Watershed Profile:

Nisqually

The Place and the People

The Nisqually River Watershed is a land of wind and wildlife, glaciers and storms, towering firs and diminutive banana slugs. Yet it is also a land greatly affected by human decisions and activities. As one of the least developed rivers in southern Puget Sound, the Nisqually links the snows and ice of Nisqually Glacier on Washington's highest peak, Mount Rainier, to the marine waters of Puget Sound.

The Nisqually journeys from sub-alpine meadows and old-growth Douglas-fir forests through foothills of timberlands, across lowland prairies to estuarine marshes and tidal mudflats. Its watershed encompasses a broad range of land uses and jurisdictions - rural communities, national and state parks and forests, public and private timberlands, municipal hydropower dams and reservoirs, farmlands, the Nisqually Indian Reservation, Fort Lewis Military Reservation and the Nisqually National Wildlife Refuge. It is the only watershed that begins in a National Park and ends in a National Wildlife Refuge. It also has a military base that has been nationally recognized for its unique focus on protecting wildlife, native plants and fish.

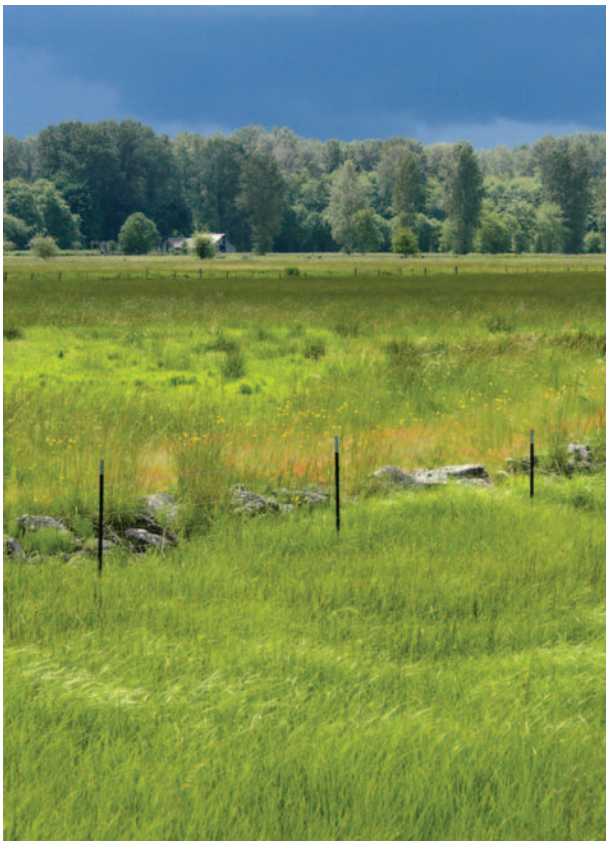


Photo by Dan Kowalski

The lower portion of the Nisqually River is considered to be some of the best remaining salmon habitat in the region. Between river miles (RM) 4.5 and 12.7, the river meanders freely across the valley floor; large woody debris is present in healthy amounts, and there is a healthy riparian zone. The Nisqually River also has the largest undeveloped delta in Puget Sound.

The Nisqually watershed supports one threatened Chinook population and numerous other species of salmon, including a unique late-season returning population of chum.

Despite a backdrop of different values, views and lifestyles, the members of the Nisqually River Council have been a driving force for balancing natural resources and local economies. It is the center of community participation and support for salmon recovery activities. The Nisqually Tribe has pioneered agreements among local, state and Tribal governments, area businesses and land owners to sustain the natural bounty of the river and the local economy.

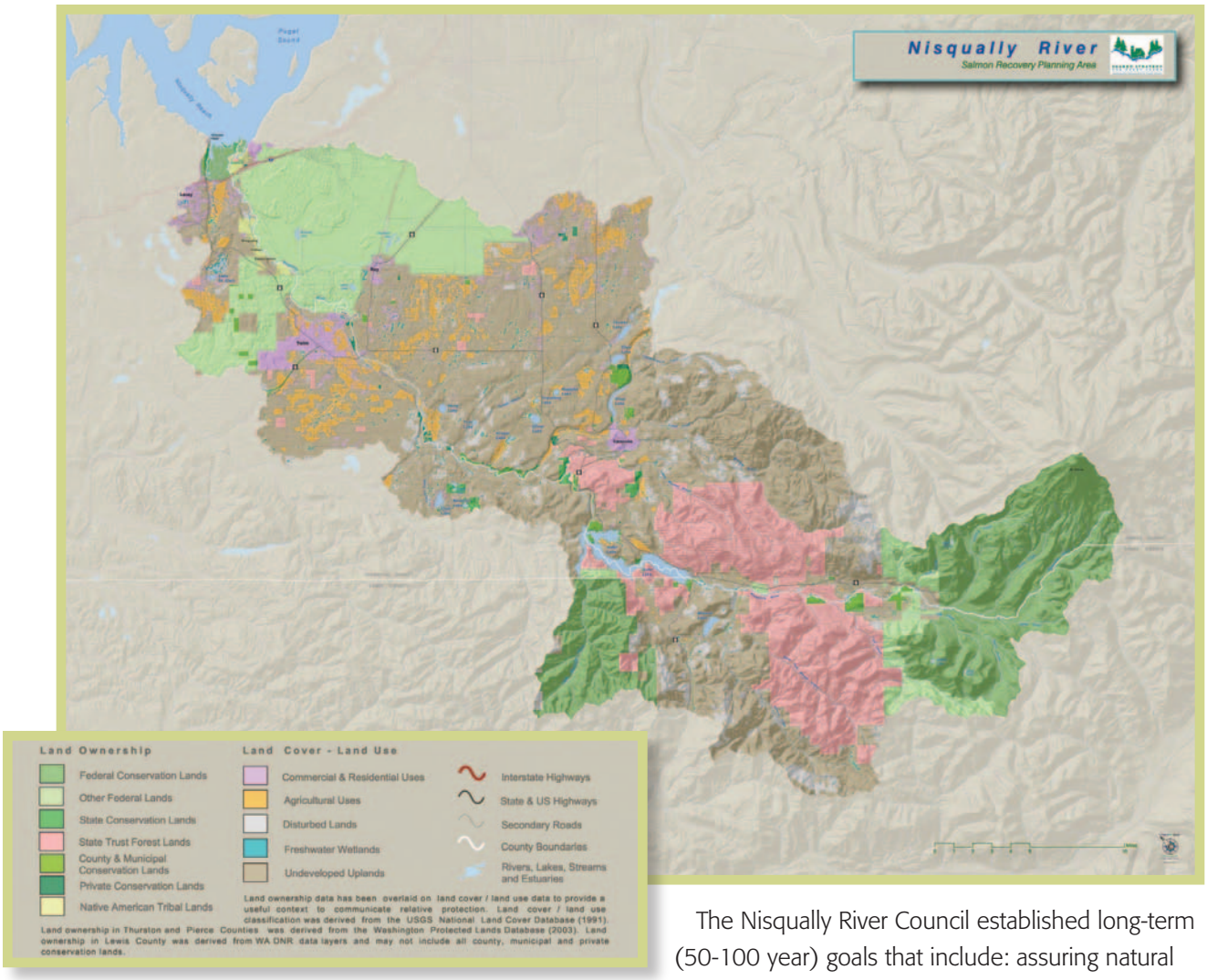
For decades, the Nisqually has been richly endowed with leaders that have provided local innovation and set the course for the State in natural resources. Billy Frank, Jr. and other tribal members challenged the federal and state governments to win back fishing rights for all tribes and set up a co-management structure between the Puget Sound tribes and the State Department of Fish and Wildlife to care for the treasured salmon and other fish and shellfish. Billy was joined two decades ago by some of the finest leaders in the State's history in creating the Nisqually River Council. These leaders brought together skeptical farmers, timber companies and local government officials to create a future for all. Today, the Nisqually Tribe continues to work closely with Fort Lewis, the Counties, city governments, and watershed residents to find solutions that allow the military, farming, forestry, the local economy and fish to thrive.

Over the last 30 years, significant advances have been made to protect and restore the watershed. Seventy percent of the mainstem river is in protected status under federal, state, local and private agreements. Recently, the Nisqually Tribe acquired 410 acres of the Braget family farm, most in the lowlands and estuary of the Nisqually. The purchase will result in restoration of all diked habitat on the farm. More than 30 acres of the farm were restored as tidal habitat when a dike was breached in November 2002, and the Tribe plans to restore an additional 110 acres on the property within the next year. In addition, the Nisqually Wildlife Refuge just completed its Comprehensive Conservation Plan which includes plans to restore an additional 700 acres of estuarine habitat in the Nisqually Delta.

Photo by Dan Kowalski

The Nisqually Salmon

The Nisqually River hosts several species of salmon including Chinook, coho, winter steelhead, chum, pink, and sea-run cutthroat. Bull Trout also use the estuary for foraging, migrating and over-wintering purposes. As in other watersheds, Chinook because of their large size, rely mainly on the wider and deeper mainstem Nisqually River for spawning. The Mashel River, Ohop Creek and the lower reaches of smaller tributaries are also used and are important so that Chinook, as part of the



species' survival strategy, have several alternative places to spawn and rear.

Recovery Goals

The 2001 Nisqually Chinook Recovery Plan lays out the strategies and actions for salmon recovery in this watershed. This plan is the work of a multitude of interests and expertise in the watershed. The Plan has the full support of the Nisqually River Council and was adopted officially by unanimous vote in 2001. Members include the co-managers, Thurston and Pierce counties, and the incorporated cities in the watershed. The implementation of the plan is supported by those members through participation in the NRC as well as through local regulatory updates to critical area ordinances.

The Nisqually River Council established long-term (50-100 year) goals that include: assuring natural production of fall Chinook in perpetuity by providing high quality, functioning habitat and by developing a self-sustaining, naturally spawning population. The goals translate into specific targets for returning adult fish with an average 3,600 natural origin recruits. Achieving these numbers of fish will ensure sustainable harvest, provide significant contributions to the recovery of other important species at risk and enhance natural production of all salmonids. The collaborative efforts used to reach these fish goals will also ensure that the economic, cultural, social, and aesthetic benefits derived from the Nisqually ecosystem will be sustained in perpetuity.

Over the next twelve years, in pursuit of their long-term goal for a self-sustaining population, the Council will strive to achieve an annual return of

1,200 fish to their spawning grounds, with a contribution of hatchery origin recruits comprising no more than 30% of the spawning population. They hope to also have an annual in-river harvest of 10,000 - 15,000 fall Chinook provided it is consistent with conservation objectives in the previous goal.

Chinook Population	Mean spawner abundance 1996-2000	Low Productivity		High Productivity
		Planning Range for abundance	Planning targets for abundance (with productivity in parentheses)	
Nisqually	890	13,000 – 17,999 (1.0)	13,000 (1.0)	3,400 (3.0)

What is the current status of threatened Salmon populations?

The Nisqually Chinook enter the river from July through September and peak spawning occurs in mid-October. Historically some fish returned earlier in the spring, but these were last observed in the early 1950s.

Since the mid 1970s, Nisqually Chinook have been managed as a single population for the purpose of supporting treaty and non-treaty fisheries. Native Chinook have been extirpated as a consequence of habitat loss, hatchery introductions, and high harvest rates. The current production consists primarily of hatchery releases with some natural spawning in the mainstem and lower reaches of major tributaries. Since 1999 the co-managers have been managing for an escapement objective of 1,100 fish. This objective has been met or exceeded in five of the past six years.

What are the key factors contributing to the current status of the populations?

Habitat degradation is one of the primary reasons for the decline of Chinook in the Nisqually basin. Hydroelectric development accounts for one series of events that has contributed to habitat degradation. In the 1900s two major hydroelectric projects were constructed in the basin: the City of Centralia's Diversion Dam, and the City of Tacoma's Nisqually Hydroelectric Project at Alder LaGrande. The Centralia Dam, located approximately half way up the anadromous portion of the Nisqually River, did not have a fish ladder for many years, limiting Chinook access to important upstream habitat areas. There was also no mechanism to ensure juvenile salmon migrating downstream did not pass through the Centralia powerplant turbines. In addition, until flow management agreements were reached during the federal relicensing process for the dams, both the Centralia and the Tacoma projects created significant changes in flow in the river, dewatering the river during important juvenile rearing periods and scouring salmon eggs out of the river bottom with sudden massive flow releases.

Other impacts to habitat, beyond the dams, have been caused by past forestry and agricultural practices and encroaching urbanization. Some of the

Key Facts

Land use and ownership patterns in the upper watershed is 78% forestry and recreation, 18% national park lands, 2% agriculture and 2% urban. In the lower watershed 22% forestry, 18% forest/prairie (military-owned), 4% agriculture, 49% rural/residential, 3% residential, 2% urban.

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Located in Thurston, Pierce and Lewis counties, cities in the watershed include Eatonville, Roy and Yelm.

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The planning area for the watershed under the state Watershed Management Act is Watershed Resource Inventory Area (WRIA) 11.

Photo by Dan Kowalski

the upper portions of the watershed that have been in forestry production were not managed to protect the streams. Impacts included loss of mature forest riparian buffers and severe sedimentation problems from forestry road construction. Past agricultural practices included the ditching and straightening of streams and draining of wetlands including much of the lower four miles of Ohop Creek and the diking of most of the estuarine wetlands to create farmland. Encroaching urbanization has resulted in bank hardening and removal of riparian buffers at certain locations along the mainstem Nisqually, Mashel River and Ohop Creek limiting their ability to migrate within their floodplains.

The natural population of Nisqually late returning Chinook were also impacted by historically high rates of harvest. These rates have increased since the turn of the century with fishing in unconstrained mixed-stock sport and commercial fisheries. Hatcheries were built throughout the South Puget Sound in an attempt to satisfy the burgeoning fisheries. As more hatchery fish were produced from the 1950s through the 1990s, the Nisqually River Chinook population became even more established as a hatchery or secondary management unit.

During this period generic measures were taken in an attempt to control this impact, including fishery management models used in the Pacific Fisheries Management Council forum, the North of Falcon process, and the development of the Pacific Salmon Treaty. Direct benefits to the Nisqually Chinook were small.

Hatcheries are also an important factor in understanding the current status of Chinook in the Nisqually. The need to preserve the genetic composition of native Chinook was completely ignored in early hatchery programs. From 1942 to 1970, a total of 8.4 million juvenile hatchery Chinook were introduced from other Puget Sound basins and released into the Nisqually Basin. From 1971 to1990 a total of 22.5 million hatchery Chinook were out-planted in the basin.

In recent years, there have been efforts to address these hatchery issues. The Nisqually Indian Tribe has begun to reform its hatchery enhancement efforts. The Tribe operates two hatcheries in the basin: one at Kalama Creek and one at Clear Creek. Each of these facilities includes an adult trap for returning broodstock. Returning Chinook from both facilities are known to contribute to natural spawning. The objective for fall Chinook escapement to the spawning grounds in excess of 1,100 has been met for five out of the last six years. In 2004, 2,600 Chinook returned to the river, which is described as "drastically up from 400 a decade ago" (NWIFC NewsNet 4-5-05). Additionally, the Nisqually Tribe is working with the Hatchery Scientific Review Group (HSRG) to design a program to reform hatchery practices in the next 12 years.

The Nisqually Fall Chinook are beginning to benefit from the results of a twenty year effort to protect and restore critical habitat. These successes include the permanent resolution of a number of challenges to Nisqually Chinook survival.

Instream flows, the minimum amount of water required in a stream to maintain the existing aquatic resources for salmon and other species, have been set for the mainstem Nisqually River in

1985 through the FERC relicensing process for the river's hydroelectric facilities. The instream flows were established based on the needs for Chinook and steelhead during spawning and for steelhead juveniles during summer rearing. The flow settings also accommodate the needs of other species. In addition, the tributary instream flows in the basin are regularly being met, except in the Mashel River near Eatonville. Currently, the Nisqually Chinook Recovery Team is investigating actions to increase the reliability of these tributary flows.

Tributary watersheds which are important for Chinook spawning, specifically the Mashel River and Ohop Creek are managed, mostly in the upper portions, under habitat conservation plans and the Forests and Fish agreement. Best management practices and cooperative collaborative relationships have led to agricultural practices that are more consistent with the needs of salmon. Both of the lower reaches of Mashel River and Ohop Creek are targeted for substantial restoration efforts in cooperation with local landowners in the next few years.

In the lower basin, large sections of land adjacent to the Nisqually River are protected from urban development because they are enclosed by Fort Lewis, the Nisqually Indian Reservation, and the USFWS Nisqually Wildlife Refuge. Other sections of land are safeguarded as major public landholdings. These include the Gifford Pinchot National Forest, Washington Department of Natural Resources, Mt. Rainier National Park, WDFW lands, the Nisqually-Mashel State Park, City of Centralia Hydroelectric Project, and the City of Tacoma Nisqually Hydroelectric Project. The non-profit land conservancy in the watershed, the Nisqually Land Trust also is the owner of a number of significant salmon habitat properties. To date, about 70% of the mainstem riparian habitat of the Nisqually River has been placed in permanent protection.

There are four significant habitat factors continuing to limit the Chinook population:

1. The I-5 Bridge and placement of fill on which portions of the Interstate highway runs through the lower Nisqually restricts natural channel migration and limits the upper extent of the estuary.
2. The Centralia Diversion Dam
3. Human population growth is a concern especially in the Mashel River and Ohop Creek tributary watersheds. The NRC is concerned that in the future, portions of these watersheds may convert to a high percentage of urban or rural-residential use. (2001, 10)
4. Development along the nearshore environment has resulted in significant hardening of the shoreline.

Overall Approach to Recovery

The Nisqually River Council is structuring their approach to recovery around strategies related to addressing the habitat needs of Chinook, harvest practices, and hatchery management. The NRC has

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identified the need to protect, enhance, and restore prioritized habitat in the basin. The plan calls for the development of a single genetic stock to be maintained through appropriate hatchery practices. Harvest practices will be managed to allow sufficient numbers of adult Chinook to reach spawning grounds.

Recovery strategies were developed with the understanding that the I-5 and the Centralia Diversion Dam were factors currently beyond the reach of the Council to reform. A scientific model (EDT) was used to analyze each stream reach in the Nisqually River to identify other habitat attributes that have contributed to the loss of Chinook performance from their historic status (August 2001, 32). The highest priority restoration area in the watershed is the Nisqually Estuary. The model suggests that by restoring all available estuary habitat in the Nisqually that the number of naturally produced Nisqually Chinook salmon could double. The Nisqually Chinook Recovery Team's strategies also focus on improving spawning and rearing habitat in freshwater that will result in higher productivity, abundance, and life history diversity. The plan places a high priority on the nearshore and marine habitat for out-migrating juveniles.

Habitat recovery goals will be achieved through protection and restoration strategies. Long-term protection will be achieved by identifying key areas where protection is most needed and acquiring them, and by working with regulatory agencies to develop, maintain, and enforce strong regulatory protections. (5/05, 14). Acquisition of certain properties and/or development rights will occur where necessary to prevent degradation and to allow for active and passive restoration, and/or where development is incompatible with protection of aquatic systems.

Freshwater habitat restoration efforts are focused on Ohop Creek, the Mashel River, and the mainstem because it is estimated that about 70% of the historic production would have originated

from the mainstem Nisqually, and more than 25% of the historic population would have originated from Ohop Creek, Mashel River, and the mouths of smaller mainstem tributaries. Currently, the mainstem comprises nearly 90% of the Nisqually Chinook population. The higher percentage of fish using the mainstem than was historically the case is primarily due to the decreasing quality of habitat in the tributaries, forcing salmon to seek refuge in the better quality habitat found in the mainstem (Nisqually 2001, 31).

The primary strategy for hatcheries in the Nisqually is focused on fostering locally adapted late returning Chinook in the Nisqually basin. Currently, the Nisqually Tribe is working with the Hatchery Scientific Review Group (HSRG) to design and implement a programmatic hatchery change by 2006 to become compatible with the natural stock objectives. The target stock composition, if achieved, will help reduce the effects on both the productivity (the biological system's ability to supply organisms with energy and resources to feed, grow, and survive) and other ecological effects of interactions with fish that have spent essentially all of their life-cycle in the wild and whose parents spawned in the wild (natural origin fish) by limiting the amount of direct interaction and influence with hatchery fish.

A significant part of the Council's strategy revolves around "H- Integration," or the integration of habitat, hatchery, and harvest programs and actions considering the collective impacts and interactions of all three components. The habitat recovery strategy described in the 2001 Nisqually Recovery Plan is being revised to ensure that it is consistent between habitat, hatchery and harvest sections. A model developed by the HSRG (the AHA model), is being used to analyze the combined effects of hatchery, harvest and habitat actions and to evaluate the potential success of meeting specific goals and objectives.

Key strategies and Actions Supporting the Overall Approach to Recovery

Habitat

1. Restore estuary and nearshore marine environments

A substantial portion of estuarine habitat important to juvenile late returning Chinook, has been impacted by railroad construction beginning in 1912, the Interstate 5 crossing, and diking. The I-5 Bridge and placement of fill restrict natural channel migration and limit the upper extent of the estuary. Historically, the Nisqually estuary extended upstream of I-5, and multiple slough channels crossed the Nisqually delta. Downstream of I-5, the delta is now largely within the National Wildlife Refuge. Much of the area is currently not accessible to juvenile and adult Chinook because of extensive dikes originally constructed for farming on the saltwater face and riverine side of the estuary. (2001, 23). To restore and protect these estuarine and nearshore environments, the Nisqually Recovery Plan

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seeks to acquire and protect all non-public estuary properties, restore former estuarine habitat, work with USFWS to restore former habitat (especially in the Nisqually Wildlife Refuge), work with Fort Lewis and private landowners to restore former estuarine and palustrine habitat, as well as conduct studies to further identify and prioritize key habitat areas.

2. Restore and Preserve the Nisqually River mainstem

Generally, all mainstem geographic areas were determined to be essential for preservation because of their high use by Chinook and because habitat conditions, although moderately degraded in some reaches, are intact. The Reservation reaches along the mainstem are considered the best example of pre-1850 conditions. These are considered near pristine and are ranked highest for protection. The goal is to acquire, protect or restore habitat values on 90% of 84 miles of shore lands along the mainstem Nisqually (Mainstem sample actions Appendix 4, 2001).

Protection will be achieved by acquiring mainstem shoreline habitat, securing commitments for permanent protection of critical tribally owned properties, and securing commitments for permanent protection on critical publicly owned properties (USDOD/Fort Lewis, Tacoma Public Utilities and City of Centralia properties). Restoration will be achieved by restoring lost off-channel habitat and enhancing existing habitat, investigating placement of in-stream large woody debris, developing and implementing a long-term plan to reduce impacts of existing residential development in the floodplain, and by developing and implementing a long-term plan to restore a river meander belt and reestablish connections with side channels along the mainstem.

3. Restore and Preserve the Ohop Creek and the Mashel River subbasins

Restoring and preserving the Ohop Creek and Mashel River subbasins are a high priority because of their importance to the life history diversity of Nisqually Chinook. Specific attributes targeted for restoration in the Ohop and Mashel sub-basins are sediment load, riparian and in-stream habitat, channel stability and in-stream flows.

To address these priorities, a comprehensive Lower Ohop Restoration Plan will be developed within the next couple of years. Elements will include (1) identifying all current landowners willing to allow restoration plans to be developed, 2) assembling relevant site information needed to develop a stream corridor and wetland restoration plan, 3) developing restoration designs for specific areas within the reach that will address the stream's ability to meander in areas that have been straightened, 4) reconnecting wetlands, and re-establishing wetland vegetation, 5) channel configuration, planting and instream structures, and 6) preparing cost estimates, long term maintenance needs, and monitoring recommendations.

In the Mashel sub-basin, biological assessments determined that protection strategies are needed for the downstream stretch of the Mashel River and that restoration was needed for the upstream stretch of the river. Due to forest management activities, some reaches in the Mashel sub-basin currently experience greater sediment supply and lower recruitment of wood to the channel than they did historically. Improved forestry management practices are expected to restore channel stability, habitat diversity, and to reduce sediment load.

A restoration plan will also be developed for reaches affected by the City of Eatonville, which will also emphasize the Mashel River, as well as Lynch Creek and Twenty-five Mile creek. Elements of the plan include 1) working with city and private landowners to identify areas for which restoration plans can be developed, 2) assembling relevant site information needed to develop a stream corridor restoration plan, 3) development of restoration designs for specific areas within the reach that will address channel configuration, planting, dike removal or setbacks, 4) restoration of summertime stream flows in the de-watered section, and in-stream structures, and 5) cost estimates for long-term maintenance needs and monitoring recommendations.

4. Protect and restore key mainstem tributaries

While mainstem tributaries currently make a much lower contribution to preserving the abundance of Nisqually Chinook, protecting these streams from further degradation is important for maintaining population life history diversity. The main factors of decline are habitat diversity and sediment load, reduced flow during fall and early winter affecting adult migration and channel stability (increased bed scour during egg incubation). Actions for protecting and restoring mainstem tributaries include evaluating the effects of changing water withdrawal by the City of Olympia, acquiring development rights in targeted areas (Lackamas, Toboton, Tanwax, Powell, Horn and Murray Creeks), and developing a long term plan to restore natural channel configuration in certain areas. (August 2001).

5. Evaluate the effects of water well withdrawals

In order to ensure achievement of established minimum flow levels, the effects of well water withdrawals on summertime stream flows will be evaluated in both deep and shallow aquifers.

Hatchery

1. Utilize brood stock only from the Nisqually River basin

When hatchery fish with a different genetic composition from wild Chinook native to the Nisqually River basin are used in hatcheries, fish that escape the hatchery program and mate with wild Chinook negatively impact the genetic diversity of the wild population. Using Chinook from only the Nisqually River to propagate the subsequent generation of hatchery fish will reduce the impact on wild fish from hatchery-origin fish that mate with wild fish.

2. Implement a mating strategy to reduce the loss of genetic diversity

Hatcheries often do not mimic natural mating processes and can result in a loss of genetic diversity. Efforts will be made to use mating strategies in hatcheries that will reduce negative impacts to genetic diversity.

Harvest

1. Stagger the fishery

The current strategy for managing harvest is to schedule the fishery for four days on and three days off to allow Chinook throughout the run time to pass upstream, rather than concentrating all the fishing effort on the early portion of the run and allowing only the later returning fish to pass upstream. This strategy mimics nature in that it allows migrating adults to spawn throughout the timing of a natural run and leads to a locally adapted stock.

2. Install a seasonal weir above the hatcheries

Scientific models are being used to evaluate the implications of various strategies that will enable the Nisqually watershed to meet its goals, including appropriate harvest rates and hatchery contribution on the spawning grounds. One of the strategies

being evaluated is the use of a seasonal weir in the river just above the hatcheries that will allow them to control the contribution of hatchery and natural origin fish on the spawning ground.

3. Continue to implement a coded wire tag

Harvest managers will continue the coded wire tag and mass marking program and will develop a reliable methodology for calculating spawning escapement (the number of fish allowed to escape harvest to spawn).

Adaptive Management

Though the most recent revision of the plan was drafted in 2001, the plan is considered to be a living document that will be implemented and adapted over time. The Nisqually Chinook Recovery Plan is currently in its fourth year of adaptive management.

The adaptive management process is driven by an annual work plan. Monitoring and evaluation actions are viewed as an integral part of adaptive watershed management. The current program addresses implementation, effectiveness, and validation monitoring and uses the EDT approach for organizing, recording and documenting new data and information and for tracking progress. A revised monitoring and evaluation plan will be developed by fall of 2005 using Managing for Success, a model originally developed for hatchery actions by the HSRG and currently being expanded to accommodate harvest and habitat actions. The tool will also allow the team to choose variables that are affected by multiple actions across the landscape to provide a coherent and integrated approach to monitoring and evaluation.

An intensive pilot monitoring program is being developed for the Mashel River. The planning team anticipates that it will be used as the basis for a similar basin-wide monitoring plan.

Monitoring the productivity of the natural stock will show whether planned actions to limit direct interaction and influence of hatchery fish will be effective in reducing negative effects to natural origin fish.

A monitoring and evaluation program to track natural origin recruits and hatchery origin recruits in the fishery and on the spawning grounds is currently being implemented and is subject to refinement. Hatchery fish have been mass-marked for the past four years. Monitoring the marks in the fishery - both Tribal and creel census and also in a test fishery and on the spawning grounds - will be used to develop alternative and accurate methods of estimating escapement. The data will also assist in gaining a better understanding of the hatchery stray rate and the effectiveness of harvest and other strategies for reducing the hatchery stray rate.

Results

The watershed plan for the Nisqually watershed was reviewed by the Puget Sound Technical Recovery Team (TRT: a group of seven scientists) and an interagency committee facilitated by the Shared Strategy staff. The TRT reviewed the plan to determine the degree of certainty that the plan can achieve recovery goals. The conclusions of this analysis are below. For the most part, the issues identified below by the analysis are discussed in the watershed plan, but the reviewers felt they merited particular attention to increase the certainty of achieving plan outcomes. Where the analysis identified key uncertainties, proposals are included for consideration. If implemented along with the watershed plan's other actions, these proposals would increase the certainty of results and achieve the requirements for a recovery plan under the Endangered Species Act.

The long-term history of the Nisqually River Council and the Nisqually Chinook Recovery Team proves the benefits of a collaborative approach among key stakeholders and interests. Over the past 20 years, significant actions have protected and restored important portions of the watershed. Of particular note is the protection of the mainstem and restoration of the estuary. The overall plan for recovery is comprehensive and well documented. The Council is commended for their use of adap-

tive management over the last several years since adoption of the Nisqually River Plan. Recent adoption of an in-stream flow program will ensure flows are protected and improved where necessary for recovery of the Chinook populations.

Increased focus on the Ohop and Mashel tributaries called for in the plan will provide important information to improve the fish use and productivity of these main tributaries. It is important that restoration plans for both of these tributaries be completed in the next few years to determine the potential of these systems, ensure adequate protection and initiate restoration where it will have a significant benefit for the Chinook population.

Unfortunately, the Nisqually population, like others in Puget Sound, has suffered from past hatchery and harvest activities, resulting in the loss of the native Chinook population. The NRC approach to developing a locally adaptive population over time is the best approach given the current conditions. Achieving this goal will be one of the biggest challenges for creating a low risk population in the Nisqually. It will be essential that the hatchery and harvest management programs assess progress over time to determine if the right mix of hatchery fish and naturally spawning fish are achieved. The Nisqually approach to H-Integration is one of the strongest in Puget Sound. One critical component is early implementation of efficient approaches to capture hatchery returns to ensure that too many do not overwhelm the returning naturally spawning adults.

The review process also identified a number of issues and uncertainties that are common to many Puget Sound watersheds. Strategies to address these issues that are contained in this local watershed chapter are a good approach, based on the current state of scientific understanding. Nevertheless, because (1) these issues are very important to the success of watershed approaches to recovery and (2) the effects of some of these strategies on salmon populations at watershed scales are relatively untested, these issues deserve particular attention. Reducing the uncertainties in the issues below could come through local and/or regional inclusion in adaptive management and monitoring programs, regional or local pilot studies to explicitly test their effects, or through additional implementation actions. The complexities associated with these issues are discussed in the regional strategy section of this document or in the regional adaptive management and monitoring program. The "cross-watershed" issues identified are:

- The importance of habitat protection strategies and the need to assess the results for fish from the combination of protection tools available,
- The need to develop H-Integration strategies or, where they are included, to move them further along the integration continuum over time,
- The need to reconcile local nearshore strategies and actions with the regional nearshore chapter,
- The need to address water resources, both water quality and water quantity,
- The need to better link the effects of land use to habitat-forming processes and to habitat conditions. In turn, the effects of these changes in habitat, processes and landscapes on salmon populations need to be estimated,
- The need to develop or complete a robust adaptive management and monitoring program.

If the proposals above are implemented, this watershed and its Chinook population will provide a critical contribution to the recovery of Puget Sound Chinook.