EXECUTIVE SUMMARY

Technical Assessment & Recommendations

for Chinook Salmon Recovery

in the Stillaguamish Watershed

September 2000

A. INTRODUCTION

Chinook salmon (Oncorhynchus tshawytscha) were listed as threatened under the federal Endangered Species Act (ESA) in March 1999. Other anadromous fish species within the central Puget Sound region have since been listed (e.g. bull trout—Salvelinus confluentus) or are currently a candidate species (e.g. coho salmon—Oncorhynchus kisutch) for ESA protection. This report describes the effects of hatchery management, harvest, and historical land use on chinook salmon (chinook) populations in the Stillaguamish Watershed (Water Resource Inventory Area 5), which is located in the western Cascade Range and Puget Lowland of Washington state (Figure 1). Substantial evidence has been accumulated to document the decline of chinook salmon in the Stillaguamish and throughout Puget Sound.

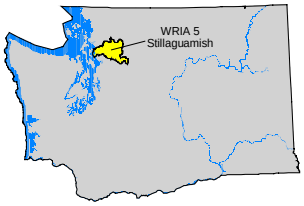

Figure 1. Location of Stillaguamish Watershed

This report is intended to provide a foundation for understanding chinook life history stages, the human-induced impacts on these life stages, and the technical basis for chinook recovery for the approximately 1,813 km2 (700-square mile) watershed. Its objectives are to identify and quantify, to the extent possible: 1) historic resource conditions; 2) changes to this resource that have caused a threatened chinook status; 3) restoration goals for Stillaguamish chinook; 4) required modifications in hatchery, harvest, and habitat; and 5) a restoration strategy to achieve the identified changes. While providing a base of technical information and recommendations that focus on the measurable short-term and long-term benefits for chinook, this report also lays the groundwork for a multi-species salmonid recovery plan.

Approximately 25 individuals with technical and planning expertise in the watershed comprise the Stillaguamish Technical Advisory Group (STAG), which has provided the main contributions to this report. These individuals represent state and tribal fisheries co-managers and other private and non-profit organizations and agencies that affect habitat.

B. WATERSHED OVERVIEW

The Stillaguamish River drains an area of approximately 181,303 hectares (448,000 acres) and includes more than 7,432 km (4,618 miles) of streams and rivers. The river enters Puget Sound at Stanwood, 25 km (16 miles) north of Everett in northwest Snohomish County. Elevations in the watershed range from sea level to about 2,086 m (6,844 ft) on Whitehorse Mountain. The Stillaguamish Watershed can be divided into three general regions (Figure 2): the North Fork, South Fork and the Lower Mainstem. Pilchuck, Deer, and Canyon Creeks are the three largest tributaries to the Stillaguamish system.

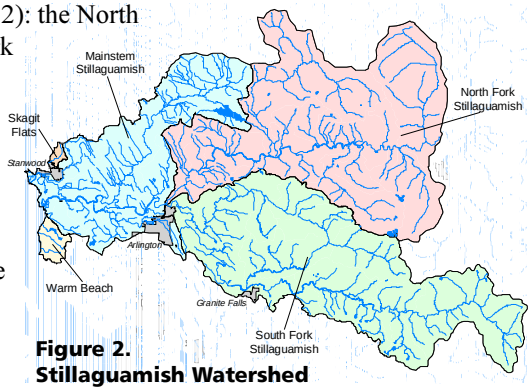

Figure 2. Stillaguamish Watershed

The climate is typically maritime with cool, wet winters and mild summers. Precipitation and streamflows are highest in late autumn and winter as a result of rainstorms and rain-on-snow events. During the summer dry period, the lowest flows occur usually from July through September.

C. STATUS OF THE CHINOOK SALMON POPULATION

Chinook salmon spend their earliest and latest life stages in freshwater river and stream habitats. Like many anadromous Pacific salmonids, chinook salmon spend most of their adult lives feeding in saltwater. The majority of adults return to freshwater as three and four year olds to reproduce.

Pre-development (1870) estimates of Stillaguamish chinook escapements (adult fish returning to spawn in the river) ranged from 9,700 to 13,321. This contrasts sharply with estimates of 400 to 1,550 returning fish for the years 1986-91 (Figure 3 on next page). Escapement figures from 1999 estimate only 1,098 returning adult chinook, falling well below the current escapement goal of 2000 fish (WDF 1977).

Stillaguamish-origin chinook salmon are vulnerable to harvest in recreational and commercial fisheries throughout their adult range, from Alaska to the Puget Sound. Because the stocks are depressed, the Stillaguamish Tribe has not had a directed chinook salmon fishery in the Stillaguamish River for two decades. Since 1952, hatchery programs in the watershed have attempted to enhance fishing opportunities and mitigate habitat loss. The current tribal natural stock restoration program contributes an

Stillaguamish Technical Advisory Group Technical Assessment Participating Organizations: Stillaguamish Tribe of Indians, Snohomish County Public Works Surface Water Management Division, Tulalip Tribes, Washington State Department of Fish and Wildlife, U.S. Forest Service, Washington State Department of Ecology, Stillaguamish Flood Control District, Snohomish Conservation District, U.S. Army Corps of Engineers, Washington State Conservation Commission, National Marine Fisheries Service.

This scientific report has been written as a guide for future salmon recovery efforts. It is not intended to represent an existing plan, course of action or program of the authoring agencies. It is the first step towards a multi-species salmonid plan resulting from broad based stakeholder participation.

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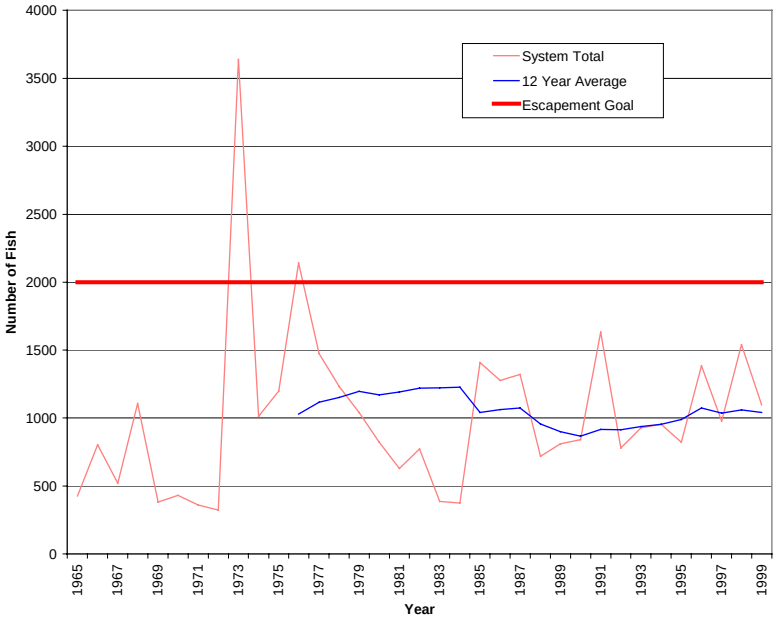

Figure 3. Summary of chinook salmon escapement in relation to the overall escapement goal in the Stillaguamish Watershed, 1965-1999.

estimated one-third of the returning adults to the spawning habitat within the North Fork of the Stillaguamish River.

The National Marine Fisheries Service (NMFS) has determined that the Stillaguamish Chinook Natural Stock Restoration Program is one of the six essential hatchery programs within the Puget Sound necessary for recovery of the ESU. Based on NMFS' assessment of population decline and habitat degradation, the North Fork Stillaguamish stock would likely further decline and go extinct without the intervention of the natural stock restoration program (NMFS 1999).

D. FACTORS AFFECTING THE POPULATION

Historically, agricultural and forestry land uses were the source of most habitat loss in the Stillaguamish Watershed. Losses of estuarine salt marsh and tidal channels from reclamation of tidelands, constricted channels, and cut-off sloughs have significantly reduced the quantity and quality of juvenile and adult salmonid habitat. Furthermore, the long-term absence of mature riparian vegetation throughout the floodplain has had detrimental effects on existing habitat.

Riparian and upland clearing has led to large changes in channel morphology and peak flows, filling of holding pools, loss of wetlands, channel instability and a reduction in large woody debris (LWD). Most of these impacts have been caused by logging and road building in the forest zones. These activities have also resulted in increased fine sediment loads, which are known to be the primary cause of reduced salmon egg-to-fry survival.

Presently, conversion of existing forest and agricultural lands to rural residential and urban uses is a leading issue for salmon recovery. Human population pressures and growth near critical areas are leading mechanisms of landscape alteration. Stream hydrology, morphology, water quality, and ecology are all negatively impacted as permeable soils are compacted or covered by structures, concrete, and asphalt (i.e. impervious area). The cumulative effects of impervious area can result in poor stream habitat characteristics that do not support salmonids.

Incidental and directed harvest impacts have been a significant factor affecting Stillaguamish chinook for decades. Overall rates of exploitation have recently declined from 50-80% in the late 1970s to 25-35% in the late 1990s. State and tribal managers currently set maximum allowable exploitation rates, including all sources of fishery-related mortality affecting this stock, at levels that will not impede the ability of the stock to recover to healthy, sustainable levels of production.

The potential demographic impacts to wild populations from hatchery supplementation programs are also considerable. Hatchery-produced fish lack genetic vigor, transfer disease to wild fish, and may compete for food resources and space. Furthermore, increased hatchery production theoretically makes more fish available for harvest, resulting in increased harvest pressure on wild salmon intermingled in pre-terminal mixed stock fisheries.

E. DESIRED FUTURE CONDITIONS

The recovery goal for the Stillaguamish Watershed is to protect, restore, and enhance the abundance, geographic distribution, and diversity of all stocks of wild chinook salmon produced in the watershed to a level that will sustain fisheries, non-consumptive fish benefits, and other related cultural and ecological values.

The overall objective of listing the Puget Sound chinook as threatened is to restore the Evolutionarily Significant Unit (ESU) to a self-supporting population that does not require legal intervention to maintain its existence, while complying with other ESA requirements (NMFS 2000). Within the Stillaguamish Watershed, the primary objective is to restore chinook to a level where natural stock production is healthy enough to support ceremonial, subsistence, recreational and commercial fish harvests. The relative health and viability of the population will be judged by its abundance, productivity, population structure, and diversity (NMFS 2000). These factors are essential to a viable salmon population and depend on properly functioning habitat.

1. Future Hatchery Operation

Future hatchery goals include maintaining the genetic integrity of both natural spawning populations within the Stillaguamish Watershed and the brood stock population used for the natural stock restoration program through continued genetic monitoring. Because it has been demonstrated to reduce the impacts of domestication within the hatchery and improve survivorship, the co-managers (WDFW & Tribes) will create more natural rearing conditions within the hatchery.

Another goal of the hatchery program is to assist the naturally spawning fish in rebuilding their numbers to a consistent, self-sustaining population that does not require human intervention in order for the population to support directed and incidental harvests. Co-managers will determine the future need and size of a chinook hatchery program to meet other management objectives such as the U.S./Canada Indicator Stock Program.

2. Future Harvest

Upon achieving recovery goals, fishery plans will be designed with the following considerations:

- Harvest-related mortality rates will be at or below levels that would jeopardize the populations.
- All sources of harvest-related mortality will be used to develop and evaluate harvest management plans.
- Risk buffering will be used to minimize the probability of over-harvest.
- Harvest-related mortality will not result in considerable alteration of important population characteristics.
- Maximum sustainable harvest (MSH) will set harvest levels no higher than the level that will, over the long term, provide the maximum level of harvest, given the above constraints.

3. Future Habitat Conditions

Habitat goals for the Stillaguamish include maintaining and restoring natural watershed processes and a dispersed and well connected network of high quality habitats. A long term strategy for the development and adaptation of land use activities to achieve these goals should be based on specific objectives. The performance targets below define properly functioning habitat conditions and should be used as the guiding scientific principles for salmon recovery.

Future Habitat Objectives:

- Temperature: Water temperature should not exceed 12-14°C (54-57°F).
- Dissolved Oxygen: Levels should exceed 5mg/l, and ideally be well above 8-9 mg/l.
- Sediment: Fine sediment (<0.85mm) concentrations should remain below 11%.
- Channel Morphology: Main channel habitat on the North Fork Stillaguamish should be increased by 38% including deep holding pools and LWD.
- Hydrology: Annual hydrographs display characteristics of base flow and flow timing comparable to historic (1870) watershed conditions.
- Landslides: Human-induced landslide activity reduced by 70%.
- Wetlands: Restore or create 70% of the lost wetland function.
- Beaver Ponds: Restore beavers and their associated ponds back to 50% of their historic levels.
- Estuary/Blind Channel Habitat: Restore or create 50% of the lost area back to fully functioning estuary/blind channel habitat conditions.

F. RECOMMENDED ACTIONS

1. Hatchery Management Plan

Hatchery reform goals are to conserve indigenous genetic resources, assist with the recovery of naturally spawning populations, provide for sustainable fisheries, conduct scientific research, and improve the quality and cost-effectiveness of hatchery programs (Gorton Science Advisory Team 1999).

Salmon and steelhead hatchery reform should be led in Washington State through the development of programs focused on: 1) adult fish, 2) natural stock genetics, 3) separation of hatchery and wild stocks, 4) monitoring of hatchery impacts, 5) research, 6) fish identification, and 7) adaptive management. Implementation of each of these components will increase the likelihood of salmon and steelhead hatcheries positively contributing to salmon recovery while continuing to provide commercial and recreational fishing opportunities.

Hatchery goals will increasingly be judged on how well they integrate salmon recovery, habitat protection and restoration, and the protection of other native species with the goals of harvest management. In contrast to historical periods, hatchery success will be measured by potential ecological effects (e.g. nutrient input from carcasses, competition with natural fish) instead of the number of fish produced (NWIFC 1996).

2. Harvest Management Plan

Consistent with the overall goal of this technical assessment, harvest of chinook salmon will occur in a manner that will have a low probability of impeding the capability of all natural stocks in the system to rebuild to levels that will support directed harvest and other benefits.

The primary components of the interim harvest management plan are: 1) maintain the exploitation rate on each brood below a level that, accounting for harvest, will not impede the ability of the stocks to rebuild; 2) maintain natural spawning escapement for each stock above a minimum level to assure the continued viability of the management unit; 3) reduce fishery-induced size and age selectivity; and 4) establish recurring evaluation of harvest management and adaptation of the plan based on this information.

A program to collect and evaluate information necessary to develop a long-term harvest management plan for Stillaguamish chinook will continue. The plan will be based on updated assessments of system productivity and capacity. The most important part of the plan will be production functions for each stock relating recruitment biomass to the biomass of fertilized eggs on the spawning grounds. The long-term harvest management plan will be designed to provide long-term maximum sustainable harvest for the entire management unit, under the constraint that the viability and diversity of the production of each stock will not be jeopardized.

3. Habitat Management Plan

The degradation or complete loss of habitat is generally caused by direct human impacts that disrupt natural habitat-forming processes. In the Stillaguamish Watershed, these impacts are exhibited in riparian vegetation, channel morphology, and water quality/quantity, disrupting watershed-scale processes and reducing overall habitat quality. Developing a successful habitat management plan will require a greater understanding of the complex relationships between land use practices, watershed-scale processes, and chinook habitat requirements. Coupling available historical information with future research (while implementing a campaign of protection,

enforcement, and restoration actions) will help land managers define clear and attainable recovery goals for chinook salmon.

Habitat recovery objectives for the Stillaguamish Watershed are: 1) maintain and restore natural watershed processes; 2) maintain a dispersed and interconnected network of high quality habitat that addresses the needs of all life history stages of chinook; and 3) monitor and evaluate certain land use activities so that they can be adapted (where possible) to achieve specific objectives outlined in the document.

Recovery Actions

A complete recovery strategy should outline specific actions and measures for each habitat problem that limits chinook productivity. Each known or suspected habitat problem and the focus of specific actions within the document are outlined below (not listed in priority order):

a) Loss and Degradation of Riparian/Shoreline/Floodplain Vegetation and LWD Recruitment—actions that focus on enhancing riparian areas, promoting retention of mature forest characteristics, and restoring hydrologic connectivity.

b) Loss and Degradation of In-channel and Off-channel Rearing Habitat—actions that focus on maintaining mature forest cover, maintaining low impervious surfaces, and allowing channel migration.

c) Loss and Degradation of Estuary and Near Shore Habitat—actions that focus on the restoration and enhancement of lost or degraded estuarine habitat areas and conditions preferred by chinook juveniles.

d) Loss and Degradation of Spawning Habitat—actions that focus on the restoration of natural hydrologic and sediment regimes, wood recruitment, and channel migration.

e) Loss of Large and Deep Holding Pools for Adult Chinook—actions that focus on improving capacity of riparian area to contribute large woody debris.

f) Degradation of Water Quality—actions that focus on decreasing sediment, increasing hydrologic connectivity and enhancing riparian areas and wetlands.

Chinook salmon recovery will require specific protection, enforcement, and restoration actions that address the root causes of the problem rather than the visible effects.

Protection: Acquiring land use and development rights through conservation easements, land use plans or fee simple purchases should be a core protective action. An acquisition strategy should prioritize properties based on their restoration potential, ecosystem connectivity and threat of development. Additional protection can also be achieved through the revision of aquatic and land use regulations, such as local, state, and federal regulations that are intended to provide protective measures for riparian, floodplain, and near shore habitats. Regulatory frameworks should be assessed with the intent to revise (where necessary): shoreline master plans, hydraulic code, stormwater management, best management practices for farm and rural landowners, critical areas and grading ordinances, zoning, comprehensive plans, and the growth management act.

Enforcement: Increased compliance to aquatic and land use regulations should also be pursued through improved enforcement. Hiring additional enforcement staff and empowering them to enforce regulations will help increase compliance levels. To further increase compliance, enforcement needs to be accompanied by effective prosecution. Increasing inter-jurisdictional cooperation and uncoupling enforcement capacity from administrative constraints will increase the productivity and effectiveness of agencies responsible for enforcing regulations.

Restoration: Effective restoration actions should target fish production bottlenecks and work to restore natural processes that produce and maintain habitat and increase chinook productivity. Restoration efforts aimed at reducing or limiting road densities in landslide prone areas, stabilizing major fine sediment sources (e.g. major landslides), and disconnecting road drainage networks from natural hydrology will address sediment issues that are limiting chinook productivity in the Stillaguamish Watershed. Reconnecting isolated habitats and enhancing riparian areas to restore natural wood recruitment and habitat connectivity will increase habitat availability and complexity for multiple life history stages of chinook. Increasing sediment filtration, ground water recharge, and stormwater retention can be achieved through detention facility maintenance and wetland restoration.

G. NEXT STEPS

Developing and implementing the full range of specific actions to recover chinook salmon will take time. However, much of the guidance in this document can achieve measurable goals in the short term. Jurisdictions and entities with the ability and responsibility to recovery chinook salmon and comply with the ESA should find this comprehensive technical assessment an invaluable guide.

This document will be released to the public in the Fall of 2000. The STAG will then initiate multi-species reconnaissance in the winter of 2001 and begin drafting a multi-species technical assessment built on a chinook salmon foundation. By the fall of 2001, the elements of a multi-species plan will begin to take form. Specific actions to recover and sustain salmonids in the Stillaguamish Watershed will be included. A final multi-species plan and related agreements are scheduled to be adopted by 2003.

The complete plan to manage threatened salmonid stocks will involve the full participation of Stillaguamish stakeholders and jurisdictions that will implement salmonid recovery actions. The involvement of the Stillaguamish Implementation Review Committee (SIRC) will be a key part of this planning effort. Jurisdictions will also have additional opportunities to comment on actions and to propose initiatives that contribute to fish recovery. The Stillaguamish salmonid plan will borrow from regional frameworks, to the extent possible, in pursuit of regional ESU goals and to promote consistent policies that recover salmonids and their habitats.