny, Jefferson County Water Quality

North Pacific Coast Lead Entity group field trip.

Environmental Protection Agency articulated the belief that implementation of the Forest Practices Rules under Forests and Fish Report should:

- Significantly advance forest practices in Washington state;
- Improve water quality in the short term; and
- Allow water quality standards to be met in the long-term.³

However, in 2011, full implementation of this regulatory package was delayed by the Washington State Forest Practices Board extending the deadline for Road Maintenance and Abandonment Plan (RMAP) implementation until 2021, which extended the presence of the fish-blocking structures in salmon-bearing streams for an additional five years.

Recovery Efforts Shows Signs of Improvement But Still Lagging in Key Indicators

A review of key environmental indicators for the Quillayute basin shows that priority issues continue to be degradation of water quantity and quality, degradation of floodplain and riparian processes, degradation of forest cover and high road densities. There have been improvements in the repair or abandonment of forest roads and the successful treatment of invasive species. In general,

there is a shortage of staff at all levels (e.g., federal, state, tribal, and county) needed to address the issues and implement actions to restore and protect habitat and to monitor and enforce compliance of existing regulations. In addition, funding shortfalls for large-scale projects contribute to the slow pace of progress.

Review of the trend for these key environmental indicators since the 2012 State of Our Watersheds Report shows an improvement for some indicators and a steady loss for others in habitat status:

Tribal Indicator	Status	Trend Since SOW 2012 Report
Water Quantity - Peak Flows	From 1975, peak flows have shown an increasing trend on the Calawah mainstem. If this trend continues as anticipated under predicted climate change conditions, this may pose a significant impact to salmonid runs.	Declining
Water Quantity - Low Flows	From 1975, mean low flows have shown a decreasing trend on the Calawah mainstem. If this trend continues as anticipated under predicted climate change conditions, this may pose a significant impact to salmonid runs.	Declining
Forest Roads	About 54% of the 1,528 RMAP forestland culverts have been repaired or abandoned.	Improving
Road Densities	Fifteen watersheds representing 68% of the land area may not be properly functioning due to road densities that exceed 3 mi/sq mile threshold.	Declining
Timber Harvest	Between 2011-2015, 1.4% private and 0.3% state owned forestlands were permitted for harvest. Average rate of harvest was 1.1 sq mi/yr down from the average rate of harvest of 4.4 sq mi/yr (1996-2010).	Improving
Forestland Cover	Between 2006-2011, state and private forestlands saw a negative forest cover trend, with the highest losses in the West Fork Dickey (12.1% decrease) and lower Bogachiel River (9.9% decrease).	Declining
Invasive Species	Since 2003, successful treatment has reduced knotweed densities in the Dickey, Calawah, Sol Duc, and Bogachiel watersheds. In 2014, the Quileute Tribe treated 7.63 miles and 13 miles in the Dickey River and Bogachiel River watersheds respectively. In recent years, there has also been treatment in the Quillayute Mainstem. Clallam County has partnered to treat the Sol Duc and Olympic National Park to treat the Quillayute.	Improving

The Tribe continues to work toward the protection and restoration of healthy and functional nearshore, estuarine and river habitat, restoring those areas that are degraded, and conducting research to understand the organisms and the habitats they occupy.



Debbie Preston, NWIFC

A cooperative state-tribal sandbagging effort on the Sol Duc River during the low flows of 2015 helped fish reach spawning grounds.

Looking Ahead

Current trends indicate that continued funding of habitat restoration activities is necessary to achieve the identified salmon restoration goals for WRIA 20. Upgrading of the regulatory framework that serves to protect salmon habitat must occur if the underlying assumption to all the recovery goals is to be realized: that existing habitat will be protected from loss. The current regulatory framework clearly has not provided adequate protection of the water quality, instream flow and riparian habitat within the Area of Concern.

Quileute Natural Resources continues to work with government and private partners on improvements to salmon habitat, most recently with the continued participation in the Lead Entity and Regional Recovery Process (a fusion of four coastal lead entities), developing strategies for recovery and participating in the grant process.

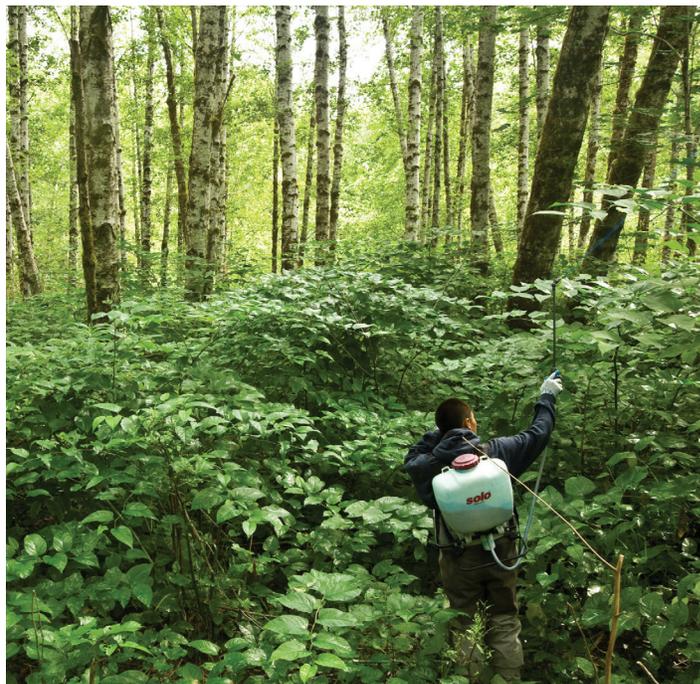
The greatest need is continued funding, since habitat restoration is an ongoing process (e.g., culvert, bridge and road maintenance, and weed control). Funding also is needed for staff programs to monitor, assess and develop plans for needed restoration and/or protection.

Water quality monitoring through federal and state programs is a vital part of salmon habitat protection and will need continued support as well.

For more information about the efforts of the Quileute Natural Resources program please visit www.quileutenation.org/natural-resources.

In February of 2012, Congress approved additional lands to become part of the Quileute Reservation, approximately doubling reservation size. This was to provide for the Move to Higher Ground, designed for tsunami protection. These lands (except for one small fee parcel converted to trust status), come from Olympic National Park and are largely undeveloped. A portion is wetlands.

Over the next five years, the Tribe, while continuing to focus on maintenance of stream monitoring and salmon habitat restoration throughout WRIA 20, will be expanding concerns to assure the



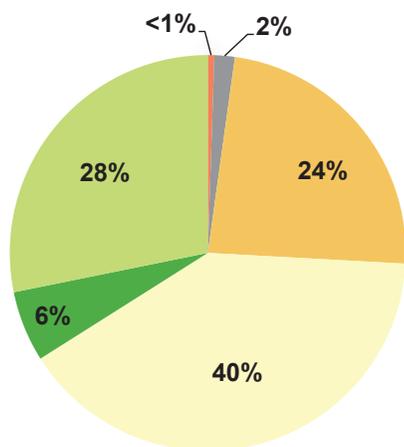
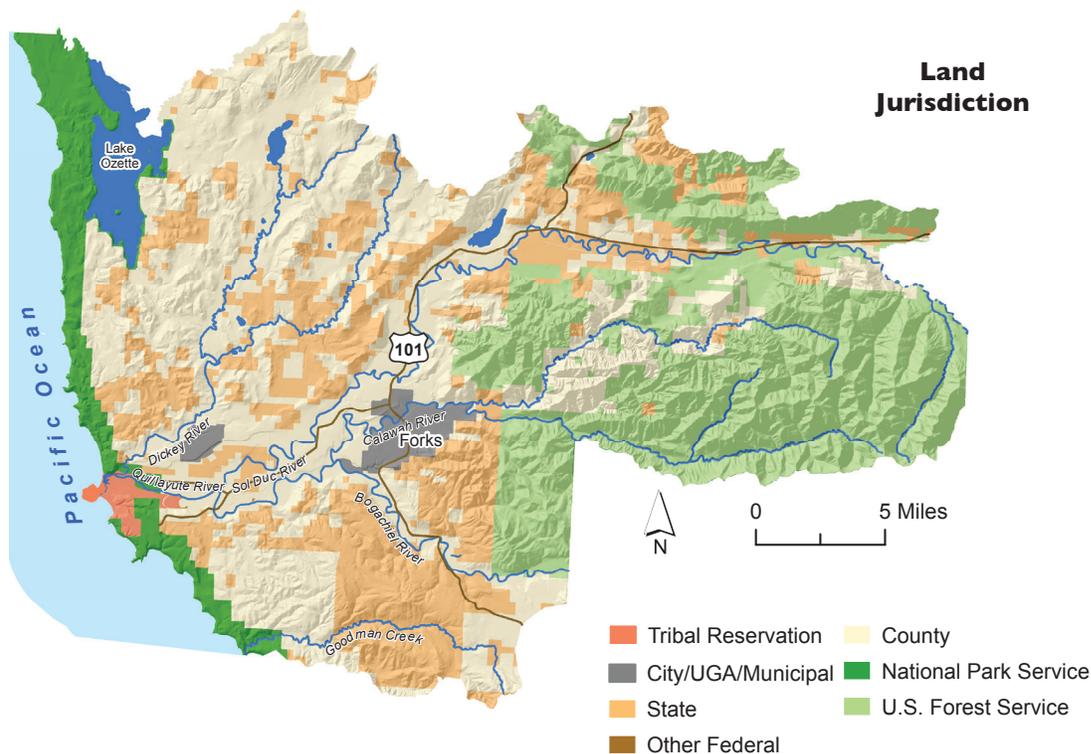
Debbie Preston, NWIFC

Eradication of the invasive knotweed in the Quillayute River watershed has been a multi-year effort by the Quileute Tribe involving crews spraying and injecting the plant with herbicide to kill it. Knotweed replaces important habitat components for fish and spreads easily requiring years of follow-up effort in watersheds.

Move to Higher Ground occurs in a manner that will continue to protect our natural resources. We are exploring flood control and culvert projects for the new lands, in cooperation with state and federal agencies. We are also working on climate change concerns through existing federal grants from EPA and BIA and insofar as watershed management interfaces with climate (e.g., flooding, new precipitation cycles, low flows, changes in invasive species or habitat for native species), we will need to address such issues.

Quileute Tribe

Lake Ozette, Quillayute River and Goodman Creek



The Quileute Tribe’s Area of Concern includes the northern portion of WRIA 20, from Lake Ozette to the Goodman Creek watershed. The largest basin in the area is the Quillayute, with four major sub-basins: the Dickey, Sol Duc, Calawah and Bogachiel rivers. The Quillayute River, a broad low gradient river, flows westerly from the confluence of the Sol Duc and Bogachiel rivers and enters the Pacific Ocean at La Push, the ancestral home of the Quileute Tribe. The Bogachiel and Sol

Duc rivers enter the Quillayute about 5.5 miles from its mouth; these are referred to as the “Three Rivers.” The Calawah River, a major tributary of the Bogachiel River, enters the Bogachiel about 8.5 miles from the latter’s confluence with the Quillayute River. The Dickey River enters the Quillayute River approximately 1 mile up from the mouth. A number of smaller independent streams, such as Cedar Creek and Goodman Creek, also drain into the Pacific Ocean.

Streamflows in the area are generally provided by abundant rainfall, the average of 120 inches a year being among the highest in Washington state. A part of the basin lies in Olympic National Park, which has been protected from timber harvest and other major human impacts. Those lands outside the park include Olympic National Forest, state forests and private timberland.

The area supports Chinook, coho, sockeye, chum and pink salmon as well as steelhead and cutthroat trout, although chum and pink salmon are infrequent.^{1,2} Chum, pink salmon and cutthroat trout are not managed by the Quileute Tribe.

All the fisheries are co-managed with the state of Washington. The Quileute Tribe shares Usual and Accustomed areas with the Makah Tribe in the Lake Ozette basin. With the Endangered Species Act listing of Lake Ozette sockeye as threatened in 1999, the National Marine Fisheries Service spearheaded a steering committee made up of co-managers and other stakeholders to develop a Recovery Plan.³ The plan has extensive discussions of limiting factors, threats and recovery recommendations. This process was funded by the federal government. Very limited funding is available now for facilitation of an Implementation Steering Committee. For the present, recovery projects will need to be funded on an individual basis, largely by competitive grants.

A watershed management plan was also prepared that provides specific guidance and recommendations on water resources management and a detailed implementation plan was developed to guide the actions needed to protect, preserve, and/or restore the natural resources in WRIA 20.⁴

Data Sources: Quileute 2015,⁵ SSHIAP 2004,⁶ USFWS 2014,⁷ WADNR 2014a,⁸ WADNR 2014b,⁹ WADOT 2012,¹⁰ WADOT 2013,¹¹ WAECY 1994,¹² WAECY 2011a,¹³ WAECY 2013¹⁴

Loss of Forest Cover Impacts Fish Habitat

Current forest cover conditions are generally good to healthy in most watershed units in the Quileute Area of Concern. Between 2006 and 2011, watersheds within Olympic National Park and U.S. Forest Service lands had little (<1%) or no change in forest cover conditions while within the state and private lands, the overall trend is negative. Watersheds with the highest losses were West Fork Dickey (with a 12.1% change) and Lower Bogachiel River (9.9%).

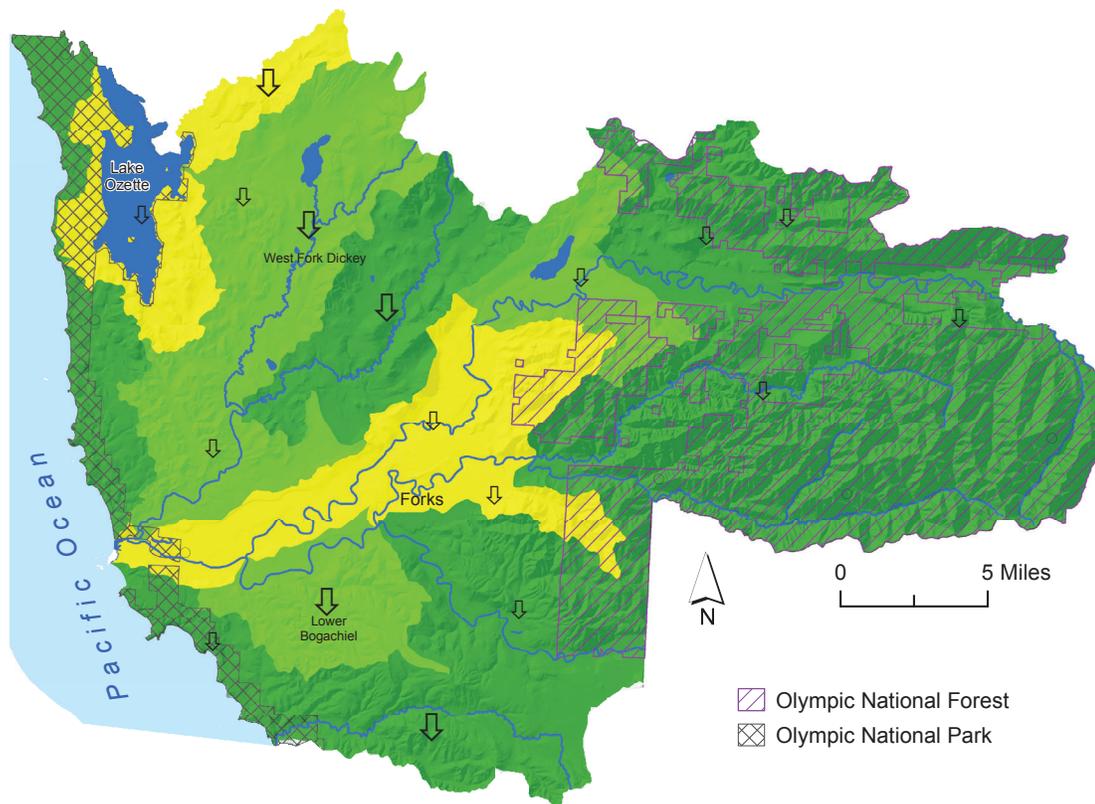
Healthy forest cover conditions are vital for the maintenance of proper watershed processes and thus salmonid habitat. A major goal of the WRIA 20 watershed plan “is the maintenance of forest cover to benefit fish habitat, water quantity and water quality, and to provide additional ecosystem services such as carbon sequestration.”¹

The 2011 forest cover conditions of most of the watershed units in the Quileute Area of Concern were generally good to healthy, but moderate forest cover conditions do exist in the northwest part of the area near Lake Ozette, as well as in the central region near the city of Forks. However, the Forks

area is historically a prairie and much of it was not covered by forest. These areas were mostly outside Olympic National Forest and Olympic National Park.

Between 2006 and 2011, watersheds within Olympic National Park and U.S. Forest Service lands had little (less than 1%) or no change in forest cover conditions, while within the state and private lands, the overall trend in forest cover is negative. Watersheds with the highest losses were West Fork Dickey (with a 12.1% change) and lower Bogachiel River (9.9%). Since these areas are in private forestlands, it is likely that these changes were caused

by timber harvesting. No watersheds showed any gains in forest cover, making the net change in forest cover of the different watersheds either neutral or negative. While the overall forest conditions are good to healthy, the general trend for most watersheds outside the park and Forest Service lands appears to be negative. However, it is important to note that except for the National Park, this area (especially private and state ownership) is under continuous harvest and replanting, so figures do change over time.



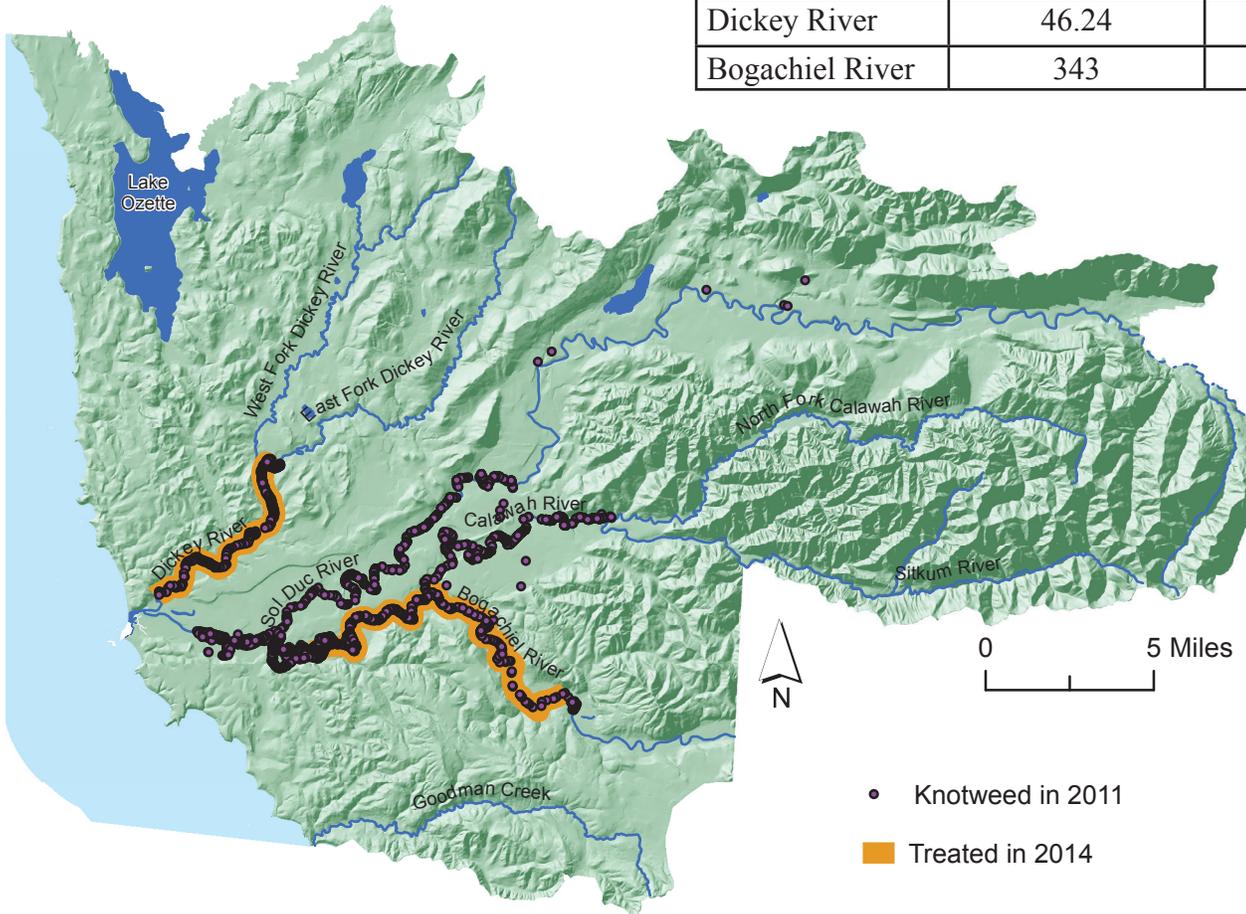
Data Sources: SSHIAF 2004,² USGS 2014,³ WADNR 2014b,⁴ WAECY 2006,⁵ WAECY 2011a,⁶ WAECY 2011b⁷

Invasive Knotweed Management

The Quileute Tribe continues to make efforts to reduce invasive knotweed densities in the Dickey, Calawah, Sol Duc and Bogachiel watersheds, and the Quillayute mainstem, a process that began in 2003. In 2014, the Quileute Tribe treated 7.63 miles and 13 miles in the Dickey River and Bogachiel River watersheds respectively. Clallam County has treated much of the Sol Duc.

Knotweed Control by Quileute Tribe in 2014

Watershed	Acres Searched	Miles Treated
Dickey River	46.24	7.63
Bogachiel River	343	13



Quileute tribal staff controlling knotweed.

Invasive knotweed (*Polygonum spp.*) plants are known to displace native species and alter riparian vegetative communities.¹ They can cause long-term changes to the structure and functioning of the riparian forests, negatively impacting watershed health and adjacent fish habitat. These plants have been widely distributed in the riparian zone of the Quillayute watershed.² Its removal and control continues to be listed as a “Top Priority” salmon restoration project by the Quileute Tribe.

Since 2003, the Tribe has embarked on a multi-year effort to eradicate these plants.

The program has resulted in the largely successful removal of these plants in the Dickey system.³ The efforts in the Calawah, Sol Duc and Bogachiel are also largely successfully completed.⁴ Because rhizomes sometimes regenerate plants, a few years of retreatment is essential.

These efforts have resulted in a drastic reduction of the densities of these plants, so that it now takes only a fraction of the time it previously took to treat and control them.⁵ The Tribe continues to monitor these systems for re-infestation, while expanding work into the Quillayute mainstem.

Data Sources: Quileute 2011,⁶ Quileute 2015,⁷ SSHIAP 2004,⁸ WAECY 2011a⁹

Forest Practice Activities

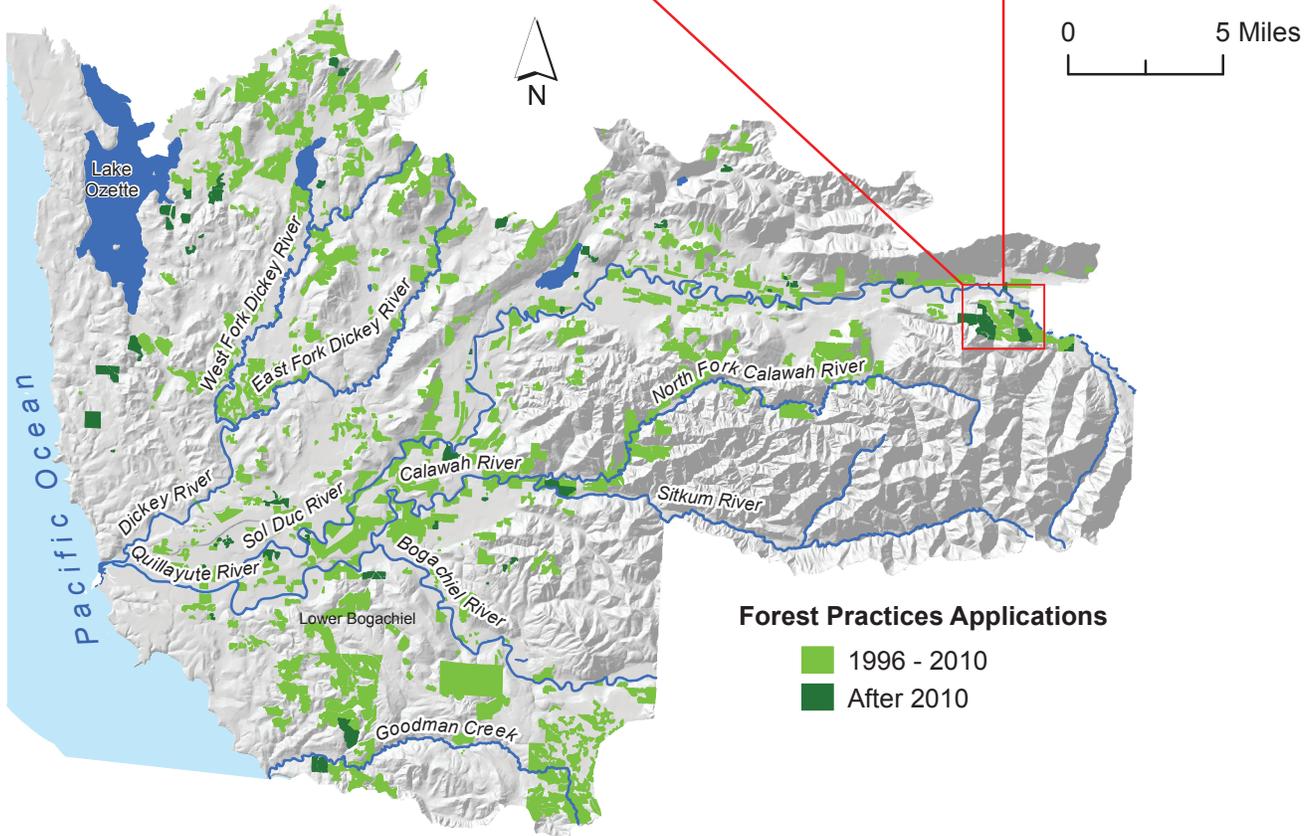
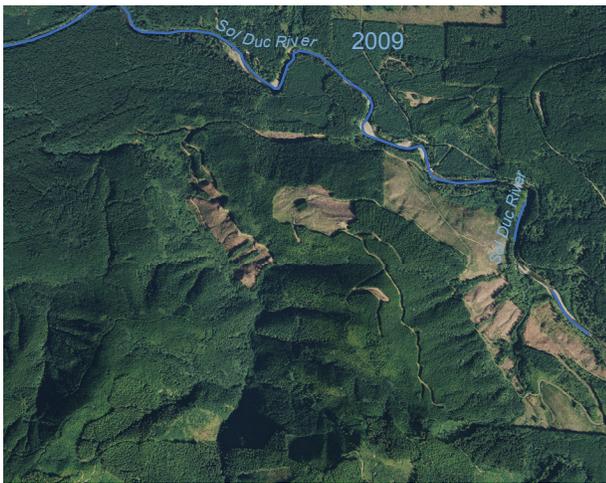
Since 2011, 1.4% of private and 0.3% of state-owned forestlands have been permitted for harvesting in the Quileute Tribe's Area of Concern. Between 1996 and 2010, the rate was 20.1% and 8.9% respectively. The average rate of harvest was 4.4 square miles/year (from 1996 to 2010) and 1.1 square miles/year (since 2011), which may indicate a trend toward a slower rate of harvest activity.

Forests in the Quileute Tribe's Management Area of Concern have been relied upon for many important resources, including timber. However, the removal of vegetation from commercial timber harvesting negatively impacts riparian function, results in poor large woody material recruitment in streams and alters the flow regime. These are factors limiting salmon production in the area.¹ Forest practice ap-

plications filed for the purposes of cutting or removal of commercial timber products in the Area of Concern show that between 1996 and 2010, about 20.1% of private and 8.9% of state-owned forestlands were permitted for harvesting. Since 2011, about 1.4% and 0.3% of private and state-owned forestlands respectively were permitted for harvesting. From 1996 to 2010, the average rate of harvest was 4.4 square miles/

year and since 2011, it has been 1.1 square miles/year. This may indicate a trend toward a slower rate of harvest activity.

Most of the recent forest practice activities seem to be concentrated in the Lower Sol Duc, Dickey and Goodman Creek watersheds, which are predominantly private forestlands.



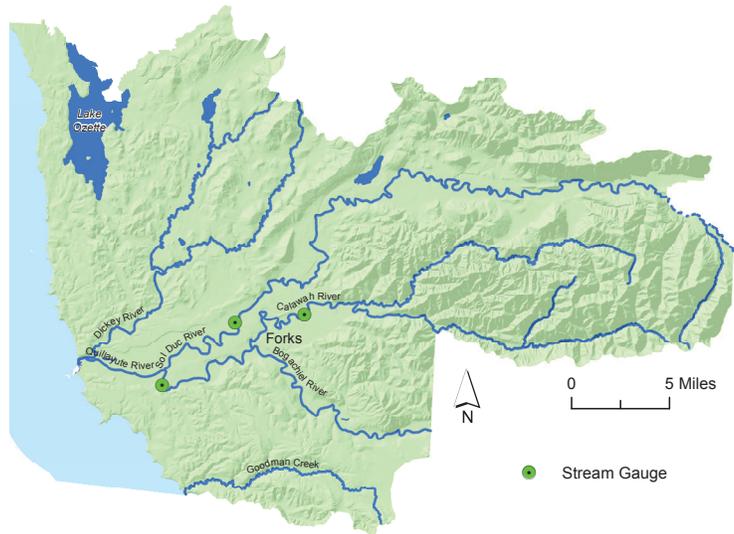
Data Sources: NAIP 2009,² NAIP 2013,³ SSHIP 2004,⁴ WADNR 2011,⁵ WAECY 2011⁶

QUILEUTE TRIBE
Streamflow

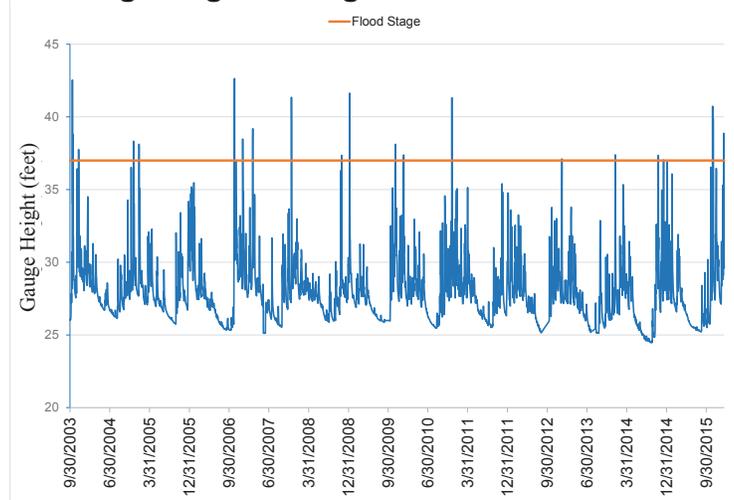
Since 2010, streamflows for the Calawah River have followed the same overall trends as the previous 35 years – increasing peak flows and decreasing low flows. Both trends could threaten salmon habitat and other aquatic ecosystem functions. For instance, in the summer of 2015, streamflows in this Area of Concern were so low that fish had difficulty reaching spawning grounds.

The ability of river systems to provide adequate water for fish is critical for fish migration survival and productivity. Protection of instream flows is a key goal of the WRIA 20 detailed implementation plan.¹ However, to date there are no instream flow rules in place and no funds from the state or others to initiate them.² The Quileute Tribe works with the Department of Ecology to continue operation of the monitoring gauge on the Sol Duc River, which supports stocks of coho, Chinook and sockeye salmon, as well as native runs of steelhead and cutthroat trout. The variation in streamflow timing and magnitude shown for the Sol Duc is typical for streams in this basin, with peak flows in the winter months and low flows in the summer months. The Tribe also operates a gauge on the Bogachiel River, which is used to track flooding and its impacts on road access from La Push to Forks. In addition, tribal staff monitors water flow levels with a handheld device while monitoring for water quality.

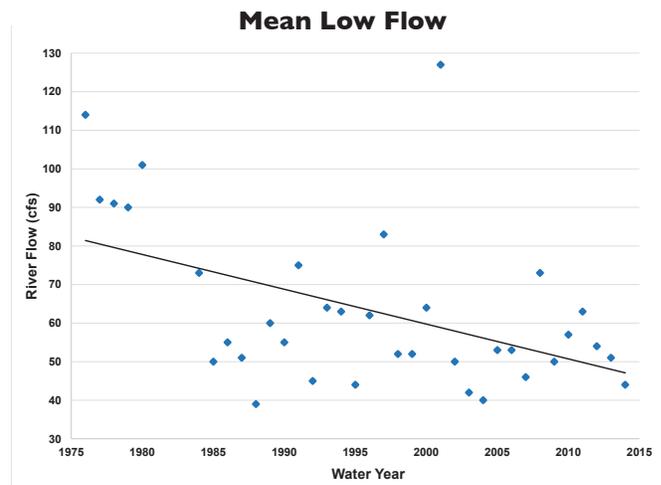
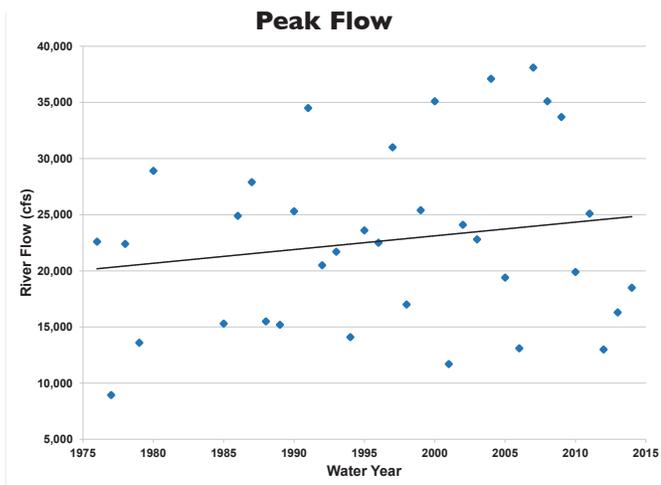
Since 2010, streamflows for the Calawah River have followed the same overall trends as the previous 35 years – increasing peak flows and decreasing low flows. Such a scenario is predicted to occur as a result of climate change, and both trends could threaten salmon habitat and other aquatic ecosystem functions.³ Increased peak flows may also be the result of removal of vegetation.^{4,5} They cause the scouring of streambeds, channel incision (and subsequent disconnection from floodplain), and downstream transport of wood, resulting in simplified stream channels and greater instability. The trend of increasing peak flows has been shown to make streams less productive.⁶ Many studies in the Pacific Northwest have documented the relationship between low streamflows and poor salmonid survival.^{7,8} The reduction in streamflows may result in less fish habitat because of dry streambeds or pools become cut off from the main channel and strand fish. In the summer of 2015, streamflows in this Area of Concern were so low that fish had difficulty reaching spawning grounds.



Gauge Height for Bogachiel River near La Push



Calawah River Flows



Data Sources: SSHIAP 2004,⁹ USGS 2015,¹⁰ USGS 2016,¹¹ WAECY 2011a,¹² WAECY 2015¹³

Impact of Roads on Fish Habitat

About 54% of the 1,528 Road Maintenance and Abandonment Plan (RMAP) forestland culverts in the Quileute Area of Concern have been fixed, leaving about 46% to be repaired by 2021. Also 15 watersheds representing 68% of the land area may not be properly functioning due to road densities that exceed the 3 miles/square mile threshold.

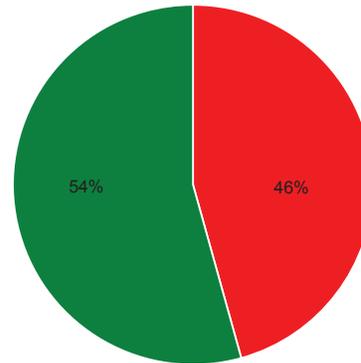
Roads are a vital component of the human use of forested watersheds, but they can affect fish habitats by increasing erosion and sediment loading, and by changing channel morphology. If not properly constructed or maintained, culverts at road crossings may become fish barriers. The WRIA 20 Detailed Implementation Plan recommends restoring fish populations by working to remove fish passage barriers.¹

The Washington State Forests and Fish Law requires most forest landowners to have a RMAP for their ownership, which includes a schedule for any repair work needed to improve road systems at stream crossings and address aquatic habitat and fish-passage issues. The RMAP data shows that about 54% of the identified 1,528 culverts in the Quileute Area of Concern have been fixed and the remaining 46% were yet to be repaired and remain barriers to fish, as of December 2014. In addition, there were 121 non-RMAP fish barriers in the area.

The National Marine Fisheries Service defined watersheds with road densities greater than 3 miles/square mile of watershed area as “not properly functioning” for salmon habitat.² Watersheds were classified as “properly functioning” when road densities were less than 2 miles/square mile and “at risk” when values were 2-3 miles/square mile. In 2014, 15 watersheds representing 68% of the land

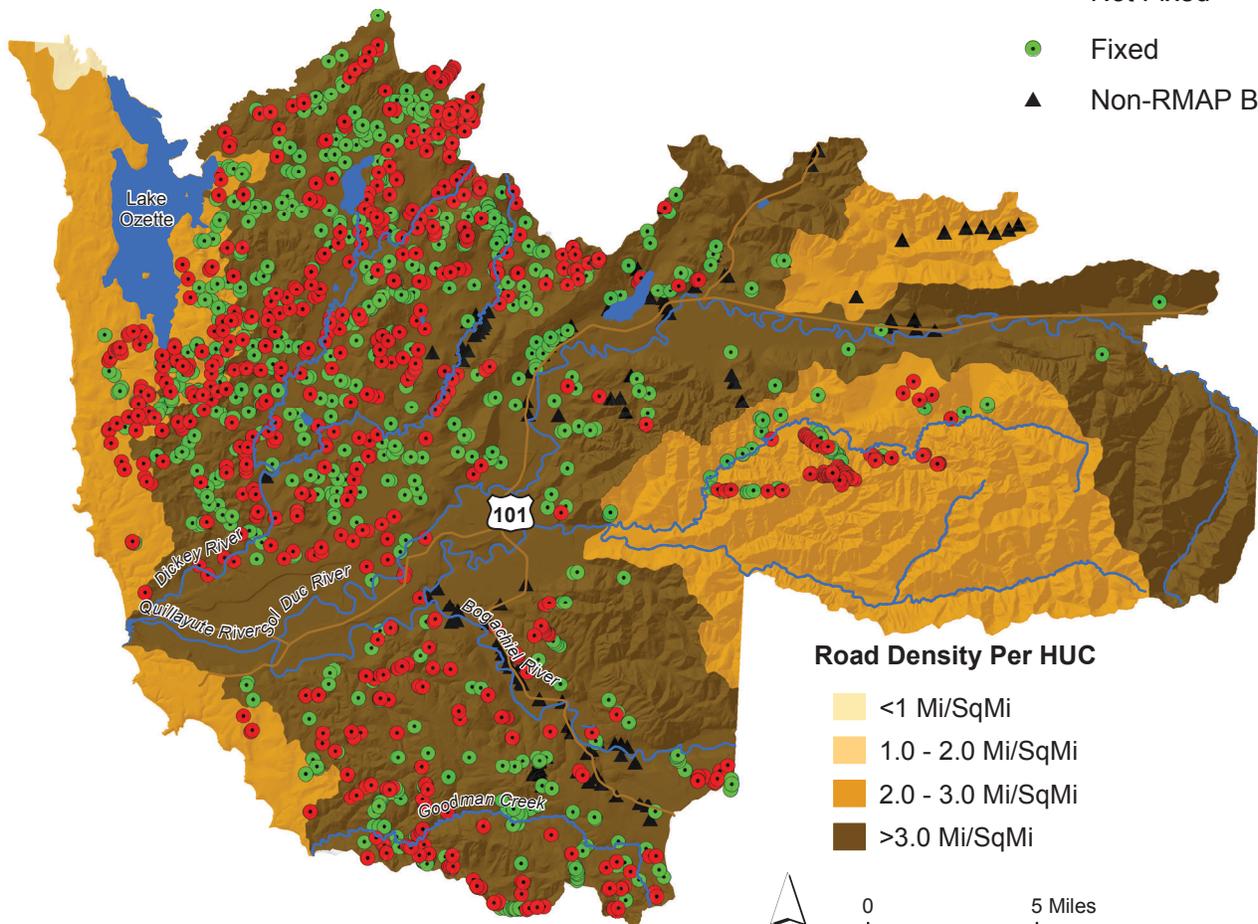
area in the Quileute Area of Concern still have road densities that placed them in the “not properly functioning” category and this could have an impact on stream hydrology, fish habitat and salmonid production. The highest density of over 5 miles/square mile was in the Crooked Creek watershed near Ozette Lake. Other high density watersheds were the West Fork and East Fork Dickey River, as well as the Bockman Creek-Sol Duc River watersheds.

RMAP Culvert Repair Status



RMAP Status

- Not Fixed
- Fixed
- ▲ Non-RMAP Barrier



Road Density Per HUC

- <1 Mi/SqMi
- 1.0 - 2.0 Mi/SqMi
- 2.0 - 3.0 Mi/SqMi
- >3.0 Mi/SqMi



Data Sources: SSHIAP 2004,³ WADNR 2014c,⁴ WADNR 2014d,⁵ WADOT 2012,⁶ WAECY 2011a⁷

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Invasive Knotweed Management

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