Snohomish River Basin
Conditions and Issues Report

Project No. 293-001
Executive Summary

Prepared for:

The Snohomish River Basin Work Group

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PREFACE

This report is offered as a starting point for comprehensive, collaborative and informed choices about future uses of Snohomish River Basin water resources. As a public resource, water has many masters with different interests, purposes, legal rights and constituencies. There is considerable information about this basin, but nothing links it into a composite picture. Nor is there any forum to consider and resolve conflicting or competing interests.

The Snohomish River Basin Work Group formed in 1994 and included state, local and tribal governments with interests in water supply, water quality, fisheries habitat restoration and fisheries enhancement. It originally focused on preparing elected officials and citizens for comprehensive, collaborative watershed planning. It selected Pentec Environmental, Inc. to start developing a picture based on all known and available studies, data and information as of August, 1996. Although the Work Group provided direction and guidance to Pentec regarding the report's scope of work, the conclusions presented here are solely those of Pentec.

The 1998 state legislature finally authorized watershed planning, but a proposed listing of Puget Sound Chinook for protection under the Endangered Species Act during the session added a new factor to the water supply, water quality, fisheries equation. This report, however, is no less relevant to anyone interested in the goal of integrated water resource management.

The Work Group will continue to support elected and tribal officials toward this goal, and expresses its appreciation for Pentec's patience through several reviews. For this we give special thanks to Roy Metzgar who managed this project, to Rhett Jackson who was the principal author, and to Jon Houghton, Jeff Fisher, and Mike McDowell of Pentec, who also contributed to the report.

Tom Dickson, Chair — December 1999
Snohomish River Basin Work Group

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EXECUTIVE SUMMARY

BASIN OVERVIEW

The Snohomish River Basin, encompassing 1,780 mi^2, is the second largest river basin draining to Puget Sound. The basin, depicted in Figure 1, includes three major rivers, the Skykomish, the Snoqualmie, and the Snohomish. These rivers and their tributaries support a large salmonid fishery including coho, chinook, chum, and pink salmon, and steelhead trout. The Snohomish River Basin is a major source of municipal water supply for Everett, Southwest Snohomish County, Seattle, Bellevue, other cities, and areas in King County.

Conditions of the streams and rivers of the Snohomish River Basin range from pristine to moderately impacted to heavily impacted, reflecting the variety of land uses, including timber production; urban, industrial, and rural residential; and agriculture. Primary impacts have been caused by diking, channelization of flood-plain tributaries, riparian forest removal, woody debris removal, construction of fish passage barriers, industrial discharges, log rafting, and nonpoint source pollution. With regard to some human activities, the basin is currently recovering from historical impacts. Rapid urbanization is the most detrimental change occurring in the watershed now.

PURPOSE OF THIS REPORT

The Snohomish River Basin Conditions and Issues Report has been prepared to provide basic information for understanding the Snohomish River Basin and its water and resource issues. The report collates and presents mostly existing and some new information on water quality, river conditions, fish habitat, land use, water demand, water availability, and flow conditions in the Snohomish River Basin. It also presents ideas for improving habitat conditions and recommendations for gathering additional data. This report will serve as a reference for addressing water and land management issues.

A central issue in the Snohomish River Basin is the potential conflict between increased human water demand and the desire to maintain and enhance fish productivity. Reductions in summer low flows detrimentally affect the production of certain salmonid species, specifically coho, steelhead, and summer chinook; therefore, increased water withdrawals can reduce fish productivity if they reduce summer low flows. This conflict is summarized well in a report

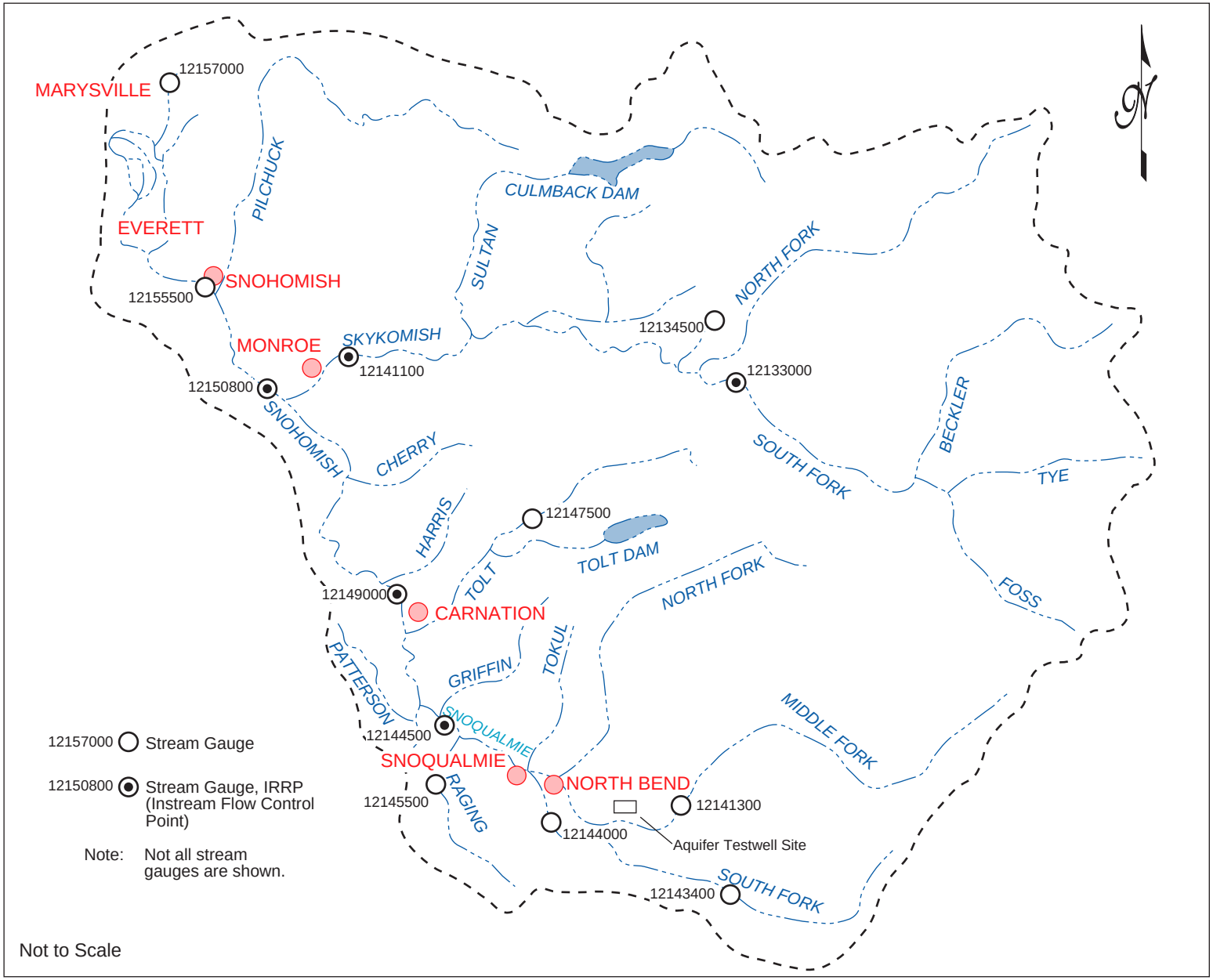

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Figure 1 Snohomish River Basin.

published by the University of Washington on the effects of instream flow requirements on the reliability of the Tolt River water supply system:

> The process of establishing tradeoffs between the needs of water suppliers and the needs of the biological population of a river or stream has been gaining attention in recent years as the demands for potable water have steadily increased. The growth in out-of-stream uses of water such as municipal water supply, water for energy, and water for agriculture, has led to the need to develop measures to effect a compromise between these needs and the needs of instream aquatic populations (Snyder et al. 1983).

FINDINGS

Fish Production and Habitat Conditions

The Snohomish River Basin supports large populations of anadromous (ocean-going) salmonid species, including chinook, coho, pink, and chum salmon, and steelhead trout, Dolly Varden, and sea-run cutthroat trout. On May 24, 1999, the National Marine Fisheries Service (NMFS) formalized the listing of Puget Sound chinook salmon as threatened under the Endangered Species Act (ESA). NMFS has designated the coho salmon as a candidate for listing. The US Fish and Wildlife Service (USFWS) listed bull trout in Puget Sound as threatened, effective December 1, 1999.

Fish habitat, riparian, and flood-plain conditions on the Snoqualmie and Snohomish rivers have been drastically altered from natural conditions by a century of agriculture and transportation activities, including activities such as logging, farming, and diking.

In summary, the major human-caused conditions limiting freshwater production and survival of salmonids are as follows:

1. Reduction of rearing and high-flow refuge habitat (relative to natural conditions) in side channels, sloughs, abandoned oxbows connected to the main channels, and flood-plain tributaries have resulted from channel alteration, diking, and construction of fish passage barriers.

2. A shortage of woody debris, shade, and cover in flood-plain tributaries and rivers has resulted from loss of riparian forest. Woody debris creates pools, traps gravel, and forms cover, all of which are beneficial to fish.

3. Fresh- and saltwater marsh habitat in the estuary have been reduced (70 percent of historical saltmarsh area has been eliminated). Marshes and their distributary channels provide food and rearing habitat for salmonid fry and smolts.

4. Cumulative effects of urbanization—including channel scouring by high flows, reduction of low flows, riparian disturbance, and water quality contamination—have greatly reduced fish populations in some small streams.

Water Use

The Snohomish River Basin has two large municipal water supply systems, more than 15 local water suppliers, and an uncounted number of domestic wells serving fewer than 8 residences each.

According to the Puget Sound Regional Council (1992), population within the Snohomish River Basin is predicted to increase by approximately 53 percent, from 206,000 to 315,000, by 2020, and the total population for King, Pierce, and Snohomish counties is expected to increase 43 percent from 2.6 to 3.7 million. This population growth will increase water demand from 28.6 to 33.1 MGD for within-basin users. For regional water supplies provided by Seattle and Everett the total projected demand is 20.8 MDG. The total projected increase in water demand for 2020 is 51.6 MGD for basin-dependent suppliers. Everett, Seattle, and some smaller, independent water suppliers have developed and begun to implement conservation strategies to reduce water use. Additionally, new water sources are being investigated, and in some cases, water supply development plans are underway.

Because all of the water exported from the basin comes from the Sultan and Tolt river reservoir systems, which are operated to release water in the summer and fulfill instream flow requirements, the current reduction in summer flows in the larger rivers is either imperceptible or enhanced by releases from the reservoirs. Within-basin consumptive use in the summer accounts for about 12 percent of summer flow in the Snoqualmie River, 7 percent in the Skykomish River, and 7 percent in the Snohomish River. The water budget analysis in this report does not apply to small streams, however, and the combined effects of residential

development and associated well withdrawals may have significant impacts on low flows in small streams.

River and Stream Flows

Some fish populations of the Snohomish River Basin may be limited by natural low-flow conditions in the summer. Fisheries research has shown that productivity of coho salmon tends to be higher in years with relatively high summer flows and lower in years with relatively low summer flows in smaller tributaries to the mainstem rivers (Smoker 1953, Neave 1948 and 1949). The young fry of this species must spend one or two summers living in freshwater streams and rivers before moving out to sea. Their summer survival depends on flow adequate to provide cool water and sufficient habitat area, and on other factors, such as cover and shade. Flow-limiting conditions occur frequently in this basin because during the dry months of August and September, groundwater flow often cannot provide enough water to fill the wide channels created by large winter flows.

Current instream flow requirements for August and September exceed the 7-day low flow in more than half the years with recorded flows. In other words, the natural flow regime often does not provide sufficient flow in August and September to meet instream flow requirements and to prevent some fry mortality. Water supply projects that reduce summer low flows will have trouble meeting instream flow requirements unless storage is utilized. In this basin, groundwater aquifers have some short- or long-term connectivity with surface waters, and groundwater withdrawals will cause some reduction in summer flows. Conjunctive use systems may alleviate flow reductions from groundwater withdrawals.

In addition to water withdrawals, land development and logging can also affect low flows. Land development reduces summer flows permanently by reducing recharge to groundwater and increases stormwater runoff, which makes flood flows larger and more frequent. In rural areas, residential development is supported by local well withdrawals, which can have significant impacts on flows in small streams. Low flows in Quilceda and Allen creeks have diminished due to past development, and small streams such as Dubuque, Star, Patterson, Tuck, and Cherry creeks and the Raging River are at risk for summer low-flow reduction due to future development. By reducing evapotranspiration, clearcutting usually increases summer flows for a period of several years. Analysis of the Raging River gauge data indicates that clearcut logging in the 1980s in this basin may have temporarily increased summer flows.

Water Quality

Water quality in the Snohomish River Basin has been affected by unfiltered agricultural runoff, stormwater runoff, riparian degradation, industrial discharge in the estuary, septic tank effluent, and sewage treatment plant discharges. The principal water quality problems affecting fish are reduced dissolved oxygen and elevated summer temperatures. Generally, water quality conditions in the basin are good except in specific locations like Marshlands, French, Quilceda, Allen, and lower Patterson creeks.

OPPORTUNITIES FOR IMPROVEMENT OF FISH HABITAT CONDITIONS

Restoration Projects

There are many opportunities to improve fish productivity in the Snohomish River Basin through restoration projects, aimed primarily at flood-plain habitat and secondarily at estuarine habitat.

- Establish forested riparian corridors and, where necessary, naturalize ditched channel sections on the flood-plain sections of streams such as Cherry, Harris, and Patterson creeks, and Haskel and Ebey sloughs. Forested riparian corridors would provide shade and woody debris and filter agricultural runoff. In some cases, they would also shade out pasture grasses that are clogging the channels. In association with this effort, livestock access to streams and rivers should be reduced.

- Replace culverts and tide gates that block fish access to usable habitat.

- Reconnect oxbow lakes with the main channel flow in the Snoqualmie Valley.

- Breach dikes and re-create marsh habitat in the estuary. Several such projects have already been conducted by Snohomish County, Port of Everett, Washington State Department of Fish and Wildlife, and local diking districts.

- Plant and maintain a forested buffer along the Snoqualmie and Snohomish rivers.

Changes to Regulations

This report on basin conditions would not be complete without discussing known inadequacies of current regulations for protecting existing fish habitat. From a fish productivity viewpoint, protection of existing habitat is as important as, if not more important than, restoring badly degraded habitat. For example, stormwater regulations in Snohomish County are insufficient to protect small streams with significant residential development, such as Dubuque and Star creeks, from hydrologic impacts of new development. Snohomish County should adopt a stormwater ordinance equivalent to the Department of Ecology's Stormwater Management Manual for the Puget Sound Basin. The City of Everett has recently done this.

The Skykomish Valley is the scene of serious land-use problems as new housing developments are constructed within the channel migration zone of the river. Homeowners must fight the river to maintain their property, and many homeowners have lost that fight. To reduce further instances of these conflicts, Snohomish County should adopt the Skykomish River Flood Hazard Reduction Plan.

The Washington Department of Natural Resources (DNR) should review the success of riparian zones left by recent timber harvest activities on the south side of the Skykomish River. Within the channel migration zone, the Skykomish River can easily erode 100 ft of bank in a single flood episode, removing all of a riparian buffer. Based on a review, DNR may consider requiring wider selective-cut buffers to ensure that riparian trees are maintained even when the channel moves.

DATA GAPS

There are a number of areas where additional information would be helpful in evaluating resource management issues in the basin, but only a few highlights will be mentioned here. To help prioritize restoration efforts, a quantitative limiting factors analysis should be conducted on a species-by-species basis, starting with chinook salmon. In addition, scientific surveys should be conducted to assess juvenile salmon usage of mainstem habitat. Mainstem channels should be surveyed to identify opportunities for off-channel habitat restoration. Water budget and flow assessments should be conducted on several representative small stream systems to estimate the magnitude of human-caused summer flow reductions in such streams.

CONCLUSION

This assessment concludes that current water withdrawals have not had a perceptible or significant effect on summer low flows in the larger rivers of the Snohomish River Basin, and that current use of the basin's water resources is quite low. With appropriate mitigation and conjunctive use strategies, additional water supply systems can be developed without significantly reducing fish productivity. If rural water distribution systems accompany new, larger-scale water supply projects so that dispersed groundwater withdrawals can be reduced, these new projects may benefit overall fish productivity by improving flow conditions in small streams. Relative to water withdrawals, the more direct impacts of past, present, and future land development and agriculture are of greater significance for fish in this basin. Many opportunities exist to improve habitat and increase fish productivity by restoring some of the habitat features destroyed by past activities.

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