We volunteered not to fish for Chinook and to focus on the recovery of our salmon. But even with the nets out of the river, our fish numbers are not increasing. We work hard to restore habitat and recover Stillaguamish Chinook, but in the meantime, our culture faces extinction. We are a living culture and we must have salmon to harvest.

– Shawn Yanity
Stillaguamish Tribe

The Stillaguamish Tribe is composed of descendants of the Stoluck-wa-mish River Tribe. In 1855 the population resided on the main branch of the river, as well as the North and South Forks. The name Stillaguamish, under various spellings, has been used since around 1850 to refer to those Indians who lived along the Stillaguamish River and camped along its tributaries. They were a party to the Treaty of Point Elliott of January 22, 1855. No separate reservation was established for the Stoluck-wa-mish Indians. Some moved to the Tulalip Reservation, but the majority remained in the aboriginal area along the Stillaguamish River. Tribal headquarters are located in Arlington, Washington.
Stillaguamish Watershed Salmon Recovery Plan

The Stillaguamish watershed remains one of the few largely undeveloped rural areas adjacent to major urban centers in Puget Sound. The local economy remains based in natural resources, with forestry the most extensive land use in the watershed. Streamside land use within the hydrologically connected areas used by anadromous fish comprises 61% forestry, 22% rural, 15% agriculture and 2% urban. Not surprisingly, the leading factors for decline in riparian habitat throughout the watershed have been related to forest practices and conversion of floodplain habitats to agricultural and urban land uses.

The Stillaguamish Watershed Salmon Recovery Plan’s stated goal is to maintain and restore natural ecosystem conditions that sustain salmon productivity.

A three-tiered approach was outlined for recovery:
• Prevent further fragmentation of aquatic habitat;
• Improve connectivity between isolated habitat patches; and
• Protect and restore areas and necessary functions surrounding critical salmon habitat from further degradation, and allow for the expansion of existing refugia.

Results Mixed after Recovery Progress Review

The Stillaguamish Implementation Review Committee (now known as the Stillaguamish Watershed Council, or SWC) adopted a 10-year watershed goal for habitat enhancement projects. These projects reflected the categories and geographical priorities (riparian, estuary, large woody debris, floodplain, sediment and hydrology) that corresponded with the limiting factors for Chinook salmon populations in the Stillaguamish watershed.

The identified project goals are:
• Planting 400 areas of riparian habitat;
• Restoring 195 and creating 120 acres of estuary habitat;
• Installing 51 engineered logjams;
• Restoring 30 acres and removing 4.1 miles of armoring in floodplain habitat;
• Conducting 2 landslide treatments and 106 miles of forest road treatments for sediment control; and
• Acquiring 1,445 acres for conservation protection.

Review of habitat recovery progress and trends at the 10-year mark of the Stillaguamish Watershed Salmon Recovery Plan reveals mixed results:
• 493 of 400 acres of riparian habitat restored;
• 233 of 315 acres of estuary marsh land created or restored;
• 30 of 51 engineered logjams installed;
• Over 5 miles of side-channel floodplain habitat reconnected or restored;
• 1.5 of 2 landslides treatments completed;
• Over 300 miles of forest road treatments (not including state forest roads) and over 105 miles of road storage, decommissioning and/or abandonment (including state forest roads) have been completed; and
• 550 of 1,445 acres of land acquired in priority reaches.

Greater Population Demands Degrade Habitat

The recovery plan envisioned that a variety of protection tools and incentive-based voluntary actions would be drawn upon to protect Chinook salmon habitat. Central to this effort would be development of non-regulatory and programmatic actions to encourage habitat conservation and the integration of salmon recovery goals and objectives with local comprehensive plans and land-use policies. Little to no progress has been made on this protection strategy.

The last 150 years of human expansion and development has depleted natural resources and left degraded the natural ecology of the Stillaguamish River basin. One of the major resource concerns for the Stillaguamish Tribe is the state of salmon within the watershed, and the Tribe has been deeply committed to the Stillaguamish Watershed Salmon Recovery Plan. The Salmon Recovery Plan clearly identifies historic habitat loss and the causes of continued habitat degradation. This report highlights some of the major landscape-level causes for sustained salmon habitat loss throughout the watershed, from the estuary to the headwaters.
Recovery Efforts Lagging

At the 10-year mark of the Puget Sound Salmon Recovery Plan, a review of key environmental indicators for the Stillaguamish basin shows that priority issues continue to be degradation of water quantity and quality, degradation of floodplain and riparian processes, and degradation of marine shoreline habitat conditions. In general, there is a shortage of staff at all levels (e.g., federal, state, tribal, 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 upgrade in shellfish growing areas but a steady loss in habitat status:

<table>
<thead>
<tr>
<th>Tribal Indicator</th>
<th>Status</th>
<th>Trend Since SOW 2012 Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoreline Modifications / Forage Fish</td>
<td>Since 2005, the counties of Port Susan Bay (Island and Snohomish) have combined for a net increase of 1.1 miles of marine shoreline armoring, which represents 17% of total net increase in marine shoreline armoring for Puget Sound over the same time period. 99% of documented forage fish spawning in Port Susan Bay occurs along erosional drift cells, and 38% of the shoreline of these drift cells are already armored or otherwise modified.</td>
<td>Declining</td>
</tr>
<tr>
<td>Water Quality - Shellfish</td>
<td>In 2014, over 1,000 acres upgraded from unclassified to approved for commercial shellfish growing. This comes in addition to the 1,800 acres of Port Susan's shellfish area that was upgraded to the State Department of Health's high rating of approved in 2010.</td>
<td>Improving</td>
</tr>
<tr>
<td>Water Quality - Peak Flows</td>
<td>Long-term increases in rainfall accompanied by decreases in snowfall have likely been driving steady increases in peak flows in the North Fork Stillaguamish River. These increases are confronting each current brood year of spawning North Fork Stillaguamish Chinook with a 50% chance, rather than a historic 10% chance, of being exposed to peak flows that correspond to egg to fry survival rates where the Chinook stock does not replace itself.</td>
<td>Declining</td>
</tr>
<tr>
<td>Water Wells</td>
<td>In 2009, Ecology reported 666 wells drawing from the reserve and by the end of 2013 the number was 827, a 24% increase. Current unofficial estimates of Ecology data have the number of exempt wells drawing from the reserve at between 900 and 1,000 wells.</td>
<td>Declining</td>
</tr>
<tr>
<td>Population Growth</td>
<td>As of 2013, there were an estimated 52,000 people living in the Stillaguamish River watershed. Most residents continued to live outside of incorporated towns and Urban Growth Areas (UGA) in 2010 (64%) and continued to do so in 2013 (63%). This data points to a slowing trend of rural population sprawl in the Stillaguamish watershed. Whether this is a reflection of the “Great Recession,” or whether this is due to growth management planning is not understood at this point.</td>
<td>Declining</td>
</tr>
<tr>
<td>Floodplain</td>
<td>As of 2013, the 10-year floodplain restoration targets for the Salmon Recovery Plan were not being met. Only 22.3 of a targeted 30 acres of floodplain area had been restored, and only 0.24 miles of a targeted 4.1 miles of bank armoring had been removed while 0.43 miles of bank armoring were added since 2005. Riparian forest cover in the Stillaguamish River floodplain remains 23%, unchanged since 2006. This is less than a third of the 80% riparian forest cover considered a long-term Properly Functioning Condition (PFC) in the Salmon Recovery Plan.</td>
<td>Declining</td>
</tr>
<tr>
<td>Land Conversion</td>
<td>From 2007-2015, about 945 acres were converted out of forest practices and into non-forestry uses. This is in addition to the over 935 acres converted from 1997-2006, bringing the total to 1,882 over the last 20 years. Over the past 20 years, 76% of all conversions occurred almost exclusively in the Rural Residential Zone, outside UGA boundaries.</td>
<td>Declining</td>
</tr>
<tr>
<td>Restoration - Estuary</td>
<td>Since publication of the 2012 State of Our Watersheds Report, the Stillaguamish Salmon Recovery Plan’s 10-year target for estuary habitat restoration has expanded from 315 to 548 acres. As of 2013, 150 acres or 27% has been restored towards that target.</td>
<td>Declining</td>
</tr>
</tbody>
</table>

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.
Salmon Runs Continue to Decline under Status Quo

The Stillaguamish Watershed Council has concluded that Stillaguamish Chinook cannot be recovered without major changes at the state and federal levels including:

- Adequate instream flows;
- Improved timber harvest regulations and enforcement;
- Improved water quality enforcement and compliance;
- Improved protection and enforcement on agricultural lands; and
- Development regulations that protect critical habitat throughout the floodplain and the estuary.

As David Montgomery points out in his 2003 book, *King of Fish: The Thousand-Year Run of Salmon*, “many share the blame for the decline of salmon in the Pacific Northwest. Not surprisingly, there is no shortage of finger-pointing: Land developers blame the fishing industry. Fishermen blame the timber industry. Loggers blame land developers. Some even blame hungry sea lions and fish-eating birds. And there is a long history of blaming declining salmon populations on Indian fishing. Yet even though there is a broad consensus among scientists regarding the primary factors driving salmon declines, actions to stem known causes remain either mired in institutional, corporate, and societal denial, dissipated by spin-doctoring, or thwarted by political agendas and bureaucratic inertia.”

The continued decline of salmon populations (and their habitat) in the Stillaguamish is a reflection of a society operating under the status quo policy direction.

“With legions of professionals engaged in salmon recovery, it remains rare to hear policy makers or anyone else acknowledge that how we live on the land leads directly (and sometimes indirectly) to the risk of local or regional salmon extinction,” Montgomery writes. “We seldom, if ever, hear a public official admit that the decline of salmon has been an implicit, even if inadvertent, policy for over a century. And yet, unless we address the fundamental underlying issues, we may well spend a lot of money and still end up with no fish to show for it.”

Looking Ahead

While the Salmon Recovery Plan represents a well-organized, scientifically based plan, and by its own accounting, a largely successful approach to restoration in the Stillaguamish watershed, overall land use of the watershed continues to place a countervailing pressure on the natural ecology of the watershed. The sustained drainage and clearing of the estuary and the floodplain for agriculture, the maintained harvesting intensity of state and private industrial forests, and the growing popularity of the watershed with rural residents are all continuing to limit restoration gains. Through both incentive-based programs and regulation enforcement, people within the watershed will have to make some changes to their natural resource use behaviors if the full benefits of the Salmon Recovery Plan are to be met.

If the trends continue, the status of Stillaguamish salmon will continue to decline precipitously, directly impacting the Stillaguamish Tribe’s treaty rights. It is time for elected officials and scientists to have a frank discussion of the true cost of continuing on the current societal pathway. The data presented in the State of Our Watersheds Report indicate that it will lead to the extinction of fisheries (if not populations themselves) as surely as it did for Atlantic salmon in Europe and on the East Coast. Though written in 1861, the words of Charles Dickens in *All the Year Round: A Weekly Journal* should cause us pause in the Stillaguamish today:

“The cry of ‘Salmon in Danger!’ is now resounding throughout the length and breadth of the land. A few years, a little more over-population, a few more tons of poison, a few fresh poaching devices ... and the salmon will be gone – he will become extinct.”

To counteract the continued pressures on salmon habitat in the Stillaguamish, the Tribe has been working with other watershed stakeholders to acquire and restore a corridor of lands along the main salmon bearing waters of the Stillaguamish. Over time these efforts will link quality habitats from the tidewater to the mountains and provide locations for the ambitious floodplain and estuary projects needed to meet recovery goals. The Tribe plans to complete the purchase of several hundred acres of riparian lands in the next five years, while working to restore lands it already owns. The ongoing restoration work includes engineered log jams, riparian planting, bank armoring removal, and the restoration of tidal influence to diked lands in the estuary. A sustained effort across thousands of acres is needed if we are to bring back harvestable populations of salmon to the Tribe’s nets.
At 694 square miles, the Stillaguamish River is the fifth largest drainage basin in the Puget Sound region, and includes portions of both Skagit and Snohomish counties. The basin extends to the headwaters of its two major forks in the North Cascade Mountains. The two major forks of the Stillaguamish are the North Fork, which drains approximately 284 square miles, and the South Fork, which drains approximately 255 square miles. The Stillaguamish supports both wild and hatchery stocks of anadromous salmonids and trout. These include Chinook, coho, pink, chum and sockeye salmon, and steelhead and cutthroat trout.

The Stillaguamish River basin is within the ancestral home of the Stoluck-wa-mish River Tribe, whose descendants are the Stillaguamish Tribe of present. Traditionally, people of the Stillaguamish fished, hunted and gathered their food, medicines, clothes and building materials from within and around the watershed’s boundary.

Since European settlement, land use in the watershed has continued to be dominated by physical geography. The foothills and mountains are mainly used for wood products and outdoor recreation. The more fertile and developable lowlands are primarily used for agriculture and rural residential development. Most of the basin’s human population is centered in and around the towns of Granite Falls, Stanwood, Arlington and Darrington.

The last 150 years of human land use has left the natural ecology of the Stillaguamish watershed stressed and depleted. The future of the watershed will require significantly better protection of existing natural resources, and a greater commitment to actively restoring, as well as changing, land-use behavior within the landscape.

As of 2013, there were an estimated 52,000 people living in the Stillaguamish River watershed. Most residents of the Stillaguamish continued to live outside of incorporated towns and Urban Growth Areas (UGA) in 2010 (64%) and continued to do so in 2013 (63%). These data point to a slowing trend of rural population sprawl in the Stillaguamish watershed. Whether this is a reflection of the “Great Recession,” or whether this is due to growth management planning is not understood at this point.

### Population Change in the Stillaguamish Watershed (2010 to 2013)

**Distance from UGA boundary**
- Inside UGA
- 1 to 5 miles
- 5 to 10 miles
- >10 miles

**Stillaguamish Watershed Population Density**
- 0-10
- 10-50
- 50-100
- 100-500
- 500-1000
- 1000-5000
- >5000

<table>
<thead>
<tr>
<th>Distance from UGA</th>
<th>Estimated Population in 2010</th>
<th>Estimated Population in 2013</th>
<th>Percent Change in Population from 2010 to 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside UGA</td>
<td>18,489</td>
<td>19,447</td>
<td>4.9%</td>
</tr>
<tr>
<td>0 to 1 mile from UGA</td>
<td>4,496</td>
<td>4,691</td>
<td>5.1%</td>
</tr>
<tr>
<td>1 to 5 miles from UGA</td>
<td>22,633</td>
<td>22,445</td>
<td>-0.8%</td>
</tr>
<tr>
<td>5 to 10 miles from UGA</td>
<td>4,168</td>
<td>4,320</td>
<td>3.5%</td>
</tr>
<tr>
<td>&gt;10 miles from UGA</td>
<td>309</td>
<td>293</td>
<td>-5.6%</td>
</tr>
</tbody>
</table>

Arlington, Stanwood and Granite Falls all experienced increased population densities and sprawl between 2010 and 2013.

From 1990 to 2010, it is estimated that the Stillaguamish watershed saw an 85% increase in population. From 2010 to 2013, population growth within the UGA boundary and within a mile of the UGA boundary was faster than growth outside of this area. However, even with faster growth rates in and around cities, town and UGAs, an estimated 54% of watershed residents continue to live farther than a mile from incorporated areas.

Data Sources: SSHIAP 2004, USCB 2015a,b, USCB 2015b,c, WADOT 2012, WAECY 1994, WAECY 2011a,b, WAECY 2013a,b

Stillaguamish Tribe 257
Forestlands at Risk of Rural Residential Sprawl

From 2007 to 2015, approximately 945 acres were converted out of forest practices and into non-forestry uses in the Stillaguamish watershed. This is in addition to the over 935 acres converted from 1997 through 2006, bringing the total area converted from forest practices to nearly 1,882 acres over the last 20 years.¹

Since 1997, nearly 1,882 acres of forestland has been converted out of forest practices in the Stillaguamish River watershed.² Evidence suggests the primary motivation for conversion out of forest practices is residential development. To this point, over 650 acres, or 35%, of forestland conversion since 1997 occurred between 2007 and 2009, coinciding with the region’s housing boom. Beyond that point, 89% of all forestland conversion since 1997 has occurred on rural residential or Urban Growth Area parcels, strongly suggesting that the majority of forestland conversion is for residential or commercial property development.³⁴

Only 64% of private forestland in the Stillaguamish basin is signed up for the “Designated Forestland Program” meant to incentivize non-conversion of forestland. The 36% of private forestland that is not signed up is considered to be at a 91% risk for permanent conversion to residential land uses.⁵ Land in working forests is protected by the Washington State Forests and Fish Law, designed to comply with the Endangered Species Act (ESA) and the Clean Water Act (CWA) to protect native fish and assure clean water compliance.⁶ Once land is converted out of working forests, not only do the trees disappear, but so do the fish protection and clean water guarantees of the Forest and Fishes Law. In their place is a residential landscape with greater pollution and less protection.

Conversion out of forest practices is occurring almost exclusively in the rural residential zone, and is further evidence of the recent rural sprawl in the Stillaguamish watershed.

Over the past 20 years, 76% of all conversions out of forest practices have been rural residential parcels outside of Urban Growth Area boundaries.

Washington State’s 2005 Groundwater Reserves in the Stillaguamish Watershed Fail to Protect Summer Streamflow in Small Tributaries

In 2009, Ecology reported 666 wells drawing from the reserve, and by the end of 2014, the number reported by Ecology was 818, a 19% increase over the time period.

In the 2014 Stillaguamish Water Reservations Report, Washington Department of Ecology reported that 818 wells were withdrawing 143,500 gallons of water per day from the groundwater reserve for permit-exempt wells that was established in 2005. According to Ecology, an additional 50 to 75 exempt wells are drawing from the reserve every year. Accounting for the reserve is done for three sub-basins, the mainstem Stillaguamish, the North Fork Stillaguamish and the South Fork Stillaguamish. At the sub-basin scale, there is still well over 90% of water in the reserve available for exempt well development. Ecology does not account for groundwater impacts to tributaries smaller than the mainstem, the North Fork, and the South Fork sub-basins of the Stillaguamish River. In 1999, five separate small tributaries within those larger Stillaguamish sub-basins were found to be over-consuming groundwater, at a rate of 5% or more of groundwater recharge per year. The amount of 143,500 gallons per day being drawn from the 818 wells is a conservative estimate of groundwater withdrawal, based on 350 gallons per day for wells with no associated septic and 175 gallons per day for wells with an associated septic. While that may approximate current use from the 818 wells, it must be pointed out that each permit-exempt well can legally withdraw as much as 5,000 gallons per day, so while current usage is estimated at 143,500 gallons per day, through the permit-exempt well program, 4,090,000 gallons per day are actually available to the 818 wells. As the state is using 175 to 350 gallons per day to account for individual permit-exempt well usage, they should consider proposing a 350 gallon per day cap on permit-exempt wells withdrawing from the reserve to protect against unaccounted over-withdrawal in the future.

Data Sources: SSSHP 2004, USGS 2014, WAECY 2015b
Lack of Riparian Forests along with Bank Armoring Impact Stillaguamish Floodplain

As of 2013, the 10-year floodplain restoration targets for the Salmon Recovery Plan were not being met. Only 22.3% of a targeted 30 acres of floodplain area had been restored, and only 0.24 miles of a targeted 4.1 miles of bank armoring have been removed, while 0.43 miles of bank armoring were added since 2005.\(^1,2\) Riparian forest cover in the Stillaguamish River floodplain remains 23%, unchanged since 2006.\(^3,4\) This is less than a third of the 80% riparian forest cover considered a long-term properly functioning condition (PFC) in the Salmon Recovery Plan.\(^5\)

Draining and clearing of the Stillaguamish River floodplain began in the 1860s. Since that time, the floodplain has been deliberately managed in a state of permanent ecological disturbance. This has resulted in the long-term absence of mature riparian vegetation throughout the floodplain, coupled with the straightening and armoring of floodplain channels and huge deficits to habitat area and quality.\(^6\) The Stillaguamish Watershed Council (SWC) recognizes that Chinook salmon recovery will not occur without the restoration of floodplain habitat. It also recognizes that asking landowners to voluntarily protect their floodplain parcels is not the most effective restoration strategy. As a result, SWC has formulated a floodplain acquisition strategy to identify parcels that are of the highest priority in restoring the Stillaguamish floodplain corridor critical to Chinook salmon recovery.\(^7\)

Data Sources: Snohomish Co. 2010,\(^8\) SSHIAP 2004,\(^9\) WADOT 2012,\(^10\) WAECY 2006,\(^11\) WAECY 2011c\(^12\)
Improved Water Quality Reopens Commercial Shellfish-Growing Areas in Port Susan Bay

In 2014, over 1,000 acres of previously unclassified shellfish growing area in Port Susan were classified as approved for commercial shellfish growing. This acreage comes in addition to the 1,800 acres of Port Susan’s shellfish area that was upgraded to the State Department of Health’s (DOH) high rating of “approved” in 2010.

In 2014, 934 acres of previously unclassified shellfish growing area in Port Susan were classified as approved for commercial shellfish growing.1 Located in northern Port Susan, this area begins just south of Greenwood Creek in Warm Beach, and includes Kayak Point and McKees Beach. An additional 100 acres were also classified as approved in 2014 in the pocket estuary known as Triangle Cove on the west side of Port Susan in Island County. This acreage comes in addition to the 1,800 acres of Port Susan’s shellfish area that were upgraded to the State Department of Health’s high rating of “approved” in 2010. Not all recent classifications have been positive, as shellfish growing in the 25 acres around the mouth of Greenwood Creek was recently prohibited because bacteria levels exceeded state standards.

Fecal coliform counts were so high in the late 1980s that access to the entire bay was closed. In 1993, Snohomish County formed a Clean Water District (CWD) to “Restore water quality in saltwater tidelands; bringing about the upgrading of conditionally approved, restricted, and prohibited shellfish beds.”2 Efforts of the CWD have resulted in water quality improvements through changes in farming practices, city wastewater management, and updates to rural septic systems in the Stillaguamish watershed. Additionally, the Snohomish Conservation District is developing and implementing more farm plans that are helping to clean up agricultural water quality.

Finally, a cooperative effort involving the Stillaguamish Tribe, state and county agencies has been forming to carry identification of a pollution issue forward to enforcement when necessary. Maintaining the “approved” rating will require continued vigilance in all of these areas, as on-site septic, livestock and pet pollution remain persistent nonpoint pollution sources.3

While marine water quality improvements are responsible for the recent upgrades, monitoring by the Stillaguamish Tribe dating back to 1998 and a formal request for a DOH classification review of Port Susan in 2007,4 were both instrumental in DOH upgrading shellfish areas in Port Susan Bay.

Data Sources: SSHIAP 2004,1 USGS 2014,4 WADOH 2014,7 WADOH 20158
Shoreline Armoring Threatens Forage Fish Habitat Critical to Port Susan Bay Ecology

Since 2005, the counties of Port Susan Bay (Island and Snohomish) have combined for a net increase of 1.1 miles of marine shoreline armoring, which represents 17% of total net increase in marine shoreline armoring for the Puget Sound over the same time period.¹

Over 16 miles (99%) of all documented forage fish spawning in Port Susan Bay occurs on erosional drift cell habitat, characterized by feeder bluffs and accretion shoreline beaches. There is only 34 miles (over 50%) of erosional drift cell habitat in Port Susan Bay, and over 13 miles (38%) of that habitat is already modified or armored, leaving Port Susan Bay with only 21 miles of unmodified preferred potential forage fish habitat.²,³

Forage fish spawn almost exclusively on erosional drift cells. Their spawning habitats are sustained by sediment erosion from coastal bluffs depositing or accreting along the shoreline in the direction of net-shore drift, which is controlled by prevailing Puget Sound winds and currents.⁴ The greatest impact to forage fish habitat on erosional drift cells is shoreline armoring, as it interrupts erosion, distribution and accretion of sediment.⁵

Impacts to forage fish are felt directly by federally listed Puget Sound Chinook salmon, as they feed on forage fish. Forage fish spawning beaches are protected through the state’s Hydraulic Code Rules, Growth Management Act (GMA) and Priority Habitats and Species (PHS) Program, yet these habitats remain vulnerable to shoreline armoring and modification.⁶ Considering the critical ecological role of erosional drift cells for forage fish spawning and the equally critical role forage fish have in Puget Sound Chinook salmon ecology, no more armoring can be allowed along them, and every opportunity to remove armoring must be taken.

Data Sources: PSNERP 2008,⁷ SSHIAP 2004,⁸ WADFW 2006,⁹ WAECY 2013b,¹⁰
Increases in Annual Precipitation Driving Increased Flooding on North Fork

Long-term increases in rainfall accompanied by decreases in snowfall have likely been driving steady increases in peak flows in the North Fork Stillaguamish River. These increases are confronting each current brood year of spawning North Fork Stillaguamish Chinook with a 50% chance, rather than a historic 10% chance, of being exposed to peak flows that correspond to egg-to-fry survival rates where the Chinook stock does not replace itself.

In light of the long-term climate patterns driving increased peak flows in the North Fork Stillaguamish River, floodplain restoration to slow down, distribute and store peak flows is critical to North Fork Stillaguamish Chinook survival. The Stillaguamish Watershed Council has proposed a floodplain restoration strategy that protects and restores mature floodplain forests, as well as areas within the floodplain that allow for channel migration and overbank flow. The plan is being implemented to create a connected corridor of floodplain habitat through the North Fork and the South Fork Stillaguamish floodplains.


With rainfall increases across the North Fork Stillaguamish watershed resulting in larger and larger peak flow events in North Fork Stillaguamish River, restoration of floodplain habitat is critical to the survival of summer and fall Chinook populations. Approximately 80% of Stillaguamish Chinook spawn in the North Fork and associated tributaries.

Data collected on the Stillaguamish Tribe’s mainstem smolt trap have directly measured the effects of peak flow events on survival of Chinook juveniles. High flows kill eggs in the gravel, and if the trend is for flows to increase, Chinook survival will decrease.
Historical Understanding Expands Estuary Restoration Targets for Salmon Recovery

Since publication of the 2012 State of Our Watersheds Report, the Stillaguamish Salmon Recovery Plan’s 10-year target for estuary habitat restoration has expanded from 315 to 548 acres.¹ As of 2013, 150 acres were restored toward that target.² Recent research has pointed out the historic importance of tidal scrub-shrub and tidal forested wetlands in addition to emergent marsh wetland in tidal areas. As a result, the new targets for the estuary now include scrub-shrub and tidal forested wetland types as part of the restoration strategy.

Current mapping shows that there has been a 99% loss of tidal scrub-shrub wetland, a 96% loss of tidal forested wetland in the Stillaguamish watershed, and a 57% loss of emergent marsh wetland.³ Updated targets for properly functioning conditions (PFC) call for restoration of the 80% of historic estuarine wetland habitat or 4,039 acres, to constitute these three wetland types. Over 50% of that restoration, 2,191 acres, is targeted to be fixed in the 11 to 50 years of the recovery plan.⁴

Over 92% of the land in the Chinook Recovery Plan’s Estuary Priority Area is zoned Agriculture, which means every future restoration opportunity in the estuary has a good potential of being scrutinized by the Agricultural Advisory Board and the local Farm Bureau. Regional help from the Puget Sound Partnership and NOAA Fisheries will be necessary to reconcile salmon habitat restoration with agricultural land conservation.⁵ ⁶

Data Sources: Griffith & Fuller 2012,⁷ NAIP 2011,⁸ WWU 2014⁹

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**Updated final estuary restoration targets approved by Stillaguamish Watershed Council in 2014**

<table>
<thead>
<tr>
<th>Wetland Types</th>
<th>Estimated Historic Acreage</th>
<th>PFC * (80% of historic)</th>
<th>Needed to meet PFC (PFC minus Current Ac.)</th>
<th>10-Year Target</th>
<th>11 to 50 Year Target</th>
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<tbody>
<tr>
<td>Emergent Marsh</td>
<td>2878</td>
<td>2302</td>
<td>1052</td>
<td>210</td>
<td>842</td>
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<tr>
<td>Scrub-Shrub</td>
<td>1120</td>
<td>896</td>
<td>887</td>
<td>177</td>
<td>710</td>
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<tr>
<td>Tidal Forested</td>
<td>1050</td>
<td>840</td>
<td>800</td>
<td>160</td>
<td>640</td>
</tr>
<tr>
<td>Total</td>
<td>5048</td>
<td>4039</td>
<td>2739</td>
<td>548</td>
<td>2191</td>
</tr>
</tbody>
</table>

*PFC: Properly Function Condition (based on 80% of historic)
Citations

Chapter Summary

Stillaguamish Tribe: Stillaguamish River

Population Change in the Stillaguamish Watershed 2010 to 2013
5 USCB. 2015a. American Community Survey 5-Year.
6 USCB. 2015b. 2010 Census Population and Housing.

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2 Ibid.
3 Ibid.
5 UW. 2009. Retention of high-valued forest lands at risk of conversion to non-forest uses in Washington State. Seattle, WA: University of Washington, College of Forest Resources.
8 UW. 2012. Washington State Parcel Database.

Washington State’s 2005 Groundwater Reserves in the Stillaguamish Watershed Fail to Protect Summer Streamflow in Small Tributaries
2 Ibid.
3 Ibid.
Stillaguamish Tribe

Lack of Riparian Forests along with Bank Armoring Impact Stillaguamish Floodplain

6 Ibid.

Improved Water Quality Reopens Commercial Shellfish-Growing Areas in Port Susan Bay

3 Ibid.
4 Snohomish County. 2015. Snohomish County Shellfish.

Shoreline Armoring Threatens Forage Fish Habitat Critical to Port Susan Bay Ecosystem

4 Ibid.
9 WADF. 2006. Forage Fish Distribution Polylines.
10 WAECY. 2013b. Coastal Landforms and Feeder Bluffs.

Increases in Annual Precipitation Driving Increased Flooding on North Fork


Historical Understanding Expands Estuary Restoration Targets for Salmon Recovery

Technical Advisory Group, a subcommittee of the Stillaguamish Watershed Council.


4 Ibid.


7 Griffith & Fuller. Estuary Restoration Target.
