

Nisqually Watershed Chinook Salmon Recovery Plan 3 year workprogram 2009-2011

Introduction

The 2009-2011 workprogram features several key milestones in the effort to recover Nisqually Chinook. Large scale habitat restoration projects in the Nisqually River estuary, Mashel River, and Ohop Creek are scheduled to be completed or initiated in the next three years. Additionally, our stock management objectives are advancing with funds for the construction of a mainstem weir to restrict access of hatchery Chinook to the spawning grounds. A weir and harvest management plan will be developed to guide our stock management activities. We have completed a draft Nisqually Chinook Adaptive Management Framework (see attached) in order to direct the monitoring and evaluation of our recovery efforts and to inform recovery plan updates. Over the next 3 years we will refine and implement this framework.

The Nisqually Watershed is poised to make large measurable progress in Habitat, Hatchery and Harvest actions that will lead to significant improvements in the viability of the Nisqually Fall Chinook Salmon population. **This proposed three year workprogram contains habitat projects that have a modeled result of doubling of the number of naturally produced Chinook that return to the watershed and increase the life history diversity of the population from its current 80 % of historic diversity to 93 % of its historic diversity¹.** In addition we have identified harvest and hatchery actions we can take to increase the number of natural origin spawners and decrease the number of hatchery origin spawners on the spawning grounds.

Implementation of the Nisqually Chinook Recovery Plan has been ongoing since the completion of the plan in 2001. Much of the last eight years has been spent continuing the work to protect key salmon habitat areas and developing specific habitat projects that target the plan's high priority stream reaches. We currently have seventy-three percent of the mainstem Nisqually that is used by salmon under protective ownership. Large scale restoration projects in the estuary

¹ The population parameter metrics in this document were derived using the Ecosystem, Diagnostic, and Treatment model (EDT). See the 2001 Nisqually Chinook Recovery Plan for a detailed discussion on the use of the EDT model.

and the Mashel River were completed in the last three years. Restoration project monitoring has demonstrated that salmon respond quickly and positively to the well designed large scale projects. **The additional projects proposed in this workprogram will increase protective ownership of habitat by over 3 miles, increasing the percent of mainstem protected habitat to over 75 %, and will substantially implement the major habitat restoration work identified in 3 out of the 4 main priority restoration areas.**

Recent work done in the Nisqually to look closely at integration of our habitat, hatchery and harvest actions has led us to conclude that we need to take aggressive actions in each of these areas if we are to be successful in making a major contribution to the recovery of Chinook salmon in the Puget Sound ESU. The current total harvest rate on Nisqually Chinook (including ocean, Puget Sound and in-river fisheries) must be reduced. However, this will not allow the natural stock to become self-sustaining unless we also reduce the proportion of hatchery origin fish that stray and spawn with natural origin fish. This workprogram contains projects and programs that will allow us take those actions.

We have done the work in Nisqually to identify the key actions we need to take to recover Nisqually Chinook and we have laid the groundwork in the last eight years to allow those actions to take place. Most of the major priority actions we have identified that are necessary to recover Nisqually Chinook are incorporated into this plan. Many of the high priority projects listed in this plan are ready to be implemented as proposed if the funding becomes available to support the work necessary. The primary limiting factor in the implementation of our plan is securing the necessary funds to implement the actions we are including in this workprogram.

LONG TERM GOALS FOR NISQUALLY RIVER CHINOOK

1. Assure natural production of Chinook in perpetuity by providing high quality, functioning habitat and by developing a self-sustaining, naturally spawning population with diverse geographic distribution. The long term population target for Nisqually Chinook is 3600 natural spawners. The long term population target may be updated and specific population parameter targets like productivity and abundance may be added as our knowledge about the stock improves and our modeling efforts advance.
2. Assure sustainable harvest.
3. Provide significant contributions to ecosystem functions.
4. Secure and enhance natural production of all salmonids.
5. Assure that the economic, cultural, and social benefits derived from the Nisqually ecosystem will be sustained in perpetuity.

10 YEAR OBJECTIVES FOR ACHIEVING LONG TERM NISQUALLY RIVER CHINOOK GOALS

Stock objective:

Integrate harvest, hatchery, and habitat actions in order to manage for a minimum of 1200 self-sustaining natural origin recruits with no more than 5%, or the lowest possible, contribution from hatchery origin recruits over the next 10 years and a terminal harvest of 10,000 – 15,000 if consistent with escapement objective. The specific stock objective target may change as knowledge about the stock increases and our modeling efforts progress.

Habitat objective:

Utilize protection and restoration actions to support the stock objective.

- *Protection component:* No further degradation in the Nisqually watershed's and Puget Sound's ability to support the productivity, abundance, and life history diversity of natural origin Nisqually Chinook.
- *Restoration component:* Restore habitat in the Nisqually watershed and in Puget Sound to support a predicted increase in natural origin Nisqually Chinook productivity, abundance, and life history diversity.

Implement the suite of habitat projects developed during the EDT planning process and listed in the action plan over the next 10

years. The modeled cumulative impact of the habitat actions is an increase in the productivity of the Chinook population from 3.7 to 5.3 and in the ability of the watershed to support a capacity ranging from 4960 to 8600 Chinook. Additionally, the habitat actions are predicted to increase the EDT life history diversity index from 80% to 93%. The EDT productivity, abundance, and life history diversity parameters are theoretical targets that do not account for harvest, hatchery, and other (e.g., stochastic) effects. Spatial structure is also predicted to increase as habitat is restored. Improvements in the Chinook stock parameters are expected to occur over multiple generations after habitat, harvest, and hatchery actions are taken.

Community support objectives:

- Increased local community awareness of and support for high priority actions to recover Nisqually and Puget Sound salmon.
- Increased regional, state, and national community awareness of and support for high priority actions to recover Puget Sound salmon.

3 YEAR WORKPLAN IMPLEMENTATION EXPECTATIONS

Stock objective progress:

- Make significant progress towards reducing the combined pre-terminal and terminal harvest in order to achieve natural origin escapement objective (1200) with an annual terminal harvest of 10,000 Chinook.
- Reduce hatchery origin recruits contribution over the next five years to an average of less than 10% of the total spawning population.
- Implementation of habitat objectives that result in habitat's ability to support an increased productivity, capacity and life history diversity.

Habitat objective progress:

Projects implemented that, **as they mature and as the stock has time to respond**, will increase the ability of the habitat to support a Nisqually fall Chinook productivity and capacity from its current estimated values of 3.7 and 4961 to 5.3 and 8600 and increase the life history diversity index from 80% to 93%.

Community support objective progress:

Local community support:

- Increase in percentage of Nisqually watershed residents who are aware of Nisqually salmon recovery efforts.
- At least one third of currently unwilling landowners in high priority restoration areas on the Mashel River and Nisqually mainstem will give permission for restoration projects on their property.
- An increase of at least 100 active Nisqually Stream Steward volunteers.
- Increase in local government support for high priority salmon habitat projects.

Regional, state, and national community support:

- Increase in percentage of regional, state, and national community members that are aware of Puget Sound salmon recovery efforts and are supportive of recovery priorities.

THREE YEAR WORKPROGRAM SUMMARY

In order to achieve the long-term goal of a sustainable population of locally adapted Nisqually Fall Chinook we must further reduce the total harvest exploitation rate, limit the proportion of hatchery fish

spawning with natural origin fish, and restore the ability of the Nisqually watershed to support greater productivity, capacity and life history diversity. We believe we can make significant progress in these three areas in the next three years by implementing the proposed 3 year Nisqually workprogram. The following sections summarize the proposed elements of the 3 year workprogram.

Stock objective progress:

Harvest: Continued support for the capacity necessary to manage tribal and non-tribal fisheries to ensure negotiated harvest rates and escapement goals are met. Resources to purchase and test commercial fishing gear types that would allow for retention of hatchery fish and release of natural fish in the in-river fishery. Develop and implement a variable weir and harvest management schedule that allows us to continue moving towards our 10 year goal of 1200 Natural Origin Chinook on the spawning grounds while allowing less than 5% of the spawning population to be hatchery strays.

Hatchery: Support for the current hatchery programs to continue to produce fish that support the terminal harvest objectives. Support for the hatchery to manage the program consistent with their hatchery genetic management plans. Funding for the operation of a seasonal weir on the Nisqually River that will allow the physical separation of hatchery and natural origin fish to reduce hatchery origin fish straying to the spawning grounds.

Habitat: The following habitat actions, if implemented, will result in substantial increases to the productivity, capacity and life history diversity of Nisqually Chinook salmon, as the habitat projects mature and as the stock has time to respond. The table below outlines the currently modeled condition of the population and then the predicted eventual changes in those parameters after the habitat actions are completed:

<i>Scenario</i>	<i>Diversity Index</i>	<i>Productivity</i>	<i>Capacity</i>
Current condition	80 %	3.7	4961
After 3 yr workprogram	93 %	5.3	8604

Protection:

- Increase permanent protection through acquisition of anadromous habitat:
 - Mainstem Nisqually: 3 miles and 650 acres
 - Ohop Creek: 2 miles and 280 acres
 - Mashel River: 1.5 miles and 150 acres
 - Lower Nisqually mainstem and McAllister creek: 200 acres
 - South Puget Sound shoreline: 100 acres
- Support ongoing protection and stewardship of public and land trust properties
- Update and strengthen local regulatory protection:
 - Thurston County Critical Area Ordinance revision
 - Thurston County Shoreline Master Program revision
 - Pierce County Shoreline Master Program update
- Ensure Forest and Fish Agreement is implemented effectively in critical headwater forestry areas.

Restoration:

Nisqually Estuary:

Restore 760 acres of estuary on the Nisqually National Wildlife Refuge

Removal of last dike on Nisqually Tribe property, eastern side Red Salmon Slough

Restore 70 acres of transitional forest

South Puget Sound nearshore (Nisqually Estuary – Point Defiance):

Identify priority projects and implement at least one project

Mashel River Eatonville Reach:

Restore instream diversity: 1.5 miles

Restore off-channel wetlands: 5-10 acres

Restore/enhance riparian vegetation: 50 acres

Lower Ohop Creek:

Restore 6.3 miles of instream habitat

Restore 400 acres of Lower Ohop Valley floor wetlands

Revegetate 150 acres of riparian habitat and 400 acres of

wetlands

Nisqually Mainstem:

Restore access to and quality of 30 acres of high priority off-channel wetlands (25 acres McKenna Reach)

Revegetate channel migration zone: 3 river miles

Targeted watershed wide programs:

Salmon carcass nutrient enhancement:

Distribute 34000 pounds of salmon carcasses annually to key juvenile rearing areas in the Nisqually mainstem and Mashel River.

Invasive species prevention and control:

Develop a cooperative Nisqually watershed invasive species task force to develop and implement an invasive species control plan (plants and animals).

Habitat Project development:

Lower Nisqually Reach restoration opportunities assessment
I-5 fill removal feasibility analysis
Mainstem off-channel habitat project development
Riparian vegetation assessment/project development
Large Woody Debris enhancement in mainstem Nisqually

Adaptive Management:

Develop and implement comprehensive database to track salmon recovery plan, implementation and progress.

Refine and peer review adaptive management plan for Nisqually watershed.

Implement elements of adaptive management plan, including collection of key data to measure progress and inform decision makers.

Watershed Capacity:

In the Nisqually we have spent the last few years laying the groundwork for implementation of high priority actions in our salmon recovery plan. We are now in a position where we are ready to make significant progress. We have watershed and landowner commitments to do the projects necessary to implement significant portions of our plan. Our primary capacity issue is funding: to implement projects that are ready to go, and to have the necessary people to get all the necessary coordinating tasks completed.

Currently our capacity is organized as follows:

The Nisqually Tribe is the lead for salmon recovery planning and coordination in the watershed. Currently the Tribe has the following positions that assist in the Salmon Recovery Program:

- Program Manager - ensuring recovery plan development and implementation is staying on track and coordinating the lead entity process.
- 2 Habitat Restoration Biologists - develop and implement specific habitat restoration projects.
- 2 Research Biologist - maintains and updates our EDT databases, conducts monitoring, investigates key uncertainties, assists in development and implementation of adaptive management plan.
- GIS/Data Manager – organizes salmon recovery data and assists in providing information for implementation and monitoring
- Outreach and Education Coordinator- educates and coordinates volunteers in salmon habitat projects.
- 6 Technicians - assists both in restoration projects and in research projects.

In addition the Tribe has positions that manage the harvest and hatchery programs.

The South Puget Sound Salmon Enhancement Group has two project managers that are helping to manage key habitat projects in the Nisqually Plan. One is focused on freshwater projects and the other is focused on nearshore projects.

The Pierce Conservation District has one farm planner that covers both the Nisqually and Puyallup/Clover-Chambers watersheds.

The Thurston Conservation District has one farm planner that is currently only funded to work on the most downstream portion of the Nisqually watershed.

The Nisqually Land Trust has a volunteer board president and a full-time paid executive director who work together to develop and implement high priority salmon habitat protection projects. For the executive director, this acquisition work is in addition to managing the organization. As well, the Land Trust has a two-person (full time) stewardship staff assigned to protect and restore currently owned properties.

There is a need to maintain existing staff and to add new staff if we are to be successful in implementing all the identified elements in our three year workprogram. Currently funding for existing staff is not yet fully identified for this three year period.

If funding for existing staff can be secured we have also identified new positions that would significantly help to increase capacity:

Restoration:

Need new positions –

2 FTE farm planners

There are a number of high priority farm areas in both the Pierce and Thurston County parts of the watershed that do not yet have best management practice farm plans developed and implemented. Neither Conservation District currently have the funds necessary to dedicate one FTE specifically to high priority Nisqually salmon recovery area farms.

Adaptive Management/Plan Implementation:

There is a need for 1 FTEs: a technical person who would assist in the development and maintenance of a database that would track the progress of salmon recovery plan implementation in Nisqually and that would roll up into a regional system to track salmon recovery actions.

In addition to these positions there are others included in the workprogram that would be key to helping us accomplish specific plan actions.

3 YEAR WORKPROGRAM PROJECT LIST:

CAPITAL HABITAT PROJECTS:

Tier 1:

Estuary Protection and Restoration:

Nisqually Refuge Estuary Restoration 760 acres

This is the single most important habitat project in the Nisqually salmon recovery plan. It will remove much of the outer dike and allow the natural regeneration of estuary habitat and tidal channels on 760 acres. This project combined with the restoration on the Tribe's estuary lands will result in, and is the primary opportunity for, significant increases in the productivity and capacity of Nisqually Chinook. Additional project element: Develop a riparian restoration project for the riparian area in the NWR to include planting a variety of native riparian trees and shrub species and restoring natural hydrology on 38 acres of currently diked habitat on the Refuge.

Red Salmon Slough Estuary Restoration Phase 3

Removal of last remaining dike on Nisqually Tribes estuary property, old bridge pilings in Red Salmon Slough and restore riparian habitat on the remaining non-saltmarsh areas (44 acres, 38,000 plants). The dike is a raised dike for an old road and is not fully impeding salt water access, but is a partial obstruction and causes a delay in tidal inundation. Cost estimate is preliminary.

Mainstem Nisqually River Protection and Restoration:

Lower Nisqually Mainstem, McAllister Creek Acquisition

Objective in Nisqually National Wildlife Refuge Comprehensive Conservation Plan. Addition of these acres to the Refuge would make them available for restoration. Cost estimate is very preliminary.

Powell Creek/Nisqually Mainstem Off-Channel Reconnection

This project has restored access for juvenile salmon to half of the largest off-channel wetland complex on the mainstem river. Previously a series of culverts along a former logging haul road were a partial barrier for juvenile passage. There was also an old bridge abutment along the mainstem of the river where the haul road used to cross the river. This project removed the culverts and bridge abutment. There is still some revegetation work to do along the old haul road and one final culvert to remove at the upper end of the project area.

Wilcox Area Protection Project

Acquire easement over 250 acres of channel, floodplain and riparian forest along the Nisqually mainstem and Horn Creek in the Wilcox Farm area. Acquisition of a conservation easement over a large property near the most rapidly urbanizing area along the mainstem of the river.

Tatrimima Trust Shoreline Acquisition

This project proposes to acquire an approximately 30 acres in two shoreline parcels along the Nisqually River for permanent protection. The shoreline property is located in Thurston County in the Hobson Road area. These parcels front a broad bend in

the Nisqually River and have a total shoreline length of nearly one mile. This is an area of shoreline accretion and avulsion and contains a wide variety of riparian habitat types. It is located in the Wilcox Reach of the Nisqually River and is adjacent to a protected shoreline parcel and across the river from the protected Wilcox Flats area. Therefore, acquiring these parcels would make a substantial addition to a relatively large block of protected shoreline and riparian habitat. The property is being offered For Sale now (March 2009) for \$300,000. It contains an substandard mobile home that would be removed. The property also contains some non-native invasive plants that should be removed and/or controlled.

Nisqually River Wilcox Reach Side-Channel

Recreate historic connection between the Nisqually mainstem and Harts Lake Creek. This project would restore side channel habitat on the mainstem. This area currently is diked but during flooding events regularly breaches the river dike and begins to recreate a connection between the river and the creek. This project would allow this connection to happen more naturally during high flow events while controlling the flow so that the river continues to supply water to the Centralia City Light Power project through its diversion canal.

McKenna Area Protection Project

Acquire easement over 249 acres of Nisqually mainstem, off channel creek and large wetland. Acquisition of a conservation easement over a large property near the most rapidly urbanizing area along the mainstem of the river. The wetland and stream are critical off channel habitat for juvenile salmonids.

Mainstem Protection Project

Acquire 75 acres, 0.5 mile of Nisqually Mainstem per year. Projects would focus on areas with intact riparian function, channel migration zone and seek to block with other parcels already in protected status. Some specific parcels are already targeted.

Mashel River Protection and Restoration:

Little/Big Mashel Confluence Protection

Acquire approximately 120 riparian and floodplain acres and 1.4 miles of shoreline near the confluence of the Little Mashel with the Mashel River.

Mashel Riparian Habitat Acquisition Project

Acquire one mile of the Mashel shoreline in the Eatonville area with a minimum of a 200 to 400 foot buffer and 20 to 40 acres of habitat. This property would be protected and made available for restoration and enhancement of habitat. It would also be made available for public access with a public loop trail along the River.

Mashel Eatonville Restoration Phase II

This project will restore habitat diversity in 2000 feet of the highest priority reaches of the Mashel River and protect and restore over 6 acres of the riparian buffer. 16 engineered log jams and log structures will be installed. In combination with adjacent work happening simultaneously by the Washington Dept. of Transportation in the same location, and the completed Phase 1, the project will install 22 log structures that will increase pool habitat, increase stable and high quality spawning habitat, increase floodplain connections and decrease bank erosion and mass wasting. These actions are identified as one of the three highest priority restoration activities in the Nisqually watershed chapter of the NOAA approved Puget Sound

Chinook Recovery Plan. This project will significantly advance the high priority restoration implementation in the Nisqually watershed by moving the restoration of the Mashel substantially towards completion. In the long term this project will contribute to a more sustainable, healthy run of salmon, both the listed species as well as other non-listed salmonids. This will have ecological benefits not just for the salmon but for all the other species that depend on salmon. It will also have significant long term socio economic benefits in terms of increased commercial and sportfishing opportunity in Puget Sound and the lower Nisqually River and increased tourism in the rural Eatonville area as people come to view the salmon and fish for trout in the Mashel.

Mashel Eatonville Restoration Phase 3

Restore the in-stream, riparian and floodplain habitat of the Mashel River through the Eatonville Segment Reach 7.

Lower Ohop Protection and Restoration:

Lower Ohop Protection Project

Acquire 1 mile Ohop creek, 100 acres. This would acquire a key property for the Ohop Valley restoration project and ensure the long-term stewardship of the site for salmon and other wildlife habitat.

Lower Ohop Valley Restoration - Phase I

Evaluation of multi-species salmon habitat needs in the Nisqually watershed have ranked lower Ohop Creek one of the highest priority freshwater habitats for restoration. Funded by a previous SRFB grant, a restoration plan for lower Ohop Creek was developed which summarizes habitat conditions in the project reach and evaluates restoration alternatives. Using that assessment, the most comprehensive restoration alternative has been selected and engineering designs developed. The 17 landowners in the project reach are all supportive of this option. The total project will re-elevate the 4.4 miles of severely channelized creek back into its original floodplain recreating a 6 mile long stream with its original meander pattern and restoring its hydrologic connection to the adjacent floodplain and wetland areas. Off-channel habitat will be created and the riparian areas will be planted with native vegetation. The project will also revegetate 400 acres of the surrounding valley floor which is dominated by wetlands. This project has been split into three phases to spread out the need for securing funding: Phase I: Restore first mile of Lower Ohop Creek on Nisqually Land Trust property adjacent to Hwy. 7. Including channel reconstruction and valley floor revegetation.

Lower Ohop Valley Restoration - Phase II

Evaluation of multi-species salmon habitat needs in the Nisqually watershed have ranked lower Ohop Creek one of the highest priority freshwater habitats for restoration. Funded by a previous SRFB grant, a restoration plan for lower Ohop Creek was developed which summarizes habitat conditions in the project reach and evaluates restoration alternatives. Using that assessment, the most comprehensive restoration alternative has been selected and engineering designs developed. The 17 landowners in the project reach are all supportive of this option. The total project will re-elevate the 4.4 miles of severely channelized creek back into its original floodplain recreating a 6 mile long stream with its original meander pattern and restoring its hydrologic connection to the adjacent floodplain and wetland areas. Off-channel habitat will be created and the riparian areas will be planted with native vegetation. The project will also revegetate 400 acres of the surrounding valley floor which is dominated by wetlands. This project has been split into three phases to

spread out the need for securing funding: Phase II: Restore 1.5 miles of Lower Ohop Creek below Hwy. 7 including channel reconstruction and valley floor revegetation.

Lower Ohop Valley Restoration - Phase III

Evaluation of multi-species salmon habitat needs in the Nisqually watershed have ranked lower Ohop Creek one of the highest priority freshwater habitats for restoration. Funded by a previous SRFB grant, a restoration plan for lower Ohop Creek was developed which summarizes habitat conditions in the project reach and evaluates restoration alternatives. Using that assessment, the most comprehensive restoration alternative has been selected and engineering designs developed. The 17 landowners in the project reach are all supportive of this option. The total project will re-elevate the 4.4 miles of severely channelized creek back into its original floodplain recreating a 6 mile long stream with its original meander pattern and restoring its hydrologic connection to the adjacent floodplain and wetland areas. Off-channel habitat will be created and the riparian areas will be planted with native vegetation. The project will also revegetate 400 acres of the surrounding valley floor which is dominated by wetlands. This project has been split into three phases to spread out the need for securing funding: Phase III: Restore over 2 miles of Lower Ohop Creek upstream of first two phases of project including channel reconstruction and valley floor revegetation.

Upper Watershed Small Properties Protection

Acquire small properties along the high priority streams in the upper watershed, ie. Ohop Creek and Mashel River. Projects would focus on areas with intact riparian function, channel migration zone and seek to block with other parcels already in protected status. Some specific parcels are already targeted.

South Sound Nearshore Protection and Restoration:

Nisqually to Pt. Defiance Nearshore Assessment Project

This project is assessing nearshore habitat between the Nisqually River and Point Defiance to identify potential restoration projects likely to benefit salmon. Both the WRIA 11 and WRIA 12 limiting factors analyses noted the poor habitat condition of this shoreline, including estuarine habitat loss and impacts from rail line fill. Burlington Northern is a cooperating partner on this project. A final report will identify and prioritize potential restoration project sites. Preliminary engineering designs and landowner agreements will be developed for restoration at 2-3 specific project sites. The project construction proposed for 2010 would be the implementation of one of these projects. Because the assessment is still underway the cost estimate for project construction is quite rough at this point.

Chambers Beach Reconstruction and Riparian Enhancement

Reconstruct a natural beach profile along Chambers Beach through removal of derelict structures, active nourishment of degraded areas and reconstruction of back beach berm where the bank is unstable. Restore a riparian corridor through removal of invasive species and planting of native vegetation.

Issues:

- Lack of riparian corridor along the Chambers Beach and presence of several derelict structures located within the intertidal zone.
- Lack of continuous functional habitat along the Nisqually to Point Defiance shoreline.
- Beach and bank instability as a result of gravel mining operations.

The shoreline between Nisqually and Point Defiance has been highly degraded due to shoreline development and the location of the BNSF railway at or below the MHHW. The shoreline has very little functional beach habitat to support migration, foraging and rearing needs of juvenile salmonids and forage fish spawning capacity. The 1.5-mile project reach has some existing function as the BNSF causeway is set back from the shoreline and presents an opportunity to support a riparian corridor, backshore berm, beach face and low-tide terrace. However a legacy of gravel mining has significantly disturbed the beach creating instability, degraded beach profiles and little to no native riparian vegetation.

Titlow Estuary Restoration

Replace culvert/tidegate through BNSF railroad to improve connectivity and fish passage between Titlow lagoon and Puget Sound. Remove shoreline armor and derelict structure to restore/enhance the shoreline.

A tidegate installed through the BNSF causeway blocks fish passage and inhibits tidal exchange within the lagoon. Native vegetation and habitat structure has been removed from the lagoon limiting rearing and foraging capacity of the lagoon. Shoreline armor associated with the BNSF railway and park infrastructure impairs beach and riparian processes. Derelict piles within the intertidal-subtidal region inhibit sediment transport.

Chambers Bay Estuarine and Riparian Enhancement

Enhance estuarine habitat structure within Chambers Bay through active restoration and creation of salt marsh habitat within the Bay. Restore marine riparian corridor in and around Chambers Bay through removal of invasive vegetation and planting of native trees and shrubs.

Issues:

- Industrial use practices of Chambers Bay for timber storage.
- Construction of road and mill site over the historic estuarine area.
- Construction of dam which has reduced sediment transport.
- Gravel mining operations on the north side of the bay which removed mature riparian forest
- Construction of the BNSF railway which changed the connection of the estuary to Puget Sound.

Chambers Bay is the major estuarine feature between the Nisqually River and Central-North Sound. Given the current lack of habitat structure and food production inside the Bay, this historically important habitat feature now provides limited refuge, rearing and foraging capacity for migrating salmonids.

East Nisqually Reach Beach Nourishment Pilot

Initiate a pilot beach restoration and marine riparian planting project on existing pocket beaches persisting waterward of the BNSF rail line between Sequelitchew Creek and Solo Point to track and streamline beach nourishment and riparian enhancement techniques along the degraded shoreline.

The shoreline between Nisqually and Point Defiance has been highly degraded due to shoreline development and the location of the BNSF railway at or below the MHHW effectively truncating and severing functional nearshore habitat. The shoreline has very little functional beach habitat to support migration, foraging and rearing needs of juvenile salmonids and forage fish spawning capacity.

Several small pocket beaches exist along the East Nisqually Reach, these beaches support forage fish spawning and shallow water refugia. Without sediment input into the system, there is not material to feed and accrete these beaches. This project seeks

to actively nourish these pocket beaches and track the results of nourishment events to better understand this treatment as a viable restoration option.

South Sound Nearshore Protection Project

Protection of nearshore has been identified as a high priority but no specific sites have yet been identified. This cost estimate is more preliminary.

Beachcrest Pocket Estuary Restoration

This project would restore access of the saltwater tides and fish populations of the Nisqually Reach to a small pocket estuary (less than 5 acres in size) along the Thurston County shoreline. It would also open up opportunity for some limited spawning by allowing access of adult salmon to a small stream feeding this estuary. Access will be restored by removing a vertical water control structure which impounds the water, with a bridge that allows for high tides to backwater into the pond.

Basinwide Protection and Restoration:

Nisqually Vegetation Management

An assessment of riparian vegetation in the Nisqually watershed was completed in 2004. There is a need to groundtruth the assessment, identify priority revegetation areas, and organize and implement projects. In addition invasive plants that threaten ecosystem processes and habitat need to be controlled. A plan needs to be developed and implemented that prioritizes risk and outlines control measures. This will pay for a 1 FTE biologist to develop and implement a watershed vegetation management plan and a 5 FTE crew to plant and maintain a minimum of 40 acres of riparian vegetation annually and manage invasive plants in the watershed. The crew in particular is key to our long term success with vegetation projects. Without proper maintenance many revegetation projects will fail.

Japanese Knotweed Eradication

Annually identify and eradicate Japanese Knotweed infestations in the Nisqually River basin. This seasonal work would take 3 technicians and one project manager up to 3 months for 3 years to stem the spread of this highly invasive weed. The focus will be the riparian and floodplain forests of salmon-bearing streams. Waterways in the non-anadromous area of the basin will also be treated if downstream infestation from those source areas is deemed probable.

Tier 2:

Mainstem Nisqually River Protection and Restoration:

Northern Powell Complex Restoration

This project will restore a recently acquired parcel by the Nisqually Land Trust on the mainstem Nisqually River, just a little downstream of the confluence with Powell Creek. It will remove riprap and other structures from the property and revegetate the banks. This project is in an active channel migration zone and will allow the river to move more freely again.

Hahn Restoration

Restoration of the riparian buffer along a small strip of the Nisqually River mainstem on the Thurston County side downstream of the Powell Creek confluence.

Wilcox Flats Nisqually River Mainstem and Off-Channel Restoration

Restoration of Wilcox Flats (mostly owned by Nisqually Land Trust), primarily through revegetation projects, between river mile 28 and 29.5: mile of riverfront, at least 1 to 1 miles of side channels, riparian zones and uplands totaling 170 acres; In addition the adjacent Wilcox farm is participating in restoration projects (mostly revegetation work) on their property, both along the Nisqually mainstem and along lower Horn Creek as it empties out into the mainstem.

Yelm Shoreline Land Trust Restoration Project

110 acre restoration and public access project on properties now owned by the Nisqually Land Trust on the Nisqually River mainstem near Yelm on the Thurston County side. Restore along mile of river front plus a stream that accesses a large off-channel wetland. Plan and develop a day use and trail system along 1.5 miles of river.

Ohop Creek Protection and Restoration:

Upper Ohop Valley Protection

Protection of 180 acres of Ohop valley including large amounts of wetland and 1 mile of Ohop Creek. The protection of this functioning habitat benefits a array of fish and wildlife, including salmon of upper Ohop Creek, 25-mile creek and a third salmon-bearing but unnamed tributary.

Nearshore Protection and Restoration:

Hogum Bay Restoration

The Nisqually Land Trust owns a small pocket estuary just west of the Nisqually Estuary. They are seeking funds to develop a restoration plan for the property and begin implementation (\$30,000); 200 feet of saltwater lagoon frontage and 20 acres of uplands draining into the lagoon. The project would focus mainly on riparian revegetation.

Small Tributary Protection and Restoration:

Forespring Property Protection

Red Salmon creek is an independent tributary to the Nisqually Delta. It is utilized primarily by chum salmon, but also by coho, steelhead and cutthroat trout. The health of the down-gradient Nisqually estuary depends on the excellent water of this stream.

Red Salmon Creek is fed by springs that arise on the subject property and act as the headwaters of the stream. The purpose of this project is to permanently protect a large 40-acre tract of land at these headwaters. The Forespring Family Trust owns this land, and is willing to place a permanent conservation easement on the property to provide for its permanent protection. Specifically, the Forespring family, and the applicant, are very anxious to provide substantial and permanent protection to the headwater springs that feed Red Salmon Creek. This land is subject to considerable development pressure; the time to act is now.

Brighton Creek Culvert Replacement Project

Replace partial fish barrier culvert on Brighton Creek under Harts Lake Loop Road with a fish-friendly culvert. This culvert is highest priority culvert for replacement of any culvert assessed in the Nisqually watershed because it is a more complete barrier and there is still some good intact habitat upstream that is currently mostly inaccessible for salmon. It is however not rated a 1 because it is on a minor

tributary to the Nisqually and will not have significant direct benefit for Chinook or steelhead. It will have greatest benefit to coho and chum as well as some smaller benefit for steelhead and indirect benefit for Chinook salmon.

Horn Creek Fish Passage Project

Replace partial fish barrier at Horn Creek. A man-made waterfall at rivermile 1.0 precludes most salmon from migration upstream. Greatest benefit will be to coho and chum with some benefit also for steelhead. There is a partial barrier just upstream of this site under Harts Lake Loop Road that should also be addressed to ensure full access to the stream for salmon.

Tanwax Creek Riparian Restoration

The lower Tanwax Creek flows for 4.5 miles through a 98 acre riparian wetland that had been cleared and now consist of small shrubs and large amounts of reed canary grass. A 1998 wetland assessment of Nisqually basin wetlands identified this areas as a high priority for restoration due to its benefits to salmon. This project would work with local volunteers and landowners to revegetate between 3 to 5 acres annually in this high priority area.

Watershed wide Protection and Restoration:

Nisqually Basin Farm Planning

One FTE farm planner/habitat specialist each for Pierce and Thurston Conservation Districts with additional funds for cost share assistance. Each farm planner would conduct targeted outreach to farms in high priority salmon reaches of the Nisqually. Farm plans would be developed for willing landowners and cost-share and technical assistance would be provided for implementation.

Tier 3:

Invasive Species Management at NWR (obj. 1.4) Develop and implement an invasive species monitoring and integrated pest management control program for the Nisqually National Wildlife Refuge using both manual and chemical treatment methods. This would require hiring a 0.5 FTE Fish and Wildlife Biologist, GS-7/9 (\$25,400 starting annual cost), to conduct the monitoring program and guide treatment efforts as well as some time for a a 0.5 FTE Biological Technician, GS-5/6/7 (\$20,500 starting annual cost), to assist in monitoring the establishment of invasive species and implementing control measures as necessary.

Nisqually Mainstem Land Trust Boundary Protection and Restoration

Survey and fence upland boundaries on four properties totaling 2 river miles and over 200 acres that are experiencing trespass and dumping. Remove debris and exotic plants.

Red Salmon Creek/Wash Creek Restoration - Phases IV and V

Phase IV: Weed control and fence removal along Red Salmon Creek upstream of the railroad crossing on Nisqually Land Trust properties. Phase V: planting of riparian and adjacent upland areas adjacent to salt marsh and Red Salmon Creek and tributaries upstream of the railroad crossing. Follow up maintenance.

Harts Lake Loop Road Horn Creek Culvert Replacement Project This project will replace the partial fish passage barrier at Harts Lake Loop Rd. (RM 1.2) and replace it with a bottomless arch culvert that would open up several miles of salmon habitat

upstream. This project should be considered in connection with the Horn Creek Fish Passage Project that is located just downstream to obtain maximum benefit.

Lackamas Creek (Thurston Co.) Culvert Replacement

This project will replace the partial fish passage barrier under a private access road and replace it with a bottomless arch culvert or small bridge that would open up several miles of salmon habitat upstream. This project is located at RM 1.3 and is downstream of the recently replaced fish passage barrier at Bald Hills Rd at RM 1.6.

Powell Creek Neighborhood Road Passage Barrier

This project will replace the partial fish passage barrier under a neighborhood access road and replace it with a 50' X 14' steel bridge that will open up several miles of salmon habitat upstream. The project at RM 0.9 has received funding through the FFFPP grant program.

Powell Creek Watershed Restoration

This project will educate and inform the Powell Creek watershed community about potential restoration actions in the watershed. This project will also identify new restoration projects.

Salmon Carcass Nutrient Enhancement

The Nisqually Tribe has managed a project to return salmon carcasses to the watershed from the Tribes hatchery for the last five years. Program staff that help in implementation include our Restoration Biologist, Volunteer Coordinator, and our Technician. The Restoration Biologist develops an annual plan for carcass distribution including locations, amounts and timing using our best available scientific understanding of the system. Our Technician helps collect and store the carcasses at the hatchery. The Volunteer Coordinator, with the assistance of the Biologist and the Technician, organizes and leads community volunteer events to distribute the carcasses according to the plan. This is identified as an ongoing program to continue to jumpstart the nutrient food web in key salmon streams

CAPITAL HATCHERY PROJECT:

Hatchery:

Seasonal weir to reduce hatchery fish straying – in order to develop a self-sustaining natural run of Nisqually Chinook, the proportion of HORs to NORs on the spawning grounds must be decreased. A seasonal weir on the lower mainstem will trap all Chinook, enabling the segregation of NORs from HORs while providing invaluable stock assessment information.

NON-CAPITAL NEEDS

Future Habitat Project Development:

Lower Nisqually Restoration Feasibility and Design

The Lower Nisqually Reach of the Nisqually River is one of the highest priority reaches of the mainstem for restoration. It has had significant bank hardening, loss of access to off-channel wetlands, and loss of riparian vegetation. In addition it is used by 95 % of the salmon in the Nisqually because it is the last reach of the river before the estuary. This project proposes to assess this 3.6 mile reach and to identify potential habitat restoration projects. A restoration plan, which will include

various alternatives, will be presented to the landowners and other user groups along the reach. Through this outreach process an alternative or a comprehensive selection of projects will be identified and an engineer will then draft a preliminary design (30% complete) with which additional funding for implementation can be sought.

I-5 Fill Removal Feasibility Analysis

It has been identified in the watershed habitat analysis that Interstate 5 where it crosses the Nisqually Estuary is itself a serious impediment to the formation of natural tidally influenced habitat. Replacement of the current fill under the road with a pier or bridge structure could result in significant improvements to salmon habitat in the Lower Nisqually and McAllister Creek. This assessment would begin to explore that possibility and determine if a potential project might be developed.

Nisqually Mainstem Off-Channel Restoration Project Development-Feasibility

An off-channel habitat assessment completed by SPSSEG and the Tribe in 2004 evaluated the presence and condition of off-channel habitat throughout the Nisqually mainstem. The report identified high priority sites for restoration of off-channel habitat. However, the highest priority projects have not yet been implemented due in large part to a lack of landowner willingness. There is a need to do additional landowner outreach, identify new willing landowners and then assess feasibility and design key projects.

Mainstem Nisqually LWD Assessment and Restoration Plan

In the Watershed analysis and in other assessments of the mainstem Nisqually it has been noted that certain sections of the Nisqually mainstem is lacking wood, especially in the reaches immediately downstream of the Alder/La Grande Hydro Project. This project will assess the large woody debris loading in the many of these reaches and identifies wood loading deficiencies, combines them with the data on wood recruitment and identifies wood project for the mainstem including 30% engineering designs.

Nisqually to Pt. Defiance Nearshore Restoration Project

This project is assessing nearshore habitat between the Nisqually River and Point Defiance to identify potential restoration projects likely to benefit salmon. Both the WRIA 11 and WRIA 12 limiting factors analyses noted the poor habitat condition of this shoreline, including estuarine habitat loss and impacts from rail line fill. Burlington Northern is a cooperating partner on this project. A final report will identify and prioritize potential restoration project sites. Preliminary engineering designs and landowner agreements will be developed for restoration at 2-3 specific project sites. The project construction proposed for 2010 would be the implementation of one of these projects. Because the assessment is still underway the cost estimate for project construction is quite rough at this point. (also listed under capital projects)

Sequalitchew Estuarine Restoration Design

Restore fish passage and tidal hydrology to the Sequalitchew Creek estuary. The Sequalitchew estuary has been highly impacted by the BNSF causeway which has severed the connection between the estuary and the Puget Sound except through a small a 5-foot diameter concrete box culvert. Additionally, a remnant bulkhead and pilings from the decommissioned DuPont ammunitions dock constrains the upper beach profile and limits riparian, fringe habitat.

This project will explore feasibility and design options for restoring estuarine and beach processes through installation of a new structure/pile trestle in place of the causeway, removal of derelict creosote pilings and bulkhead structures, restore natural beach profile, remove invasive plants and restore native, marine riparian corridor.

Nearshore Restoration and Preservation Prioritization, Coordination, and Support
Nearshore restoration and protection are high priority habitat actions for the recovery of Nisqually Chinook. Implementing large scale projects in the nearshore requires extensive coordination; involving multiple landowners, industry, and public entities. This project would enable a person or persons to focus on nearshore project management in order to ensure that nearshore projects are thoroughly researched, coordinated, and strategic.

Habitat Protection:

Nisqually Land Trust Property Stewardship/Natural Resource Management
By the end of 2006 the Land Trust will own approximately 1250 acres in the salmon-producing section of the Nisqually River. It is essential to have the resources to continue to manage the properties for protection of their habitat value. Based on definitions and calculations devised by the Washington Department of Natural Resources, the Land Trust Alliance, and the Cascade Land Conservancy, NLT estimates annual stewardship and management costs for properties as follows: 1. Legal Stewardship: In general, this baseline of responsibilities includes the objectives and strategies necessary to protect properties from incursion and misuse; it includes health and safety risk-abatement. At \$25/acre, the Land Trusts annual estimated cost is \$31,250. 2. Ecological Stewardship: This is the next level of stewardship and requires managing properties to achieve optimal biodiversity for a given ecotype. At \$6.25/acre, the Land Trusts annual estimated cost is \$7,812. 3. Organizational Overhead: Also calculated at a rate of \$6.25/acre, the estimated annual cost is \$7,812. In total, then, the annual stewardship costs will be approximately \$46,875, or about \$140,625 for the 2007-2009 period. Currently, NLT has a small endowment that will generate approximately \$3,000 per year for stewardship. In addition for general support of outreach and education associated with stewardship needs NLT estimates it needs an additional \$10,000/yr to support that work.

Protection Enforcement and Monitoring on Nisqually Land Trust Properties
Build fences, gates and other deterrents on NLT properties adjacent to developed properties where there are current problems. These projects affect at least 5 miles of river front and several off channel streams and wetlands which provide spawning and juvenile salmonid habitat.

Protection Enforcement on Nisqually Wildlife Refuge (Obj. 1.2)
Protect Nisqually National Wildlife Refuge lands from unauthorized human disturbances. One 0.5 FTE Refuge Enforcement Officer (\$31,100 annual cost)

DNR Aquatic HCP Planning
Washington DNR is in consultation with the USFWS for an Aquatic HCP, that at this time would cover all waters (tidal and non-tidal). The USFWS will dedicate 1 FTE to this consultation for potentially the next three years. DNR will probably cover the costs of that FTE.

Thurston County CAO Revision
Thurston County staff time to do required updates to Thurston Countys Critical Area Ordinance.

Thurston County Shoreline Master Program Revision
Thurston County staff time to do required updates to the countys Shoreline Master Program.

Pierce County Shoreline Master Program Revision

Habitat Project Monitoring

Estuary Restoration Monitoring

The significance of the Nisqually River estuary for salmon recovery has prompted the Nisqually Tribe, Nisqually National Wildlife Refuge, and our partners to implement large scale restoration projects in the estuary. The magnitude and importance of the estuary restoration projects creates a clear need to implement a delta-wide, multifaceted monitoring program.

Monitoring of Estuary Restoration at Red Salmon Slough

Monitoring of the physical and biological response to the 140 acres of tribal estuary restoration on the east side of the river.

Mashel Restoration Monitoring

The significance of the Mashel River for salmon recovery has prompted the Nisqually Tribe and our partners to develop a large scale restoration and protection initiative in the basin. The magnitude and importance of this initiative creates a clear need to monitor the effectiveness of our efforts for protecting and restoring Mashel River salmon habitat.

Ohop Restoration Monitoring

The significance of Ohop Creek for salmon recovery has prompted the Nisqually Tribe and our partners to develop a large scale restoration and protection initiative in the basin. The magnitude and importance of this initiative creates a clear need to monitor the effectiveness of our efforts for protecting and restoring Ohop Creek salmon habitat.

Nearshore Restoration Monitoring

Nearshore restoration project treatments are relatively new and inherently experimental. This project will ensure that nearshore restoration projects are monitored sufficiently in order to assess the effectiveness of various restoration treatments.

Forest and Fish Prescription Implementation Monitoring/Tech. Assistance

This 1 FTE would support the continued monitoring of forest practices to ensure consistency with the Forest and Fish agreement and the Nisqually salmon recovery plan.

Nisqually Chinook Recovery Habitat Monitoring

Creation and implementation of a watershed-wide habitat and restoration action monitoring plan to assess effect of recovery plan.

Harvest Management Support

Variable Harvest and Weir Operations Schedule

The Variable Harvest and Weir Operations Schedule will utilize pre-season forecasts and in-season run updates to guide the passage of Chinook over the weir and harvest management to ensure that escapement and NOR/HOR composition goals are met.

Treaty Commercial Fishery Monitoring

Monitoring the treaty commercial fishery is critical for stock assessment and adaptive management. Fishery monitoring provides fundamental data for management including but not limited to NOR and HOR abundance, timing, and composition.

Testing Selective Commercial Fishing Gear

Selective commercial fishing has the potential to increase hatchery Chinook harvest rates while decreasing impact on natural origin fish. Various commercial fishing gear types will be tested for their effectiveness in catching Chinook while giving the fisher the opportunity to segregate HORs from NORs and live release NORs.

Stock Monitoring Support

EDT Habitat Attribute Updates

EDT Habitat Attribute Updates are needed to model the response of the Chinook population to habitat changes caused by large scale habitat restoration projects. Data from various monitoring and assessment projects will be synthesized and used to run the model updates. Model updates will be coordinated with major adaptive management cycles (every 2 years).

Chinook Spawner Surveys (mainstem, mashel, ohop, rotating panel)

Chinook spawner surveys are essential for determining the abundance, spatial and temporal distribution, and composition of spawning Chinook.

Downstream Migrant Trapping

WDFW installed a downstream migrant trap on the Nisqually River in January 2009. The trap will enable managers to determine the abundance, timing, and diversity of migrating juvenile salmonids. When combined with adult spawner abundance the trap will also give us the ability to estimate the productivity of the watershed.

Otolith Analysis

otolith study/life history analysis

This study uses otoliths (ear bones) of salmon to learn more about their life history. Otoliths grow daily and record growth in a way similar to tree rings. USGS scientists are refining a method of analysis of these otoliths that can clearly delineate the life history of each analyzed fish. This information will be essential to us being able to have some potentially empirical evidence of the impacts our restoration efforts may be having on life history diversity of the population, (one of the key VSP). We can also use the analysis on returning adults to see if a particular life history strategy is more successful at surviving to return to spawn. These funds would support the analysis of otoliths already collected and additional otoliths that will be collected in subsequent years.

Steelhead Spawner Surveys (mainstem, mashel, ohop, rotating panel)

Steelhead spawner surveys are essential for determining the abundance, spatial and temporal distribution, and composition of spawning steelhead.

DIDSON Counter @ Centralia Diversion Dam

All salmon, including Chinook and steelhead, that spawn in the upper Nisqually River and in Ohop Creek and the Mashel River must swim through the fish ladder at the Centralia Diversion Dam. This creates an opportunity to install a sonar fish counter. A fish counter will provide invaluable stock assessment data, especially for steelhead that run at a time of high turbidity in the Nisqually River which prevents accurate spawner counts.

Estuary fish monitoring

The Tribe in partnership with USFWS has conducted monitoring of juvenile salmon usage of the estuary for the last four years. Sites representative of different habitat types in the estuary are sampled once every other week during the migratory period. This information is helpful to our understanding of how restoration may affect salmon usage of the estuary and gives us a qualitative sense of the outmigrating population. In 2010 sampling is focusing on the estuary restoration sites and certain representative locations throughout the estuary and adjacent nearshore.

Research

Steelhead smolt acoustic tag study

An ongoing acoustic tracking project is placing acoustic tags in wild Nisqually steelhead smolts each spring and receivers placed in the Nisqually River and estuary, as well as in Puget Sound, the Straits of Juan de Fuca and Georgia, and beyond. Combined information from these receivers will yield a summary of movement and mortality patterns for Nisqually steelhead smolts in the marine waters, which is needed for recovery planning for the declining Nisqually steelhead run.

Watershed Plan Implementation and Coordination

Adaptive Management Plan Implementation

The Nisqually Chinook Adaptive Management Framework Implementation Project will provide the population modeling, habitat characterization, and stock status update support necessary to complete an adaptive management cycle.

In-stream, off-channel, and estuary habitat project Restoration Biologist

This 1 FTE works to ensure that priority habitat projects throughout the watershed are developed and implemented consistent with the Nisqually salmon recovery plan. This position is key to ensuring that high priority habitat projects in the plan stay on track. Position includes cost of 1 FTE plus Nisqually Tribe 54% indirect rate.

Salmon Recovery Project Technician

Assists in implementation of restoration projects, field work. 5 FTE plus Nisqually Tribe 54% indirect rate.

Lead entity coordination/Salmon Recovery Program Management

In order to effectively manage Nisqually salmon recovery implementation and the lead entity process there is a need for at least 1 FTE. This position currently exists and we would like to continue it.

GIS support for plan development/implementation

This supports 1 FTE that develops and tracks watershed data and salmon recovery projects in a GIS database. This position is critical to our ability to plan effectively, to coordinate our actions across the landscape, to communicate our projects and progress to others, and to track our progress. This position currently exists and we would like to continue it.

Development and Coordination of Adaptive Management Program

There is a need for an additional FTE to assist in the important tasks of plan development, tracking our implementation to ensure we are meeting our plan goals and objectives, using tools as they become available to evaluate our current action plan, and use the information from monitoring and new tool support to recommend updates to the plan on a yearly basis.

Identify and research key uncertainties to improve plan

There are key uncertainties identified in the plan that need to be investigated. There is an ongoing need for at least 1 FTE that investigates key uncertainties through research projects.

Adaptive Management plan and database

Complete the development of a system for Nisqually that clearly demonstrates what actions we are taking for salmon recovery, how we believe those actions will affect salmon stocks, and how well we are making progress as we implement those actions. This plan would outline key data gaps and monitoring needs that would be used to update our recovery plan and refine recovery actions over time.

Adaptive Management database maintenance

Support the capacity to keep the information in the Adaptive management database current and the system maintained.

Outreach and Education

Nisqually River Education Project (watershed schoolchildren ed)

This program organizes hands on watershed education opportunities for schoolchildren throughout the Nisqually River Watershed. This includes organizing students to help with hands on restoration projects such as tree plantings or carcass tossing as well as monitoring projects to evaluate the health of the watershed through water quality samples or benthic macroinvertebrate analysis. This program has operated since 1990 without base funding and is now at substantial risk as funds become scarce. Sustainability and ultimately the fate of salmon and this watershed is in the hands of our residents. It is only through a well informed community that understands and supports salmon recovery that our efforts have any chance of long term success. This program has touched the lives of 6,000 students and is critical to our long-term success in developing a more informed, concerned, and involved citizenry that is supportive of salmon recovery actions.

Nisqually Stream Stewards Program

The Nisqually Tribe's salmon recovery outreach and education program. Organizes educational and hands-on opportunities for watershed citizens to become more informed and active stewards of salmon habitat. This is a key program that complements the Nisqually River Education Project in developing a more informed watershed citizenry. Cost of the program is 1 FTE plus the Tribe's 54 % indirect rate as well as associated program support costs for volunteer event supplies, volunteer monitoring equipment, program newsletter etc.

Nisqually National Wildlife Refuge Education Program (Goal III, Obj. 3.1)

Hire a permanent-full time environmental education specialist (GS-09) (\$62,150 annual cost) on the Refuge staff to manage the environmental education program. As changes are made to habitats on the Refuge, opportunities would be created to include teachers and students in these long-term restoration activities, both hands-on assistance in the restoration work and monitoring of changes in the habitat.

Other

Implementation /Effectiveness /Validation Monitoring

Coordination of monitoring of overall recovery plan. This would implement the plan laid out in the new Adaptive Management plan for data collection that will inform and monitor our progress in Nisqually salmon recovery.;

NLT administrative/facilities support

The Nisqually Land Trust incurs annual administrative costs for owning and general management of properties. Costs include: Administrative support (\$10,000/yr.), GIS/data management (10,000/yr.), office truck (\$30,000 initial cost, \$2000/yr. Maintenance) Administrative support includes staffing, office space, insurance, property fees, etc.

Nisqually River Council support

This would support the continued facilitation of the Nisqually River Council and implementation of the Council's Stewardship Plan. It would support 2 FTE's: 1 FTE which is the current staff who coordinates Council meetings and plan implementation and an additional FTE to assist in Plan implementation. This additional capacity for the Foundation would provide a dedicated staff assigned to project development, project management, and grant writing/fund raising to implement the Stewardship Plan elements consistent with Chinook recovery and expanded to a multispecies approach.

Nisqually Sustainability Initiative

This additional capacity for the Foundation would implement our local based certification strategy and provide technical support to interested parties to receive third party and Nisqually River Council endorsement of activities. This is a vital program necessary for the long term success of the Nisqually Stewardship Plan and critical to salmon recovery. Our plan describes a process of working with the various third party certification systems, like Salmon Safe and SFC to encourage and promote sustainable activities throughout the watershed. These activities will greatly reduce the impact of these activities in the watershed and support salmon and wildlife survival and recovery while also supporting a vibrant economy operating in harmony with the ecosystem in the Nisqually.

Nisqually Low Impact Development technical assistance/landowner incentive program

Provide direct support and incentives for the implementation of LID and Arch guidelines in the watershed. This includes permitting assistance, engineering and design assistance, marketing, and public education and outreach.

Nisqually Water Conservation

Support for Class A water purveyors in the Nisqually Watershed to write conservation plans. This project pays for a staff position that will develop the plans in cooperation with the water purveyors and provide technical assistance to them.

Multispecies Nisqually Salmon Plan

Considerable work has already been done to begin developing a multispecies Nisqually Salmon Recovery Plan that includes Chinook, Steelhead, Coho, Pink and Chum salmon. However the project has been delayed due to a lack of resources and time. These funds would support the completion of that work.

Nisqually Chinook Adaptive Management Framework



*Nisqually Indian Tribe Natural Resources Department
Salmon Recovery Program*

DRAFT

Nisqually Chinook Adaptive Management Framework

Nisqually Chinook are managed according to the short and long-term goals spelled out in the Nisqually Chinook Recovery Plan (CRP) and subsequent 3-year work plan updates. The CRP explicitly states that the predicted outcomes of the actions listed in the plan are working hypotheses and that the outcomes should be validated through monitoring and then evaluated to determine if elements of the CRP need to be changed. The adaptive management framework detailed in this document is the process by which the CRP will evolve as the critical hypotheses are tested and our knowledge of the ecosystem improves.

Our adaptive management framework follows the simple diagram in Figure 1; where adaptive management is the integration of the entire management process and not merely a separate component. We begin our adaptive management process by stating the overarching goal for Nisqually Chinook and the underlying reason or problem statement which necessitates a recovery plan (A), followed by our working scientific framework (i.e., conceptual model) for how we understand the Chinook population (B). Next, we list our specific goals and objectives which detail our response to the problem statement (C).

Habitat, Harvest, and Hatchery Action Plans were developed through the planning process (D). The actions listed in the plans are hypothesized to be necessary for achieving the short and long-term goals for Nisqually Chinook. Each of the primary action items contained within the plans also has a monitoring component where information is collected in order to test our assumptions about that particular action item or to improve our scientific framework (E). The information collected through monitoring is then evaluated to determine if the habitat and the stock are on a trajectory to meet the goals (F). After the evaluation procedure, managers can determine whether or not plan updates/changes need to be made (G). We plan on running through the adaptive management cycle every 2 years, with a major evaluation and update every 4th year.

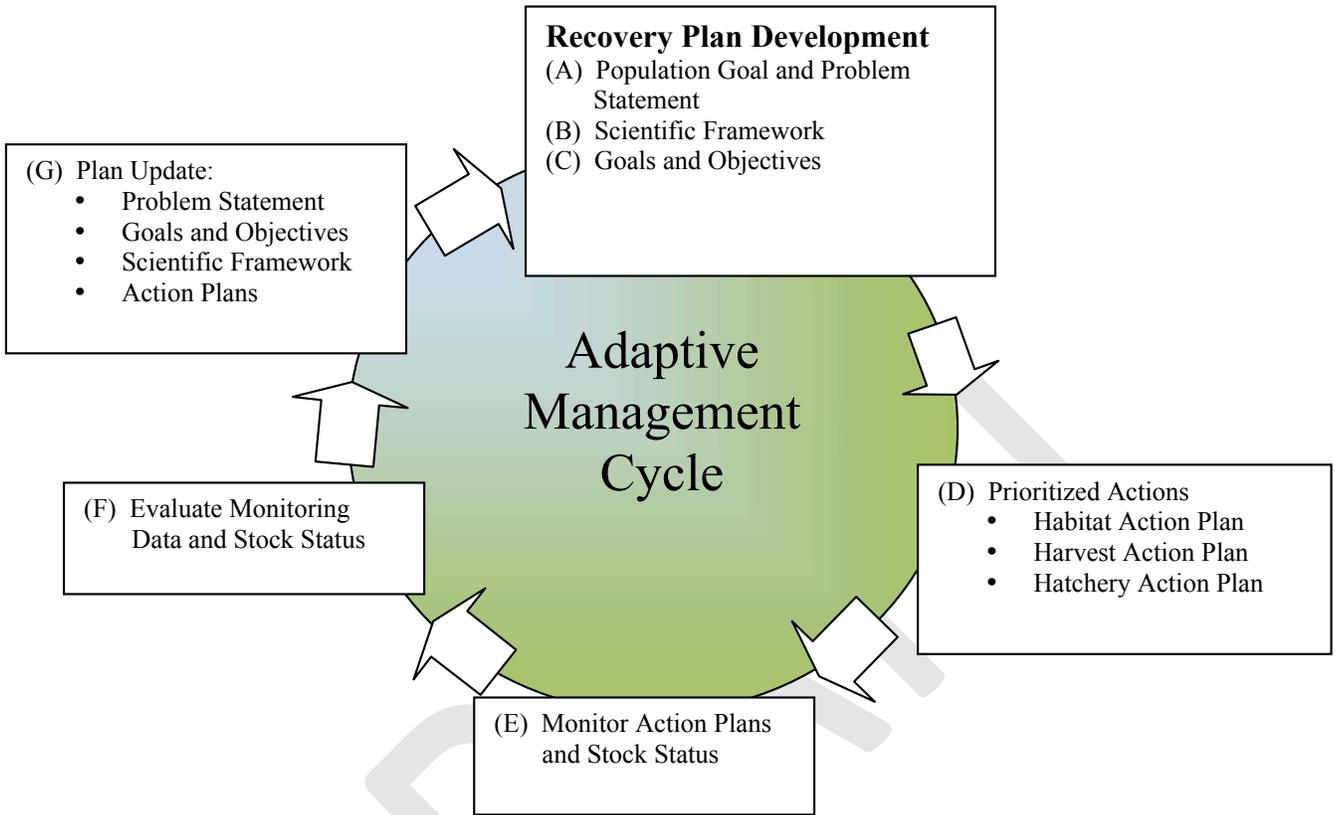


Figure 1. Nisqually Chinook Recovery Plan adaptive management cycle.

A. Chinook Management Goal and Problem Statement

The goal of Chinook management in the Nisqually Basin is to assure natural production and sustained harvest of Chinook in perpetuity. Nisqually Chinook and other salmon have supported a rich ecosystem in the Nisqually Basin and abundant harvest for thousands of years until the widespread cultural and environmental changes of the 20th century.

Native Nisqually Chinook, both spring and fall components, are believed to be extirpated due to extensive fish stocking from other watersheds, hydro operations, harvest, and habitat changes that have occurred over the last 100 years (see NCRT 2001 for details). The Puget Sound Chinook evolutionarily significant unit (ESU) is listed as threatened under the Endangered Species Act, and the Nisqually is considered one of the primary watersheds important to its recovery constituting the core fall Chinook population for Central/South Puget Sound (see PS Salmon Recovery Plan 2007).

The challenge is to develop a self-sustaining Chinook population in the Nisqually derived from various hatchery stocks while maintaining treaty, non-treaty commercial, and sport harvest opportunities. Hatchery run size, escapement estimates, catch estimates, total run size, and spawning ground composition for the last 10 years (period of full production at Clear Creek hatchery) are shown in Table 1. The large numbers of hatchery returns, high composition of hatchery fish on the spawning grounds, and high harvest are indicative of a hatchery dominated system. In order to develop a self-sustaining natural run; the exploitation rate on natural origin fish will need to be reduced, hatchery strays will need to be managed, and habitat will need to be protected and restored.

Table 1. Nisqually Chinook total run size, escapement, and harvest estimates 1998-2007. Spawning ground composition data was missing for some years and has not been corrected for the presence of unintentionally unmarked hatchery fish on the spawning grounds. Total exploitation rate is from TAM (FRAM output).

Year	Escapement Estimates				Hatchery Returns	In River Catch			Harvest		Total Run Size
	Spawning Ground Composition (%HOR)	NOR spawners	HOR spawners	Total Escapement		Outgoing Mark Rate	Commercial Catch	Test Fishery	Sport Catch	Nisqually River Harvest Rate	
1998				834	4067	7990	na	423	63%	79%	13314
1999				1399	13481	14614	na	1687	52%	81%	31181
2000				1253	4923	6836	na	406	54%	72%	13418
2001				1079	7612	14098	na	1335	64%	75%	24124
2002				1542	9341	11737	16	1223	54%	77%	23859
2003				627	7697	14583	73	715	65%	84%	23695
2004				2788	8225	13850	90	982	58%	79%	25935
2005				2159	12470	11066	125	1016	45%	67%	26836
2006	76%	523	1656	2179	10535	21568	125	2227	65%	83%	36634
2007	53%	819	924	1743	14062	22996	na				38801

B. Scientific Framework

Our current scientific framework for how we interpret the interaction between the Chinook population and the environment is based on the Ecosystem Diagnosis and Treatment (EDT) model. This model provides an estimate of how the Chinook population interacts with spatially explicit habitat units (stream reaches) in the basin. EDT estimates the restoration potential in each reach by comparing the population under current and historic conditions. The reaches with the most restoration potential can be prioritized and specific habitat needs within the reaches are identified. Mainstem Nisqually Chinook spawners are considered the primary population segment in the Nisqually with secondary segments in the Mashel River and Ohop Creek. Small, tertiary segments utilize other tributaries within the Nisqually Basin. Recovery efforts are focused on the primary and secondary population segments.

The Nisqually Chinook population is described using three parameters: abundance (or sometimes abundance), productivity, and life history diversity. The population parameter estimates derived from EDT model runs are based solely on the habitat potential and do not include harvest or hatchery effects (e.g., fitness loss). These parameters give us a description of the current stock and of the projected future performance if certain suites of habitat restoration actions are taken. The habitat action plan for Chinook recovery in the Nisqually Basin was formulated using this technique.

NOAA Fisheries Service evaluates the Puget Sound Chinook ESU based on four viable salmon population (VSP) criteria. The four VSP criteria are: Adult Abundance, Productivity, Spatial Distribution, and Diversity. The NOAA Fisheries VSP parameters are analogous to the EDT based population parameters used to describe the Nisqually Chinook population (Table 2).

In recognition that the Chinook population is influenced by harvest and hatchery actions as well as habitat conditions (including hydro), we use the All-H Analyzer (AHA) as a way to integrate management planning decisions. AHA integrates the theoretical response of the stock to various habitat, hatchery, and harvest actions. The implications of different management actions for the stock such as changes in harvest rates, hatchery releases, and habitat restoration are evaluated in order to choose a strategy that most closely meets our objectives. Since the Nisqually stock is derived from various hatchery stocks, we will present AHA model runs based on a range of assumed fitness loss from 15% to 50% (For more information about AHA see *insert citation*).

Initial Nisqually AHA model runs indicate that the naturally spawning population is currently supported by hatchery strays and is not sustainable without their continued input. This condition will persist until the total exploitation rate (ranging from 67 – 84% in last 10 years) is reduced to a level that will allow for self-sustaining natural production. The initial AHA model runs estimate that the total exploitation rate needs to be reduced to 47% under baseline habitat conditions or 52% with large scale habitat restoration. Future model runs will include a range of fitness loss estimates which will reduce the targeted total exploitation rate even further.

We will continue to research, test, and potentially incorporate other stock management and ecosystem assessment tools as they are developed.

Table 2. NOAA Fisheries VSP and Ecosystem Diagnostic and Treatment (EDT) model salmon population parameter definitions.

NOAA Fisheries VSP Parameter (From Chapter 4 of Puget Sound Chinook Recovery Plan 2007)	Analogous EDT Population Parameter
Abundance: the size of the population (number of naturally spawning fish needed to ensure that the population persists over time).	Abundance: represents the upper limit of the population in terms of survival and distribution, due to density-dependent responses. It is measured in terms of the number of adult spawners but is considered over the entire life cycle.
Productivity: how many fish are produced per adult spawner, or the overall population growth rate (how well the population replaces itself).	Productivity: the density-independent survival rate and also to the population's basic biological productivity (fecundity, sex ratio, etc.).
Diversity: the variation in genetic, physiological, morphological and behavioral attributes (provide the fish with flexibility to adjust to changing environments).	Life History Diversity: a measure of the proportion of the possible multiple pathways through space and time that are used successfully by the population (# of pathways with sustainable survival as a proportion of total # of historic pathways).
Spatial structure: the geographic distribution of fish at all life stages; needed to protect against a catastrophic loss in one location. This is important at both a river basin or population scale as well as a regional scale.	

C. Goals and Objectives

LONG TERM (ADD DATES) GOALS FOR NISQUALLY RIVER CHINOOK

- Assure natural production of Chinook in perpetuity by providing high quality, functioning habitat and by developing a self-sustaining, naturally spawning population with diverse geographic distribution. The long term population target for Nisqually Chinook is 3600 natural spawners. The long term population target may be updated and specific population parameter targets like productivity and abundance may be added as our knowledge about the stock improves and our modeling efforts advance.
- Assure sustainable harvest.
- Provide significant contributions to ecosystem functions.
- Secure and enhance natural production of all salmonids.
- Assure that the economic, cultural, and social benefits derived from the Nisqually ecosystem will be sustained in perpetuity.

10 YEAR OBJECTIVES (FROM 2010 TO 2019) FOR ACHIEVING LONG TERM NISQUALLY RIVER CHINOOK GOALS

Stock objective:

Integrate harvest, hatchery, and habitat actions in order to manage for a minimum of 1200 self-sustaining natural origin recruits with no more than 5%, or the lowest possible, contribution from hatchery origin recruits over the next 10 years and a terminal harvest of 10,000 – 15,000 if consistent with escapement objective. The specific stock objective target may change as knowledge about the stock increases and our modeling efforts progress.

Habitat objective:

Utilize protection and restoration actions to support the stock objective.

- *Protection component:* No further degradation in the Nisqually watershed's and Puget Sound's ability to support the productivity, abundance, and life history diversity of natural origin Nisqually Chinook.
- *Restoration component:* Restore habitat in the Nisqually watershed and in Puget Sound to support a predicted increase in natural origin Nisqually Chinook productivity, abundance, and life history diversity.

Implement the suite of habitat projects developed during the EDT planning process and listed in the action plan over the next 10 years. The modeled cumulative impact of the habitat actions is an increase in the productivity of the Chinook population from 3.7 to 5.3 and in the ability of the watershed to support an abundance¹ ranging from

¹ We use the abundance EDT population parameter throughout the adaptive management framework which is analogous to the capacity parameter reported in other Nisqually planning documents like the 3-yr work plan. Capacity estimates are typically higher than abundance estimates.

3528 to 7066 Chinook. Additionally, the habitat actions are predicted to increase the EDT life history diversity index from 80% to 93%. The EDT productivity, abundance, and life history diversity parameters are theoretical targets that do not account for harvest, hatchery, and other (e.g., stochastic) effects. Spatial structure is also predicted to increase as habitat is restored. Improvements in the Chinook stock parameters are expected to occur over multiple generations after habitat, harvest, and hatchery actions are taken.

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D. Chinook Recovery Action Plans

As a result of our planning process using our scientific framework, the following general priorities for Chinook recovery have been established (for more detail on specific projects see 3 year work plan).

- Mainstem, estuary, nearshore, Mashel River, Ohop Creek habitat protection.
- Estuary habitat restoration.
- Puget Sound nearshore habitat restoration.
- Mainstem, Mashel R., Ohop Cr. habitat restoration.
- Reduce total exploitation rate on natural origin fish to allow stock to be self sustaining. The current target is 47% although this will be adjusted to account for a range of fitness loss and habitat improvements.
- Install weir to block hatchery Chinook from passing upstream and reduce composition on spawning grounds to 5% hatchery origin recruits (or lowest possible given mark rate and weir efficiency limitations).
- Hatchery mark rate of $\geq 95\%$.

The recovery plan will only be effective with broad community support. Our community support priorities are:

- Increased local community awareness of and support for high priority actions to recover Nisqually and Puget Sound salmon.
- Increased regional, state, and national community awareness of and support for high priority actions to recover Puget Sound salmon

The following habitat (Table 3), hatchery (Table 4), and harvest (Table 5) action plans outline the actions needed for recovery. Actions that directly lead to stock recovery and data needs for stock recovery planning (i.e. scientific framework) are listed. Information about specific projects can be found in the Habitat Work Schedule.

Table 3. **Habitat Action Plan** (See habitat work schedule for specific project list)
 Only the primary affected parameters are listed, although most habitat actions will affect all population parameters.

<i>Geographic Area</i>	<i>Actions Needed</i>	<i>Primary Population Parameter</i>
Estuary	Reclaim estuary habitat	Productivity and Abundance
Puget Sound Nearshore	Protection and restoration of beaches, feeder bluffs, and small estuaries	Productivity and Abundance
Mainstem Nisqually River	Protect high quality habitat and restore habitat in degraded reaches	Productivity and Abundance
Mashel River	Protect high quality habitat and restore in stream habitat	Life history diversity and spatial structure
Ohop Creek	Protect high quality habitat and restore natural channel configuration and in stream habitat	Life history diversity and spatial structure

Table 4. **Hatchery Action Plan**

<i>Action</i>	<i>Status</i>	<i>Recovery Plan Objective(s) Addressed</i>
Maintain mark rate $\geq 95\%$ or minimum mark rate determined through AHA modeling efforts.	Mass marking implemented 2001, some years $< 95\%$	Composition on spawning grounds of $< 5\%$ HOR
		Reduce harvest on natural fish and increase harvest on hatchery fish
Operate hatchery in order to sustain harvest and minimize competition with natural origin fish.	On-going	Self-sustaining natural stock
		Meeting harvest goal
Investigate NOR/HOR run timing divergence using hatchery selection and/or stock introduction.	Planning	Self-sustaining natural stock
		Meeting harvest goal
Install and operate mainstem weir.	Planned	Composition on spawning grounds of $< 5\%$ HOR
		Self-sustaining natural stock
Develop in-season stock management schedule for weir and harvest management.	Planned	Self-sustaining natural stock
		Meeting harvest goal
		Composition on spawning grounds of $< 5\%$ HOR

Table 5. Harvest Action Plan

<i>Action</i>	<i>Status</i>	<i>Recovery Plan Goal Addressed</i>
Itemize and implement actions needed to ensure 1200 NORs including: <ul style="list-style-type: none"> • Selective fishing • Closures • Investigate NOR/HOR run timing divergence using harvest seasons and/or stock introduction. • Reduce total exploitation rate by reducing harvest rates in Washington, Canada, and Alaska. 	Planning	Self-sustaining natural stock
Harvest 10000-15000 Chinook	On-going	Sustainable Harvest
Develop in-season stock management schedule for weir and harvest management	Planned	Self-sustaining natural stock
		Meeting harvest goal
		Composition on spawning grounds of <5% HOR

E. **Monitoring**

Under the Chinook Recovery Plan adaptive management framework, monitoring is focused on tracking the implementation of the action plans, gauging the effectiveness of the action items, collecting information targeted specifically at improving our scientific framework, providing information necessary for in-season management, tracking the status of the Nisqually Chinook stock, and on validating our assumptions about how the Chinook population will respond to our actions. The elements listed in Table 6 below are considered critical to the CRP adaptive management process.

Specific monitoring protocols will be developed over time and we will ‘crosswalk’ the information from previous and ongoing (e.g., Mashel monitoring) data collection efforts into scientific framework support and stock recovery monitoring. High priority salmon recovery actions like large scale habitat restoration projects will likely have their own monitoring efforts which include additional elements not covered under this process. These elements may inform the adaptive management process in the evaluation section.

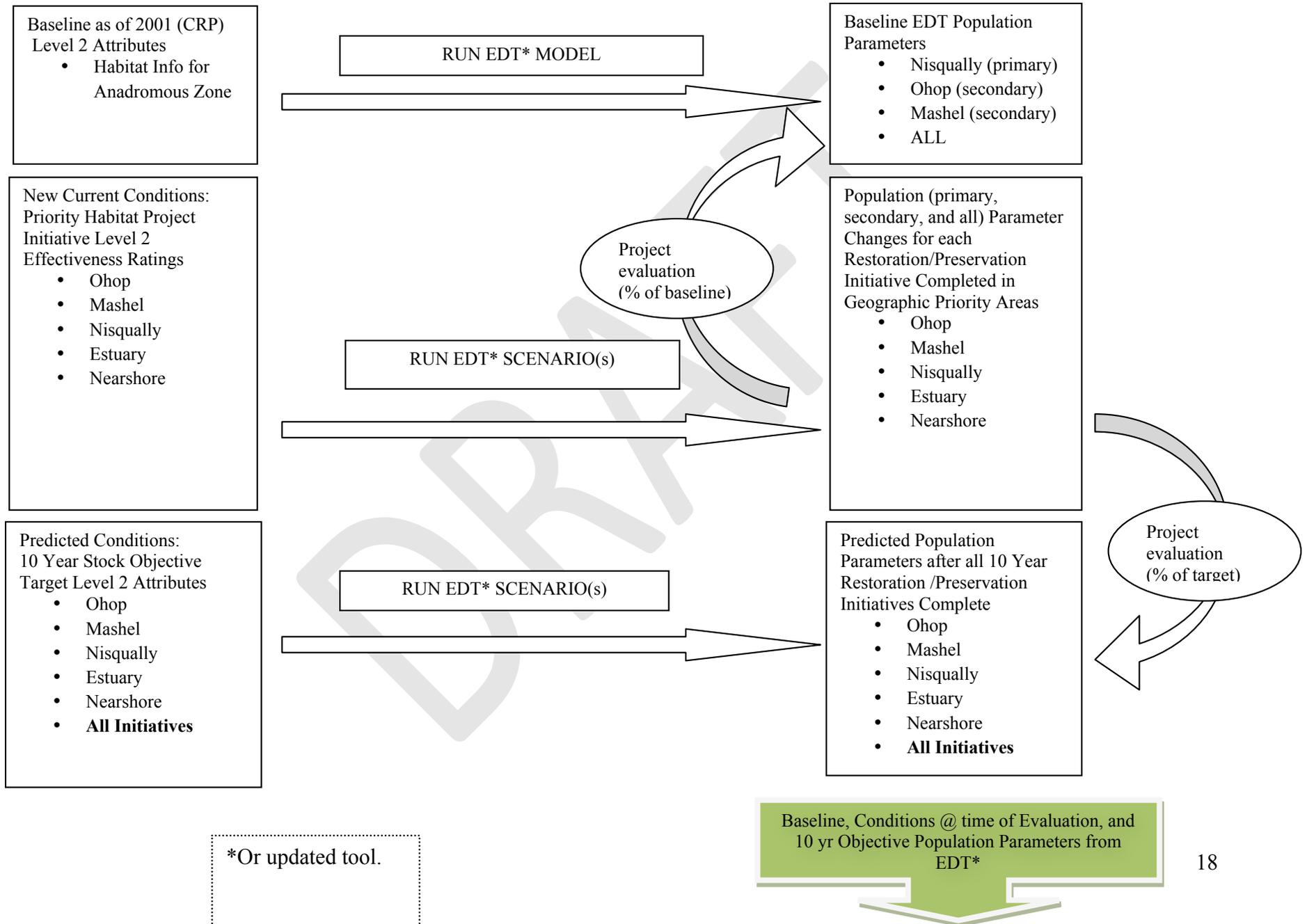
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F. Evaluation

Habitat, hatchery, and harvest actions are evaluated for their impact on our Chinook recovery objectives using the evaluation flow chart below. The monitoring data for our habitat projects are translated into EDT level 2 ratings which are used to run EDT scenarios for our habitat restoration projects and their individual and combined effects on Nisqually Chinook population parameters. These parameters, along with hatchery and harvest monitoring data are then inputted into the AHA model. AHA model outputs which include estimates of natural origin returns, harvest, hatchery returns, and spawning ground composition are used to evaluate our objectives and gauge our progress toward the goals. Observed stock status and trend data as well as other qualitative and quantitative data are used in combination with AHA model outputs to make recommendations for CRP updates.

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Nisqually Chinook Adaptive Management Evaluation Flow Chart



*Or updated tool.

From EDT*
Model Runs
(previous
chart)

AHA* model runs

EDT* Output from
Habitat Model Runs (entire
population)

- Abundance
- Productivity

Population Parameters from EDT*

Hatchery Monitoring Data

- # of smolts released
- Broodstock composition
- Broodstock number
- HOR destination
- Recruits per spawner
- Fitness estimate

Hatchery Monitoring Data

Harvest Monitoring Data

- NOR harvest rate
- HOR harvest rate
- Total exploitation rate

Harvest Monitoring Data

**Evaluation of AHA* Outputs (model runs
will include range of fitness values)**

- **Natural Origin Recruits**
 - **Current vs. Baseline**
 - **Current vs. 10 year target (1200)**
- **Spawning ground composition:**
 - **Current vs. Baseline (50-60% HOR)**
 - **Current vs. Target (<5% HOR)**
- **Harvest**
 - **Current vs. Baseline**
 - **Current vs. Target (10-15,000)**

*Or updated tool.

**Modeling Scenarios
Monitoring and Evaluation
Report**

- EDT Scenario Inputs
- EDT Reports
- AHA Inputs
- AHA Reports (with fitness range)
- Evaluation of AHA Outputs (previous chart)

‘Other’ Relevant
Quantitative and
Qualitative Data
(e.g. Stochastic Events)

Recommendations for Chinook Recovery Plan update

- Are our goals still appropriate?
- Do we need to add actions?
- What is the trajectory of the stock?
- Are we collecting the right monitoring data?
- Etc., etc. etc.

**Stock Status and
Trend Evaluation**

- NOR escapement
- Spawning composition
- Harvest
- Hatchery returns
- Spawning distribution and timing
- Productivity and other stock metrics
- Parentage Assessment

Stock Status and Trend Monitoring

- Index reach spawner surveys
- ‘Rotating Panel’ spawner surveys
- Downstream migrant abundance
- Monitoring of Fisheries
- Hatchery Reporting
- Weir Reporting

G. Chinook Recovery Plan Update (IN PREP>>>>DRAFT)

The CRP Update Team (CRPUT) will prepare an evaluation summary and CRP update recommendations to be reviewed by the Nisqually Salmon Habitat Workgroup, the Nisqually Stock Assessment Workgroup, policy co-managers, and then the Nisqually River Council in years 2, 4, 6, 8, and 10. The CRPUT will utilize the monitoring and evaluation information to systematically review each recovery plan component based on the criteria in Table 6.

Recovery Plan Component Update Criteria				
Recovery Plan Component	Criteria A	Criteria B	Criteria C	Criteria D
Chinook Population Management Goal and Problem Statement	Population and/or ESU Status Change	Improved Information (i.e., stock status, scientific framework)	Cultural Value Shift	
Scientific Framework	Tool Updates/Improvements	More Robust Tool Developed		
Goals and Objectives <ul style="list-style-type: none"> • Long Term Goals • 10 Year Objectives <ul style="list-style-type: none"> • Stock • Habitat 	Population and/or ESU Status Change	Improved Information	Cultural Value Shift	Objectives Incompatible or Inadequate
Action Plans <ul style="list-style-type: none"> • Habitat • Harvest • Hatchery 	Improved Information	Action Plans Inadequate for Achieving Goals and Objectives		
Monitoring	Inadequate Information	Updated Tools/Protocols/Techniques		
Evaluation	Recovery Framework Components Updated	Critical Uncertainties...Research Needs	Externalities (i.e., stochastic events)	