1992 WASHINGTON STATE

SALMON AND STEELHEAD STOCK INVENTORY

APPENDIX ONE
PUGET SOUND STOCKS

HOOD CANAL AND STRAIT OF JUAN DE FUCA VOLUME

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
AND
WESTERN WASHINGTON TREATY INDIAN TRIBES

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The Puget Sound Appendix covers 209 of the 435 wild salmon and steelhead stocks identified in Washington State. Because of the amount of information presented, this Appendix is published as a three-volume set: North Puget Sound, South Puget Sound, and Hood Canal and the Strait of Juan de Fuca.

THE TECHNICAL STAFFS OF THE FOLLOWING TRIBES AND TRIBAL ORGANIZATIONS CONTRIBUTED TO THE PREPARATION OF THIS REPORT.

JAMESTOWN S'KLALLAM TRIBE
LOWER ELWHA S'KLALLAM TRIBE
MAKAH TRIBE
NORTHWEST INDIAN FISHERIES COMMISSION
POINT NO POINT TREATY COUNCIL
PORT GAMBLE S'KLALLAM TRIBE
SKOKOMISH TRIBE

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INTRODUCTION

This appendix volume is part of the Puget Sound regional supplement to the *1992 Washington State Salmon and Steelhead Stock Inventory* (SASSI),[1] and provides more detailed information on individual salmon and steelhead stocks identified in the inventory. This information was assembled jointly by the Washington State Departments of Fisheries and Wildlife and the Western Washington Treaty Tribes. The Departments of Fisheries and Wildlife merged to form the Washington Department of Fish and Wildlife early in 1994. The general approach used to develop these appendices is described in the above referenced document.

SASSI documents the results of an initial stock status inventory that is the first step in a statewide effort to maintain and restore wild[2] salmon and steelhead stocks and fisheries. The inventory's intent is to help identify currently available information and to guide future restoration planning and implementation.

The SASSI process inventories **naturally reproducing** stocks of salmon and steelhead regardless of origin (including native, non-native, and mixed parentage). Only those stocks that spawn within Washington State were included. The current status of each stock was rated based primarily on trends in survival rates or population size, but the process did not focus directly on causative factors like habitat loss or overfishing. Stocks with escapement, run-size, and survival levels within normal ranges and not displaying a pattern of chronically low abundance were rated as **Healthy** stocks. Those stocks that currently display low production or survival values were assigned to one of two separate rating categories: **Depressed** stocks or **Critical** stocks, depending on the current condition of the stock. Stocks were also rated as **Unknown** stocks when data limitations did not allow assessment of current status. A rating category for **Extinct** stocks was also included. However, the only extinctions listed in this inventory are those stocks that were thought to exist, based on recent data, but were subsequently found to be extinct. Past extinctions have not been included because SASSI is a **current** resource inventory and the historic information on lost stocks is incomplete and often anecdotal.

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1 SASSI – Washington Department of Fisheries et al. 1993.

2 The term wild stock as used in this report refers to how fish reproduce, i.e. by spawning and rearing in the natural habitat, regardless of parentage, and does not refer to genetic heritage. The origin (e.g. native, non-native or mixed) and parentage (wild, cultured or composite) of individual stocks are specifically designated in this report where known. This terminology is not intended to diminish the importance of native stocks but rather emphasizes the need to protect a wide range of genetic resources maintained by natural reproduction. The terms natural and wild spawners are used synonymously as are the terms stocks and spawning populations.

Of the 435 total salmon and steelhead stocks identified state-wide, 209 stocks were found in the Puget Sound basin. Table 1 presents a summary of stock status for wild Puget Sound salmon and steelhead.

For a more detailed discussion of the methods used to identify individual stocks and rate current status, see the SASSI summary volume.

Two elements of the 1992 SASSI process are presented in this appendix:
(1) Species Overview Reports for each basin in the Puget Sound region, and
(2) Stock Reports for each individual stock. Any comments or questions regarding this information should be directed to the Washington State Department of Fish and Wildlife in Olympia, Washington.

In this volume of Appendix One, only Hood Canal and Strait of Juan de Fuca stocks are presented. There are two other separate volumes in Appendix One which present information for North Puget Sound and South Puget Sound stocks.

Table 1. Summary of stock status for wild salmon and steelhead stocks in the Puget Sound Basin.

	HEALTHY	DEPRESSED	CRITICAL	UNKNOWN	EXTINCT
NORTH PUGET SOUND					
Chinook salmon	3	7	2	3	0
Chum salmon	8	0	0	4	0
Coho salmon	4	3	0	7	0
Pink salmon	5	0	0	2	0
Sockeye salmon	0	0	1	0	0
Steelhead	7	2	1	12	0
71 TOTAL STOCKS	27	12	4	28	0
PERCENT OF TOTAL	38%	17%	6%	39%	0%
SOUTH PUGET SOUND					
Chinook salmon	5	0	1	4	0
Chum salmon	18	0	0	4	1
Coho salmon	8	3	0	0	0
Pink salmon	2	0	0	0	0
Sockeye salmon	0	3	0	0	0
Steelhead	7	1	0	5	0
62 TOTAL STOCKS	40	7	1	13	1
PERCENT OF TOTAL	65%	11%	1.5%	21%	1.5%
HOOD CANAL & STRAIT OF JUAN DE FUCA					
Chinook salmon	2	1	1	0	0
Chum salmon	12	1	2	5	0
Coho salmon	8	10	1	2	0
Pink salmon	2	2	2	0	0
Sockeye salmon	--	--	--	--	--
Steelhead	2	11	0	12	0
76 TOTAL STOCKS	26	25	6	19	0
PERCENT OF TOTAL	34%	33%	8%	25%	0%
209 TOTAL STOCKS	93	44	11	60	1
PERCENT OF TOTAL	44%	21%	5%	29%	0%

SPECIES OVERVIEW REPORTS

An overview report is presented for each species of salmon or steelhead within a river basin or regional area. These overviews provide discussions of the definition and origin of stocks and review any uncertainties relating to the decisions to list specific stocks. The overviews also present information on trends in escapement and run size for the combined stocks of each species within a river basin or region. The individual Stock Reports follow each Overview Report.

STOCK REPORTS

Each stock of salmon and steelhead identified in SASSI is the subject of a report which presents detailed written descriptions of the rationales for the stock definitions in a **Stock Definition and Origin** section (which summarizes information on distribution, timing, and biological characteristics) and highlights any related uncertainties or caveats. Stock origin is also addressed with some discussion of the probable genetic make-up of each stock, and possible interactions with hatchery fish. The **Stock Status** section of these reports assesses the trends in escapement, production, or survival for each stock, and discusses the data used to measure current status. Stock ratings are also presented.

This document is not intended to provide an assessment of factors that may be limiting production of stocks classified as Healthy, nor does the Healthy category reflect the concern held for some of the stocks classified as such. Additionally, it was not intended to profile factors that could present future risks to stock status. State and tribal fishery managers feel very strongly that habitat protection and restoration needs exist for many stocks classified as Healthy in SASSI as well as for Critical and Depressed stocks. Because of the limitations in the inventory regarding assessment for Healthy stocks, SASSI should not be used as the singular approach for defining restoration needs and priorities. SASSI also does not provide a basis for evaluating the feasibility or likelihood of success of specific restoration targets.

Additional written material was prepared for all stocks whose status was Depressed or Critical, and for some stocks in the Healthy and Unknown categories. The **Factors Affecting Production** section provides a brief description of harvest management, habitat status, and fish culture programs. The **Habitat** section reviews the general condition of the habitat used by each stock, and identifies specific environmental problems known to impact stock survivals. The **Harvest Management** section is a general discussion of the fisheries that impact each stock. The **Hatchery** section discusses salmon and steelhead culture programs in the areas utilized by each stock, and outlines possible interactions between wild fish and hatchery fish. **These discussions on factors affecting production are only meant to provide a very general overview of the type of problems faced by a stock.** More detailed examinations of these same topics will be developed for those stocks requiring priority attention as part of the overall Wild Stock Restoration Initiative (see SASSI Part 3 – Current and Future Actions).

STOCK PROFILES

It is an objective of SASSI to provide a general presentation of the available information on each stock of salmon and steelhead included in the inventory. To accomplish this, a two-page Stock Profile is included in each Stock Report to provide a quick review of the definition and status of each salmon and steelhead stock. The first page is a **Stock Definition Profile**, which summarizes the three criteria used in defining individual stocks; including spawning distribution, timing, and biological characteristics.

Spawner distribution is shown on generalized basin maps, and distinct distribution is noted if applicable. These maps are provided to demonstrate differences in distributions among stocks and are not intended to show exact spawning locations. In some cases, spawning distributions are unknown, and the basin maps are left blank. This does not mean that such a stock cannot be distinct based on spawner distribution. The fact that a self-sustaining population is known to be present in a stream or streams can validate the stock, even if exact spawning locations are unknown. Distinct spawning distribution is the most commonly used criterion for identifying individual stocks in the SASSI process because general information on the geographic location of spawning and spawning habitat is the most readily available.

Timing of various life stages is presented in graphic form, and again any distinctions (differences among stocks) are identified. Distinct temporal distribution identifies stock differences based on variations in timing of critical life stages, e.g. spawning or return timing.

Biological characteristics are summarized at the bottom of the stock definition page. Distinct biological characteristics can include any observable distinctions between stocks such as size, age structure, scale patterns, parasites, or genetic differences. This criterion is applied in a number of different ways in this inventory. For some stocks, the stock differentiation is based on observable physical attributes.

However, genetic distinctions are the most common biological characteristic used in this document. There are indirect and direct approaches in SASSI for using genetic characterizations to distinguish among stocks. The indirect approach makes assumptions about the genetic makeup of a group of fish such as when it has been substantially changed by past or continuing introductions of non-native stocks. The direct approach is based on genetic stock identification (GSI), which is a method that can be used to characterize populations of organisms based on the genetic profiles of individuals. The GSI methodology relies on the combined use of biochemical, genetic, and statistical procedures to discriminate among populations. A more detailed discussion of the methods and applications of the use of GSI in SASSI is presented in the following Genetic Stock Identification section. Where GSI information exists it is graphically presented in the form of a dendrogram.

The second page is a **Stock Status Profile**, which presents current stock status information. The data used to determine stock status are presented in tabular and graphic form. Data quality is also noted. These data sets will vary by species and stock, depending on the nature of available stock-specific information. The purpose of the numerical data is to describe the stock production trends, and may include data sets that are direct measures of abundance (e.g. escapement or run size), as well as less direct statistics like fish/mile and fish days. Both direct and indirect data can be used to express trends. For a discussion of the types of data used in SASSI to evaluate stock status, see the following Stock Assessment Data section.

The distribution (percentage) of harvest and escapement are shown in the form of a pie chart, where stock-specific data are available.

The final section of the Stock Profiles presents a summarized description of stock status, including stock origin, type, and current status. The terms used in the Stock Summary section of the profiles are defined below.

Stock Origin - The terms dealing with the origin of stocks identify the genetic history of each stock.

> **Native** -- An indigenous stock of fish that has not been substantially impacted by genetic interactions with non-native stocks, or by other factors, and is still present in all or part of its original range. In limited cases, a native stock may also exist outside of its original habitat (e.g. captive brood stock programs).
>
> **Non-native** -- A stock that has become established outside of its original range.
>
> **Mixed** -- A stock whose individuals originated from commingled native and non-native parents, and/or by mating between native and non-native fish (hybridization); or a previously native stock that has undergone substantial genetic alteration.
>
> **Unknown** -- This description is applied to stocks where there is insufficient information to identify stock origin with confidence.

Production Type - The terms defining production type describe the method of spawning and rearing that produced the fish that constitute each stock.

> **Wild** -- A stock that is sustained by natural spawning and rearing in the natural habitat, regardless of parentage (includes native).

Cultured -- A stock that depends upon spawning, incubation, hatching, or rearing in a hatchery or other artificial production facility.

Composite -- A stock sustained by both wild and artificial production.

Stock Status - These terms describe the current condition of each stock of fish and may be based on escapement, run size, survival, or fitness levels.

Healthy Stock -- A stock of fish experiencing production levels consistent with its available habitat and within the natural variations in survival for the stock.

Depressed Stock -- A stock of fish whose production is below expected levels based on available habitat and natural variations in survival rates, but above the level where permanent damage to the stock is likely.

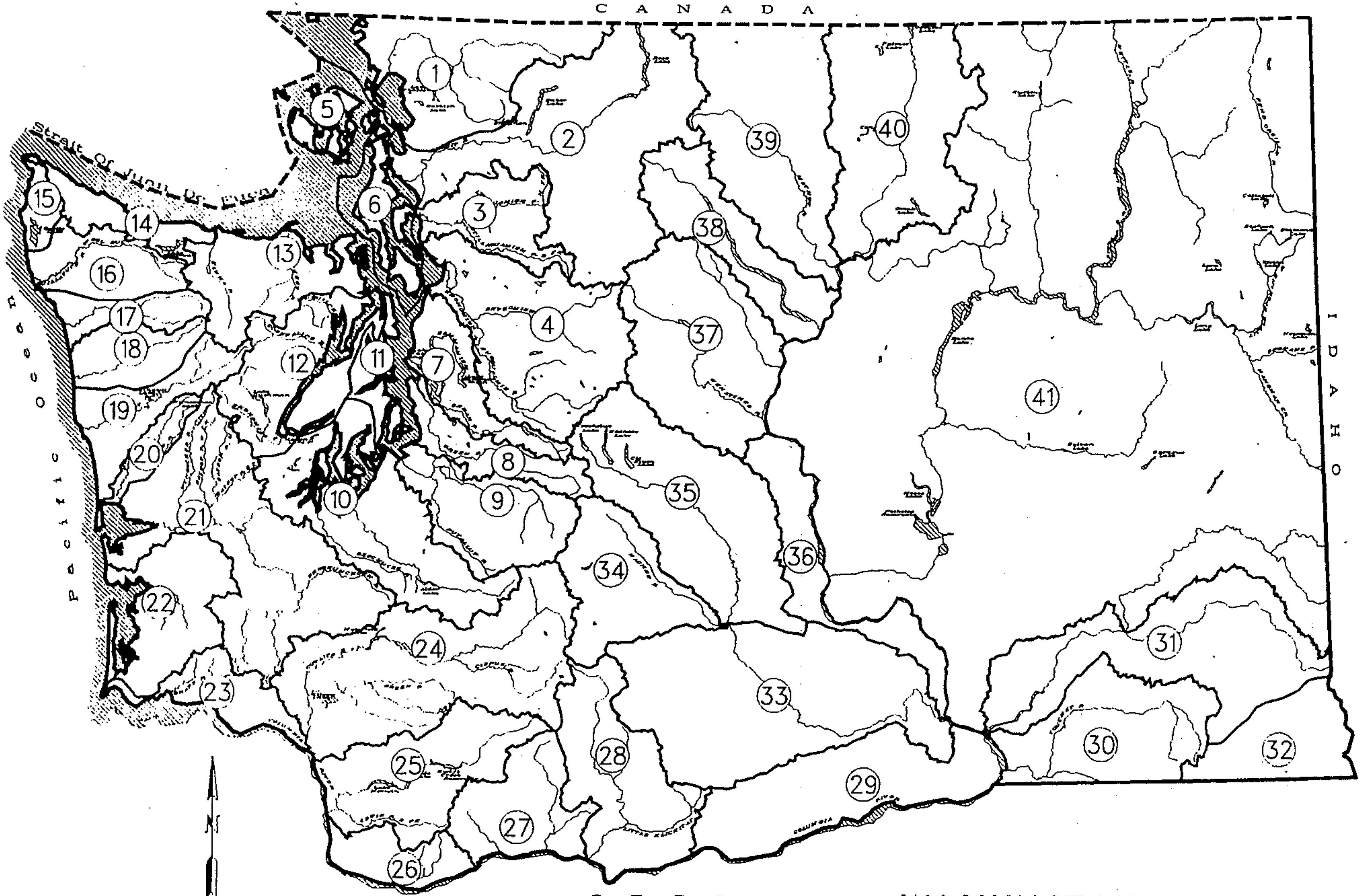
Critical Stock -- A stock of fish experiencing production levels that are so low that permanent damage to the stock is likely or has already occurred.

Extinct Stock -- A stock of fish that is no longer present in its original range, or as a distinct stock elsewhere. Individuals of the same species may be observed in very low numbers, consistent with straying from other stocks.

Unknown Stock -- This description is applied to stocks where there is insufficient information to identify stock status with confidence.

SASSI SALMON AND STEELHEAD RIVER BASINS

SASSI Stock Definition Profiles display spawning distribution information for the salmon and steelhead stocks in Washington State on river basin maps. These maps are scaled not only to present spawner distributions, but must also fit the format of the profile pages. This sometimes makes it difficult to relate a specific river basin map with adjacent systems. To help orient the reader, the state map on the following page locates the river basins used in SASSI. These SASSI river basins are not the same as Water Resource Inventory Areas (WRIA), which are used by Washington State natural resource agencies (Williams et al. 1975).



WASHINGTON STATE
Salmon and Steelhead River Basins

This appendix volume covers the Hood Canal/Strait of Juan de Fuca region.

PUGET SOUND

North Puget Sound

1- Nooksack/Samish
2- Skagit
3- Stillaguamish
4- Snohomish
5- San Juan Islands
6- Whidbey Island

South Puget Sound

7- Lake Washington
8- Duwamish/Green
9- Puyallup
10- Nisqually/DeepSouth Sound
11- East Kitsap

Hood Canal/Strait of Juan de Fuca

12- Hood Canal
13- Elwha/ Dungeness
14- West Strait

COASTAL WASHINGTON

North Coast

15- Sooes/Ozette
16- Quillayute
17- Hoh
18- Queets
19- Quinault

Grays Harbor

20- Humptulips
21- Chehalis

Willapa Bay

22- Willapa/Nemah/Naselle

COLUMBIA RIVER

Lower Columbia River

23- Grays/Elochoman
24- Cowlitz
25- Kalama/Lewis
26- Washougal

Upper Columbia River

27- Wind/White Salmon
28- Klickitat
29- Rock Creek
30- Walla Walla/Touchet
31- Snake/Tucannon
32- Asotin/Grande Ronde
33- Lower Yakima
34- Naches
35- Upper Yakima
36- Hanford Reach
37- Wenatchee/Entiat
38- Lake Chelan
39- Methow
40- Okanogan
41- No anadromous fish

GENETIC STOCK IDENTIFICATION

In SASSI, distinct biological characteristics can include any observable distinctions between stocks such as size or age structure, but are most commonly identified for chinook, chum, pink, and sockeye salmon by screening for genetic differences using a technique called **Genetic Stock Identification**. GSI is a method that can be used to characterize populations of organisms based on the genetic profiles of individuals. The methodology relies on the combined use of biochemical, genetic, and statistical procedures to characterize and discriminate stocks.

Although the GSI characterization of stocks and testing of stock structure provides a direct measure of genetic interrelationships, it is important to be aware of limitations of this approach. It is presently possible to investigate only a tiny and restricted fraction of the genetic traits of salmon by the electrophoretic analysis of proteins. To the extent that the characters that can be investigated do not represent the entire genome, the view of genetic interrelationships derived from GSI analysis will be incomplete (and could fail to detect existing reproductive isolation among stocks -- see below). Indeed, there are a large number of genetically influenced characteristics of salmon about which there is little or no information. It is assumed that most or all of the genetic variation that can be studied by electrophoresis is not subjected to natural selection, that is, it is selectively neutral. While this assumption seems justified given much of population genetics theory and a considerable amount of empirical data from a number of organisms, exceptions to it could complicate or even invalidate some of our interpretations. It must also be realized that the statistical test (e.g. G-test) of stock structure, can be reasonably used to establish the existence of multiple stocks but not to disprove that multiple stocks exist. While statistically significant differences among samples provide strong evidence for the existence of distinct gene pools (i.e. separate stocks), the absence of significant differences does **not** constitute proof that only a single stock exists.

As currently applied to the investigation of stocks of Pacific salmon, the GSI process consists of a series of steps: (1) Collect selected tissues (usually muscle, heart, eye, and liver) from a representative sample of individuals (usually 100 or more) from the population(s) under investigation, (2) Develop genetic profiles (at 15 or more variable loci) for the individuals in each population by conducting starch-gel electrophoresis and biochemical staining using tissue extracts, (3) Characterize each population sampled by aggregating the individual genetic profiles and computing allele frequency distributions, and (4) Conduct statistical tests (G-tests or chi-square) using the allele counts characterizing each population.

Electrophoresis is a process whereby charged molecules (such as enzymes and other proteins) are separated in an electric field. It is possible to document the genetic characteristics of individuals (and populations) using starch-gel electrophoresis, because of the relationship between the genetic code (DNA) and enzyme biochemical phenotypes. These phenotypes are expressed, after electrophoresis and enzyme staining, in the form of banding patterns on the gels. Each enzyme (protein) subunit is encoded by a specific segment of DNA - a gene locus - which specifies its structure. When a locus exhibits genetic variation it has two or more alternate forms or alleles. Much, but not all, of the allelic variation of enzyme-coding loci can be detected by electrophoretic analysis because it results in structural changes to the enzymes.

Reproductively isolated populations usually develop significant differences in allele frequencies at one or more loci over time. The power of GSI to identify and characterize stocks is derived from the differential distribution of alleles at many gene loci in different stocks.

The hypothesis being tested in step 4 (see above) - that the allele distributions of the populations being compared are no more different than multiple independent samples from a single, freely interbreeding population - is closely tied to the definition of stocks as reproductively isolated populations. A statistically significant result in this test causes the rejection of the null hypothesis and typically leads to the conclusion that the populations tested are genetically different and, therefore, represent distinct stocks (breeding units). The commonly used 0.05 rejection level is applied as a cutoff value to indicate statistical significance in these tests. The power of the statistical tests is dependent on the numbers of fish in the samples being compared. Because of this, differences in allele counts that are not significant at small sample sizes can become significant if the sample sizes are large enough.

Typically, the genetic testing of stock structure begins with G-tests (or chi-square tests) involving pairs of individual collections. When such tests reveal significant differences, this is usually considered to be evidence for the existence of two genetically distinct stocks. However, in some cases individual collections are combined during the testing process. This is usually done when there are two or more separate collections from the same locality (usually taken in different years). The individual collections are combined in such cases because it is believed that the combination provides a better characterization of the population than does any single sample. Samples may also be combined from adjacent localities after testing of the separate collections has revealed no significant differentiation among them. For example, if six separate samples of Skagit River pink salmon are collected from different localities (and possibly in different years) and no evidence of significant genetic differences among them is found, they may be combined to characterize pink salmon in the entire river system and this aggregate subsequently tested against collections or similar aggregates from nearby drainages (e.g. Nooksack River, Stillaguamish River, etc.).

Between any two populations, electrophoretically detectable genetic differences will likely exist at several gene loci. These differences can be summarized as a single number called a **genetic distance statistic**. Three different genetic distance statistics are routinely used by the Washington Department of Fish and Wildlife Genetics Unit: Cavalli-Sforza and Edwards' chord distance, Nei's unbiased distance and Rogers' distance. Nei's is most commonly used in the primary literature, but we find that the other two are better at discriminating among populations. All three statistics produce essentially identical diagrams of relationships (**dendrograms**) among populations.

In addition to the direct testing of stock structure using the G-test approach, dendrograms based on average genetic distances among samples have been used to summarize the genetic interrelationships among stocks. This commonly used approach provides a simple one-dimensional graphical representation of overall stock similarities and differences. The lengths of the horizontal branches that connect stocks in dendrograms are proportional to the average genetic distances between the stocks. The vertical position of individual stocks in a dendrogram does not necessarily reflect genetic relationships because each branch point is actually a point around which the lower level branches can be rotated without distorting the estimated genetic distances between them and other stocks in the dendrogram.

While dendrograms are useful because they simplify the often complex patterns of genetic interrelationships among stocks, they are not without disadvantages. The absolute magnitude of differences identified by this technique is influenced both by the specific suite of gene loci included in the analysis and the particular genetic distance measure used. As individual stocks that are most similar are connected in the process of building the dendrogram, their relationships to other stocks can be distorted. The dendrogram analysis **is not** a test of stock structure, in part because it is independent of sample size. Thus, while dendrograms can be useful for depicting genetic interrelationships among stocks and for summarizing among-stock diversity, they cannot be used to define or identify distinct stocks genetically; this must be done using the results of the direct statistical tests (e.g. G-test).

STOCK ASSESSMENT DATA

The evaluation of the current status of the stocks of salmon and steelhead identified in SASSI is based on the best available escapement, harvest, run size, and survival data. Only stock-specific data were used, which sometimes limited the available data to a short span of recent years. These data were plotted and qualitatively examined for changes in abundance or survival. Often, only a single stock-specific statistic was available to analyze the production trend of a stock. When multiple types of data could be used to examine individual stock status, the available production or survival data sets were examined individually and each stock's rating was based on the statistic(s) that best described the current status.

The Stock Reports and Stock Status Profiles present the stock assessment data for individual stocks. The following discussion defines those stock assessment terms used in the evaluation of Puget Sound salmon and steelhead stocks.

ESCAPEMENT DATA

For salmon and steelhead stocks, the term escapement refers to those mature fish that have returned to freshwater, have survived all fisheries, and constitute the spawning population for a given stock. Escapement data collected during spawning ground surveys and by counts made at traps and fish passage facilities are the most frequently used sources of information on the status of salmon and steelhead stocks. Some types of escapement data represent a direct measure of all of the fish making up a spawning population. Examples of direct escapement measurements would include total escapement estimates, and trap and dam counts. For many stocks, direct escapements are not available and indirect escapement numbers are used to evaluate stock status. Indirect escapements are generally actual count data for specific spawning ground reaches (index areas) and are usually collected on an annual basis. Examples would be redd or fish/mile counts. Indirect counts do not provide total escapements, but rather are relative data sets that can be used to indicate changes in abundance and long-term escapement trends.

The following escapement data sets were used to determine the status of various Puget Sound salmon and steelhead stocks.

<u>ESCAPEMENT</u>

Carcass	The highest daily count of dead fish (carcasses) in an index area.
Dam count	A total count of fish destined for spawning grounds upstream of a dam.

Fish-days	The total number of fish days (one fish present for one day) in an index area over an entire spawning season.
Fish/mile	A spawner count divided by the number of miles surveyed.
Index total	An estimate of total escapement in an index area.
Peak count	The highest daily count of live fish in an index area.
Redds	A count of redds (spawning nests) in a stream index area.
Redds/mile	A redd count divided by the number of miles surveyed.
Snorkel Index	A count of adults observed while snorkeling an index area.
Total	An estimate of all fish of a stock that have survived all fisheries and make up a spawning population.
Trap count	A total count of fish destined for spawning grounds upstream of a fish trapping facility.

HARVEST DATA

The numbers of fish harvested in various major fisheries can be used to measure relative abundance and to observe long-term trends. Harvest data sets are typically for specific fisheries or regions and do not necessarily represent all of the catches made everywhere that impact the stock. For example, total harvest might refer only to the combined sport and commercial harvest in the Puget Sound system, but may not include ocean catches.

The following types of harvest data were used to assess the current status of some Puget Sound salmon and steelhead stocks.

HARVEST

Total	The combined catches of all fisheries in a specific region. In some cases, catch data for some fisheries may be unavailable, but the available catch data are thought to be representative of total harvest trends.
Net	The total net catch in a major fishery or the combined tribal and/or commercial net catches in a specific region.
Sport	The total catch in a single sport fishery or the combined catches in all sport fisheries in a specific region.

RUN SIZE DATA

The term run size refers to the total number of salmon and steelhead measured at a particular point in their return migration, e.g. the total numbers entering Puget Sound. Run-size estimates may not include all returning fish (e.g. a small harvest component may not be included), but the run sizes presented in SASSI are believed to be complete enough to represent the relative abundance of the stock. Run-size data are not available for many stocks because of the difficulty in identifying stock-specific harvests in mixed stock fisheries.

The following run size data were used to determine the status of some Puget Sound stocks.

RUN SIZE

Inside	The total numbers of fish leaving the ocean on their return migration. For Puget Sound stocks, the inside run includes all fish entering the Strait of Juan de Fuca (Washington waters only).
Total	The combined escapement and harvest of a stock of fish in a specific region, but may not include all of the catches made everywhere for a specific stock.
Trap count	A total count of fish destined for areas upstream of a fish trapping facility.

JUVENILE DATA

Counts of juvenile salmon and steelhead at various life stages are used to measure relative abundance and evaluate trends. These count data are most commonly collected during the freshwater incubation, rearing, or migration periods, and may include any life stage from egg to smolt. Juvenile count data are also used to measure a variety of survival rates.

JUVENILE

PS/100m2	The average number of presmolts (juveniles enumerated immediately before the smolt stage) produced per 100 square meters of habitat.
No./100m2	The average number of juveniles (of various age classes) produced per 100 square meters of habitat.
Smolts	The number of smolts produced by spawners from a brood year.

SURVIVAL DATA

The survival of fish of a given brood year can be expressed as a ratio between any two life stages, and when collected over a number of years can provide a measure of the success of specific stocks. Recruits per spawner is the most commonly used survival statistic for salmon and steelhead stocks because it expresses the total survival for a given parent year spawning.

SURVIVAL

PS/spawn	The number of presmolts (juveniles enumerated immediately before the smolt stage) divided by the number of total spawners from a brood year.
Rec/spawn	The number of returning adults (recruits) divided by the number of spawners from a brood year.
Smolt/egg	The survival rate from egg to smolt expressed as a percentage.
Smolt/fem	The number of smolts divided by the number of female spawners from a brood year.

NO DATA

For many stocks of salmon and steelhead, there are no stock-specific data that can be used as measures of stock status. These stocks are typically small populations and are rated as Unknown status stocks.

HOOD CANAL AND STRAIT OF JUAN DE FUCA STOCK REPORTS

OVERVIEW -- HOOD CANAL CHINOOK STOCK

HOOD CANAL

STOCK DEFINITION AND ORIGIN

Existing natural chinook salmon populations originating in Hood Canal exhibit primarily summer/fall timing, i.e. they enter freshwater from late July through early October, with a peak at the end of August. Historical data on spring chinook stocks in the Skokomish River and in other streams are scant. If a spring run currently exists in the Skokomish River, it is at very low abundance.

In the Skokomish River system, chinook spawning occurs primarily up to RM 5.0 in the South Fork, and up to RM 13.0 in the North Fork. However, chinook may spawn up to 21.0 miles upstream in the North Fork where passage has been blocked by the Cushman Dam. Flow restriction and variation associated with hydroelectric operations limits spawning success in the North Fork. Intensive logging activity has compromised the quality of chinook spawning habitat in the South Fork of the Skokomish River. Impassable falls prevent chinook from spawning above RM 17.0 in the Duckabush River; only the lower 3.0 miles are routinely surveyed. The Dosewallips River is blocked by falls at RM 22.0; sections of the lower 11.0 miles are surveyed. Passage is blocked 2.5 miles upstream of the mouth of the Hamma Hamma River. Tributaries to these latter three rivers are of high gradient, preventing spawner access. A few chinook also spawn in the Union and Tahuya rivers, which flow into Hood Canal from the Kitsap Peninsula.

The chinook enhancement programs operated by WDFW, the USFWS and the tribes have, undoubtedly, influenced the genetic integrity of Hood Canal chinook populations. George Adams Hatchery on Purdy Creek and the Hood Canal Hatchery on Finch Creek in the town of Hoodsport have utilized brood stock collected from the Skykomish, Green, Deschutes and other Puget Sound rivers, and from local Hood Canal systems. The Enetai Hatchery, on Enetai Creek south of Hoodsport, releases Hood Canal- and Deschutes-origin chinook. The hatcheries have released chinook in most of the Hood Canal river systems. Genetic stock identification of chinook sampled at Hood Canal Hatchery reflects this hybridization. Because hatchery stocks have been mixed with wild chinook populations, Hood Canal chinook have been combined into a single stock for the purposes of this assessment.

STOCK STATUS

Based on the distribution of recoveries of nine brood years (1980 through 1988) of coded-wire tagged chinook released from George Adams and Hood Canal (Hoodsport) hatcheries, approximately 45 percent of Hood Canal chinook are caught in Puget Sound commercial and recreational fisheries, 23 percent in British Columbia, 4 percent in Washington ocean fisheries, 13 percent in freshwater, while 16 percent escape to spawn.

Hood Canal chinook are managed primarily to achieve hatchery escapement goals. This management regime imposes a high harvest rate on naturally spawning populations that intermix with the hatchery returns. Although production out of Hood Canal may be stable over the long-term, spawning escapement of natural chinook has not, in general, met the goals established by fisheries managers. Though natural production in the Skokomish River appears to stable, production in other streams is depressed. In particular, escapement estimates for each of the Dosewallips, Duckabush, and Hamma Hamma rivers have ranged from ten to 70 spawners. The combined escapement goal for these three rivers is 750 spawners. Returns to streams in southeast Hood Canal, primarily the Dewatto, Tahuya, and Union rivers, have been below the goal of 400 spawners. These chinook escapement estimates are derived from surveys of the Skokomish (mainstem and South Fork), the Duckabush, and the Dosewallips rivers. The natural escapement goal of 1,650 spawners, has not been consistently achieved in the Skokomish River. Escapement has ranged from 650 to 2,900 spawners in the last ten years in the Skokomish River, the largest component of natural chinook production in Hood Canal. Coded-wire tag recoveries indicate that George Adams, Hood Canal (Hoodsport) and Enetai hatchery chinook stray into the Skokomish River.

Natural escapement to Hood Canal streams has ranged from 300 to 5,200 in the last ten years (see table).

Returns of natural chinook to Hood Canal, with particular reference to the Skokomish River, are stable, and so the stock, as a whole, has been classified as Healthy. It is recognized, however, that chinook returns to many of the smaller systems in Hood Canal are Depressed.

HOOD CANAL CHINOOK

Year	Natural Escapement	Hatchery Escapement
1968	3,827	6,375
1969	2,899	14,100
1970	3,752	13,961
1971	4,537	6,402
1972	1,881	9,505
1973	2,773	11,301
1974	1,189	834
1975	2,950	1,154
1976	1,763	2,250
1977	2,452	2,587
1978	301	2,736
1979	2,202	1,264
1980	843	1,836
1981	292	2,954
1982	437	4,949
1983	1,772	1,985
1984	2,453	4,774
1985	5,234	4,234
1986	2,772	4,732
1987	2,254	6,380
1988	2,853	10,328
1989	1,425	6,095
1990	724	3,398
1991	1,823	5,636

More information on this chinook salmon stock is presented in the Stock Report which follows.

HOOD CANAL-HOOD CANAL SUMMER/FALL CHINOOK

STOCK DEFINITION AND ORIGIN

This stock has been classified as distinct based upon geographic distribution. The genetic composition of the Hood Canal (Hoodsport) Hatchery (1981, 1988) baseline is only slightly different from that of the Skagit Hatchery (1987). No genetic data exist for naturally spawning chinook in the Hood Canal region. Spawn timing peaks in mid-October, similar to other Puget Sound fall chinook stocks.

The Hood Canal stock origin is native, from Finch Creek in Hood Canal. There may be some genetic influence from other Puget Sound chinook stocks, especially the Deschutes stock from south Puget Sound.

Non-native releases into the Skokomish and South Fork Skokomish rivers since 1980 were:

Year	Number Released	Stock
1980	642,330	Deschutes
1981	203,419	Deschutes
1982	404,475	Deschutes
1984	111,059	Deschutes
1991	245,100	Deschutes
1983	506,338	Hood Canal & Deschutes
1984	208,877	Hood Canal & Deschutes
1985	455,826	Hood Canal & Deschutes

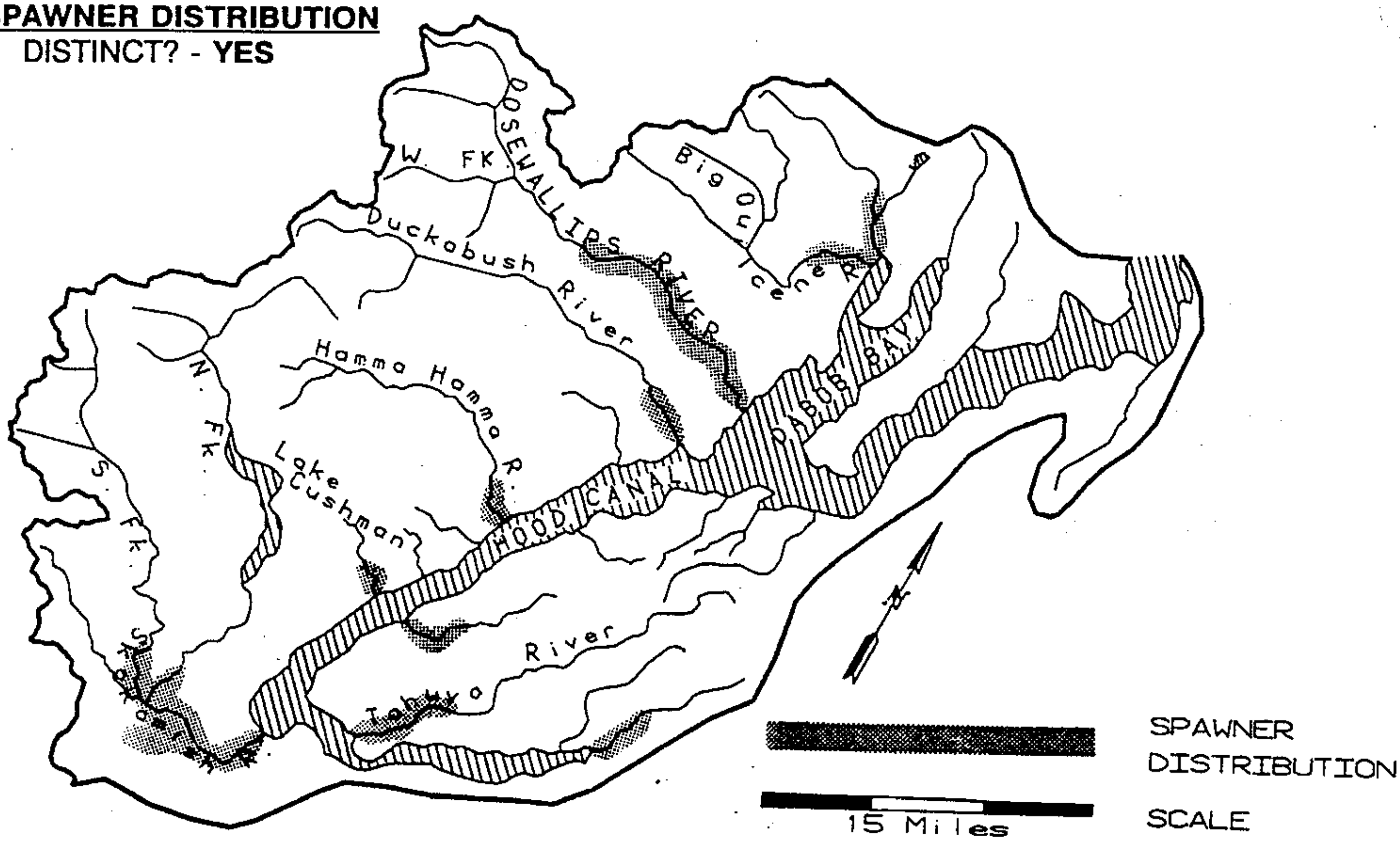
STOCK STATUS

The status of the Hood Canal chinook stock is Healthy.

Stock status may be partially dependent upon hatchery production as strays are thought to contribute greatly to the natural spawning population in the Skokomish and southeast Hood Canal streams. The sources of hatchery strays include George Adams Hatchery, Hood Canal (Hoodsport) Hatchery and Enetai Hatchery. Escapement levels of both hatchery and natural spawners in the Hood Canal region have ranged from 2,000 to 17,700 with an average of 7,700 per year (1968 through 1991). There was a decline in the escapement in the late 1970s, but escapements increased in the early 1980s and have remained stable.

STOCK DEFINITION PROFILE for Hood Canal Summer/Fall Chinook

SPAWNER DISTRIBUTION
DISTINCT? - **YES**

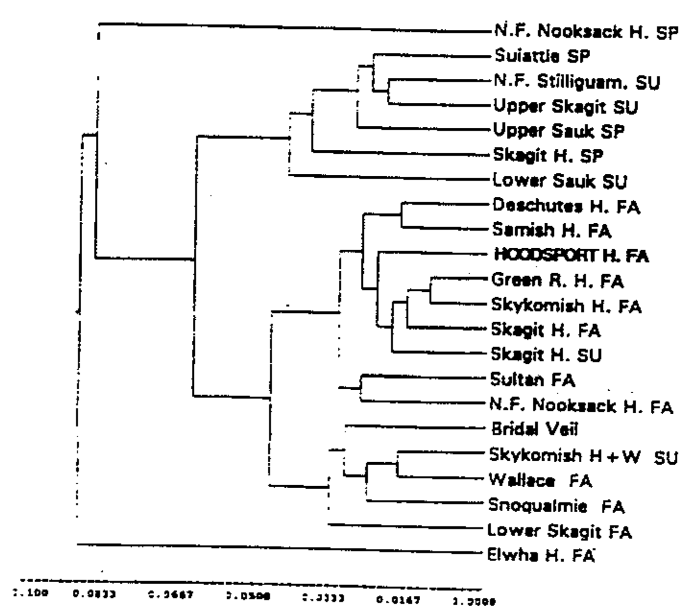


TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**UNK**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **UNKNOWN**

GENETICS - No genetic data exist for the various natural spawners in Hood Canal. However, the genetic characteristics of Hood Canal Hatchery chinook (samples from 1981 and 1988) share some similarities with Skagit Hatchery fall chinook (1987 sample).



Genetic distance (modified Rogers distance (Wright, 1978); UPGMA)

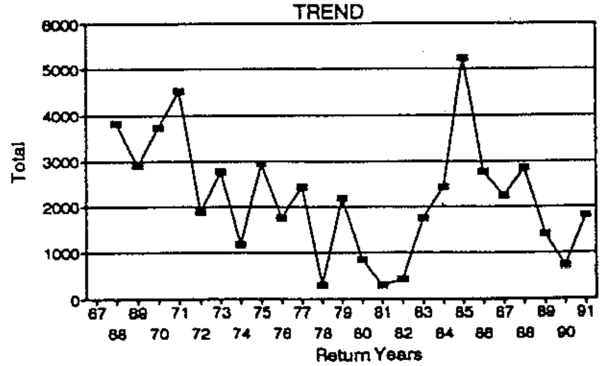
STOCK STATUS PROFILE for Hood Canal Summer/Fall Chinook

STOCK ASSESSMENT

DATA QUALITY-----> Good

Return Years	ESCAPE Total			
67				
68	3827			
69	2899			
70	3752			
71	4537			
72	1881			
73	2773			
74	1189			
75	2950			
76	1763			
77	2452			
78	301			
79	2202			
80	843			
81	292			
82	437			
83	1772			
84	2453			
85	5234			
86	2772			
87	2254			
88	2853			
89	1425			
90	724			
91	1823			

ESCAPE
TREND



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Mixed

PRODUCTION TYPE

Composite

STOCK DISTINCTION

Distribution

STOCK STATUS

Healthy

SCREENING CRITERIA

OVERVIEW -- HOOD CANAL SUMMER CHUM STOCKS

HOOD CANAL
UNION

STOCK DEFINITION AND ORIGIN

The summer chum salmon stocks in this region enter the terminal area from early August through the end of September. Spawning generally begins around the last week of August and continues through October. This early run timing creates a temporal separation from the fall chum stocks spawning in the same area, allowing for reproductive isolation between the summer and fall chum stocks in Hood Canal.

Hood Canal is a large fjord that branches off Admiralty Inlet and is separated from Puget Sound by the Kitsap Peninsula. The distance between the spawning tributaries of Hood Canal and the rest of the Puget Sound streams creates a geographical separation among the stocks.

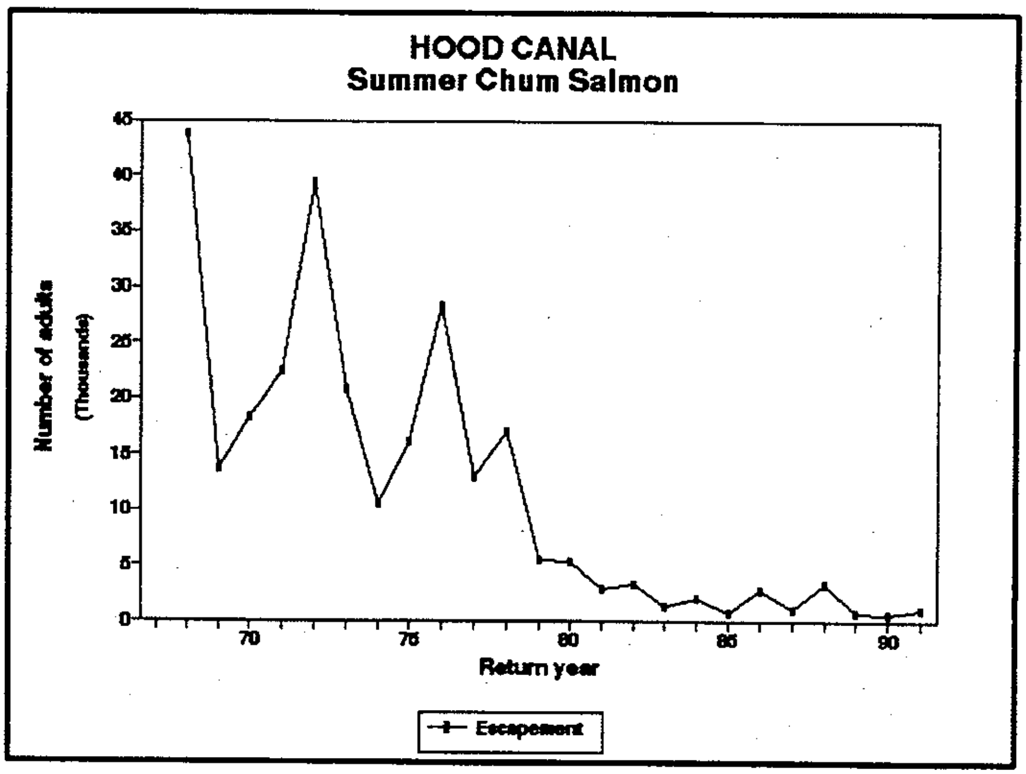
Hood Canal summer chum are currently separated into two stocks based on two criteria: (1) geographic separation of the spawning grounds, and (2) genetic distinction. Preliminary results from ongoing genetic studies indicate that there may be more than two summer stocks in Hood Canal.

The Union River summer chum were identified as a separate stock based on three criteria: (1) the location of the spawning grounds in the Union River is geographically separate from other summer chum areas, (2) the spawning season is earlier than that of the Hood Canal summer stock indicating a probable temporal separation and (3) electrophoretic analysis indicates the Union River summer chum are distinguishable from the Hood Canal summer stocks. The production of the Union River summer chum is dependent on wild spawning, and this stock was identified as a native stock.

No hatchery releases of summer chum into the Hood Canal have been made. Since Hood Canal summer chum production depends on wild spawning, and there have been no hatchery releases, these fish have also been identified as a native stock.

STOCK STATUS

Hood Canal summer chum stocks are not targeted in any directed fisheries. However, they are taken incidentally in other fisheries in Canada, the Strait of Juan de Fuca, northern Puget Sound and the terminal areas within Hood Canal. As a group, escapement levels have declined to critically low levels. The escapement goal, which is an average of the highest historical escapement estimates, has been met once for even-year and twice for odd-year returns since 1968. Escapement estimates are shown in the figure below. Escapement estimates give a good representation of the number of wild spawners on the spawning grounds. Different escapement goals are used for even- and odd-year returns but are not plotted on the figure. The even-year and odd-year wild escapement goals are 41,200 and 20,100 respectively.



Information on individual summer chum salmon stocks is presented in the Stock Reports which follow.

HOOD CANAL -- HOOD CANAL SUMMER CHUM

STOCK DEFINITION AND ORIGIN

Hood Canal summer chum salmon are a unique stock of fish, isolated from other Puget Sound stocks by distinct spawning distribution and temporal separation and have distinct genetic characteristics.

Hood Canal summer chum spawn primarily in the Big Quilcene, Dosewallips, Duckabush and Hamma Hamma rivers, but a few spawners can still be found in some east Hood Canal tributaries, including Tahuya and Dewatto rivers, on the Kitsap Peninsula.

Hood Canal summer chum spawn a month earlier (mid-September to late October) and are thus reproductively isolated from Hood Canal fall stocks through differences in spawner seasons. Additionally, genetic stock identification (GSI) studies have shown them to be distinguishable from Hood Canal fall chum stocks.

The Hood Canal summer chum are separated from Union River summer chum by a one- to two-week difference in run timing. Electrophoretic studies conducted by WDFW show that these two stocks are very closely related but distinguishable.

No hatchery plants of summer chum have been recorded in Hood Canal . If there were introductions of outside stocks into the area, it is unlikely that they have had any effect on the local stock. Hood Canal summer chum are believed to be a native stock unique in their run timing and genetic makeup.

STOCK STATUS

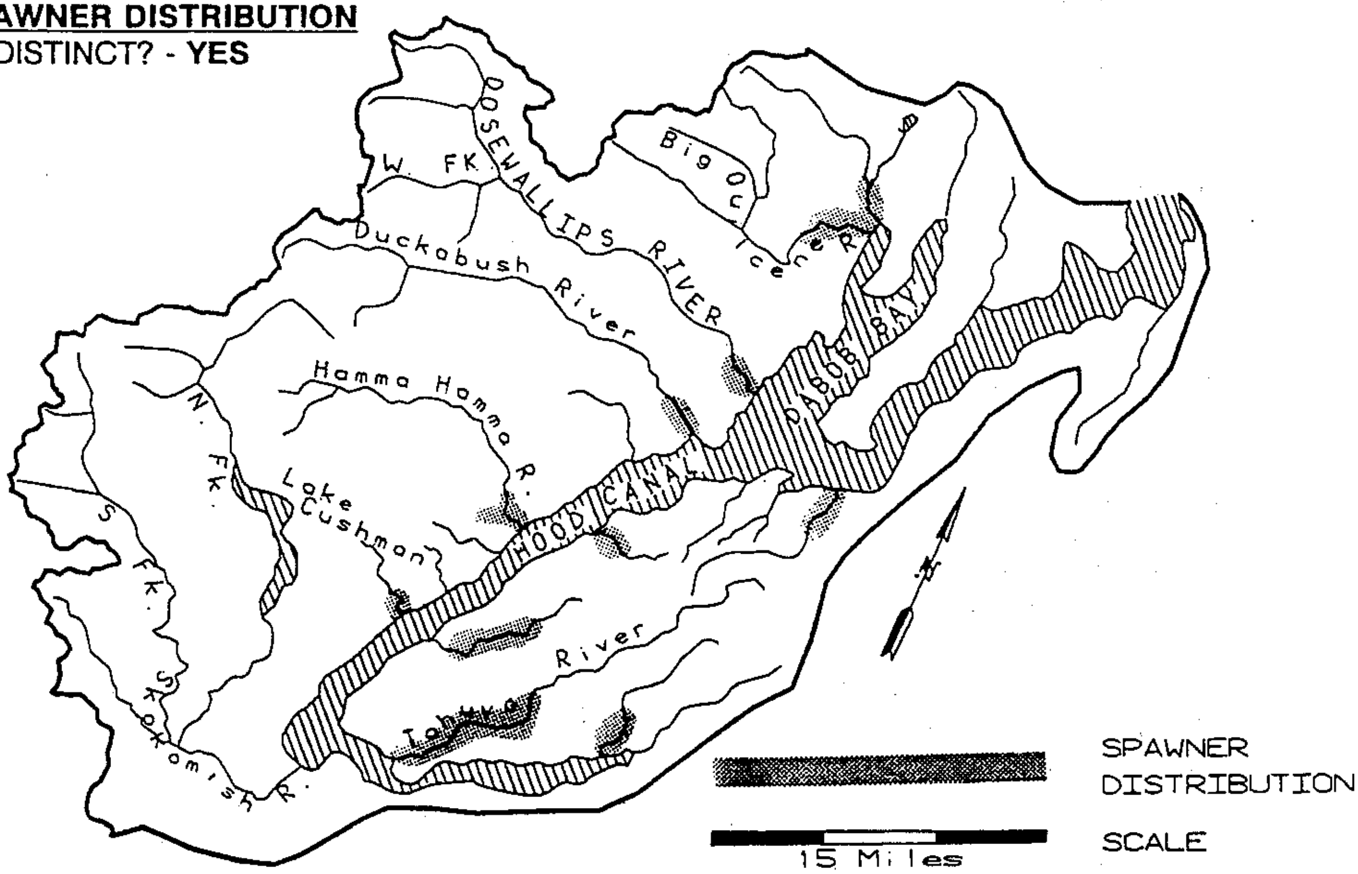
The Hood Canal summer chum stock is classified as Critical.

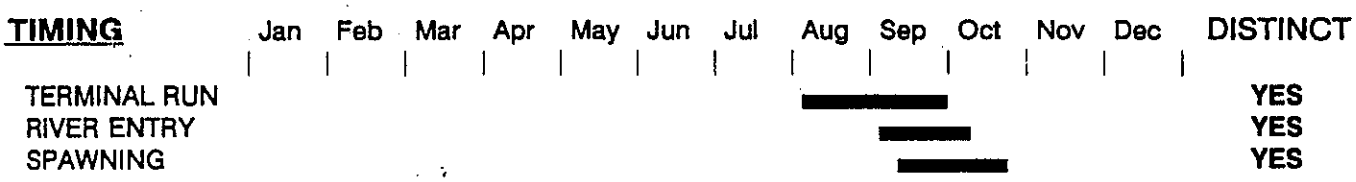
Spawning ground survey data are available back to 1943. Surveys have been conducted annually in most systems since 1958. The escapement estimation method was modified in 1974. The spawning ground data are the best source of stock assessment information currently available.

The Hood Canal summer chum numbered over 40,000 in 1968. The latest escapement estimate for Hood Canal (1991) was 703. The spawning information shows that escapement levels have been chronically low since 1980.

STOCK DEFINITION PROFILE for Hood Canal Summer Chum

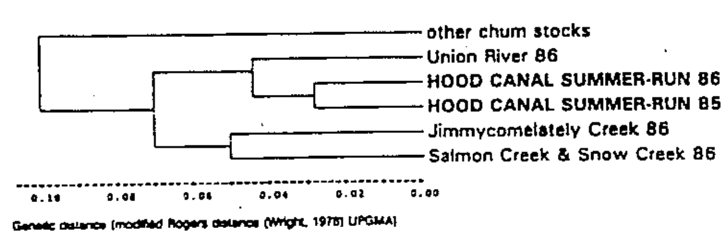
SPAWNER DISTRIBUTION
DISTINCT? - **YES**





BIOLOGICAL CHARACTERISTICS
DISTINCT? - **YES**

GENETICS - Analysis of GSI collections taken from numerous streams in 1985 and 1986 indicated Hood Canal summer chum are significantly different from all other chum stocks tested (21-locus G-tests:$p < 0.05$). Samples collected in 1992 will allow further testing of genetic diversity within this group.



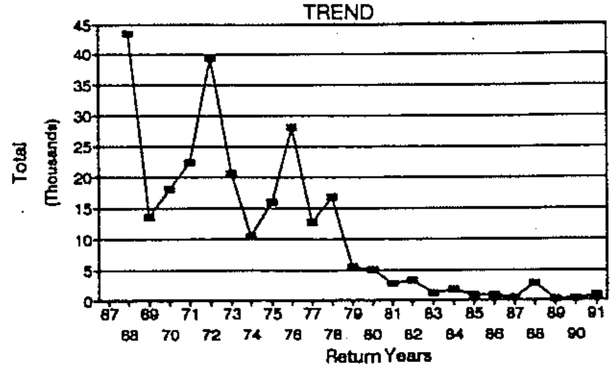
STOCK STATUS PROFILE for Hood Canal Summer Chum

STOCK ASSESSMENT

DATA QUALITY------> Good

Return Years	ESCAPE Total			
67				
68	43451			
69	13647			
70	18094			
71	22374			
72	39316			
73	20747			
74	10450			
75	16050			
76	28209			
77	12834			
78	16890			
79	5449			
80	5105			
81	2819			
82	3276			
83	1102			
84	1766			
85	705			
86	772			
87	360			
88	2687			
89	173			
90	214			
91	703			

Avg = 561



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution, Genetics, Timing

STOCK STATUS
Critical

SCREENING CRITERIA
Chronically Low

FACTORS AFFECTING PRODUCTION

Habitat -- Although few major physical habitat problems have been identified in most creeks used by summer chum salmon, the Quilcene River mouth has a serious gravel aggradation problem, and channel shifting has occurred at least twice during the past 15 years. Gravel compaction is also a problem in the lower portion of the Quilcene River. Diking in the town of Quilcene has channelized the lower river and contributes to the aggradation problem. The Little Quilcene River has similar diking but has not experienced as much gravel movement. Dredging in the Big Quilcene River has damaged spawning areas. Logging in the upper Big Quilcene watershed may also have contributed to gravel aggradation in the lower river. The Dosewallips River habitat has not changed remarkably in the last 15 years. The lower Duckabush River remains essentially as it was with the exception of minor additional bank protection projects. The Hamma Hamma River has been impacted by moderate logging in the John Creek watershed.

Other small tributaries on the west side of Hood Canal utilized by this stock are also unchanged. Streams on the east side of the Canal are essentially unchanged physically, however rural area development has increased as forest lands continue to be converted to one- to five-acre residential lots. This has led to removal of riparian vegetation and minor bank protection. A commercial horse breeding and training facility on the lower Tahuya River has seriously affected that river reach. Union River habitat is essentially unchanged, however, urbanization, large lot development, and water withdrawal threaten habitat in that watershed.

Harvest Management -- As early-migrating chum stocks, Hood Canal summer chum are commingled in Puget Sound and Canadian commercial and recreational fisheries with other returning species, including sockeye, pink, chinook and coho salmon. Incidental harvest of small numbers of summer chum in fisheries directed at more abundant commingled species historically accounts for the majority of the harvest of these fish. There are no fisheries directed at summer chum in preterminal areas or in Hood Canal.

<u>Preterminal Areas</u> - Hood Canal summer chum are harvested in several preterminal fisheries directed at other species of salmon. The lack of stock migration and stock-specific (e.g. coded-wire tag or GSI-derived) data prevents estimation of the relative contribution to these harvests.

Canadian fisheries off the west coast of Vancouver Island, Johnstone Strait, Georgia Strait and the Strait of Juan de Fuca intercept summer chum in sockeye-, pink- and coho-directed fisheries, although the contribution of Hood Canal summer chum to these fisheries is unknown. Canadian-origin summer chum probably predominate the summer chum catch in the Canadian portion of the Strait of Juan de Fuca (Canadian Area 20) and the Georgia Strait.

Washington net fisheries in the Strait of Juan de Fuca (Areas 4B, 5 and 6C) and the area around the San Juan Islands (Areas 6,7 and 7A) also harvest Washington- and Canadian-origin summer chum incidentally in fisheries targeting sockeye, pink and coho. The total annual catch of summer chum salmon from all U.S. and Canadian stocks in the Strait of Juan de Fuca averaged 718 from 1969 through 1991. The total summer chum catches in the area around the San Juan Islands ranged from 62 in 1984 to 43,000 in 1976. The average catch in 1990 and 1991 was 1,600. These catches have been identified as summer chum because they occurred during the summer chum "adult accounting periods" for summer chum passing through the Strait and the area around the San Juan Islands. Adult accounting periods are based on quantitative estimates of run timing and are intended to identify when adult salmon of a particular species or run timing are present in a given area and likely to be caught in a fishery. However, some of the chum caught during the summer chum adult accounting periods may be early-returning fall chum which are misidentified as summer chum. Genetic analysis is needed to ascertain the proportion of fall chum caught during summer chum adult accounting periods. The contribution of Hood Canal summer chum to these fisheries is unknown. Canadian and other Puget Sound summer chum probably comprise the majority of summer chum catches in recent years because they have been more abundant than Hood Canal summer chum.

Coho-directed net fisheries in Admiralty Inlet (Area 9) harvest summer chum, although large-scale fisheries have not been conducted in this area since 1978. Seattle-area (Area 10) fisheries may also harvest Hood Canal summer chum during fisheries directed at coho salmon. Summer chum from south Puget Sound most likely dominate the summer chum catches in Areas 9 and 10 because they are more abundant than Hood Canal summer chum.

Terminal Areas - Terminal-area commercial harvest occurs mainly in coho-directed fisheries in the mainstem of Hood Canal and Dabob/Quilcene bays (Areas 12, 12A, 12B and 12C). Hood Canal summer chum are designated as a "secondary" management unit in these areas. As a result, achievement of the summer chum escapement goal is secondary to the harvest and escapement requirements of commingled chinook and coho salmon.

Hatchery -- There are large coho, chinook and chum rearing and release programs at several Hood Canal hatcheries which may cause increased competition and predation on summer chum. A summer chum brood stocking program was initiated in 1992 by the WDFW, PNPTC and USFWS, entailing the live capture of summer chum in Quilcene Bay and the Big Quilcene River. The intent of the program is to establish a brood bank at the Quilcene National Fish Hatchery to stabilize and supplement Hood Canal summer chum.

Long Live the Kings, a private fish enhancement group, maintains a small hatchery on Lilliwaup Creek. They collect small numbers of summer chum entering Lilliwaup Creek, spawn them at the hatchery and release the offspring.

Last ten years salmon releases into the Skokomish-Dosewallips Basin

Release Year	Spring Chinook	Summer Chinook	Fall Chinook	Chum	Coho	Pink
1982	25,906	0	6,553,671	21,928,520	620,011	916,675
1983	0	19,724	7,159,353	38,931,555	529,474	0
1984	0	0	6,286,887	30,365,182	749,000	254,800
1985	0	0	7,032,376	55,225,215	699,900	0
1986	0	0	9,197,536	38,594,000	1,289,100	974,700
1987	0	0	6,339,416	41,844,500	403,800	0
1988	0	0	7,910,510	40,589,500	606,400	5,002,800
1989	0	0	12,897,987	38,221,100	1,077,886	0
1990	183,100	0	12,478,127	34,744,100	373,400	827,900
1991	193,377	0	5,984,598	20,907,988	1,214,100	0
MEAN	134,128		8,184,046	36,135,166	756,307	1,595,375

Last ten years salmon releases into the Quilcene Basin

Release Year	Spring Chinook	Chum	Coho
1982	152,245	1,474,949	1,298,041
1983	206,979	995,738	620,812
1984	529,549	1,218,671	866,959
1985	457,019	2,358,907	598,328
1986	204,355	2,599,971	875,680
1987	221,463	2,549,091	1,405,131
1988	136,146	2,217,147	871,119
1989	120,924	2,044,704	1,394,313
1990	211,300	2,634,174	1,090,801
1991	304,791	1,664,227	1,561,802
MEAN	254,477	1,975,758	1,058,299

HOOD CANAL -- UNION SUMMER CHUM

STOCK DEFINITION AND ORIGIN

Union River summer chum are isolated from other Puget Sound stocks by a distinct spawning distribution, temporal separation and genetic characteristics. The Union River is a tributary in the southern region of Hood Canal. The distance between the spawning tributaries in Hood Canal and other Puget Sound streams creates a geographic separation among the stocks.

Union River summer chum spawn one to two weeks earlier (late August to early October) than other Hood Canal summer chum, possibly creating a separation through differences in spawner seasons. This early spawner season separates them from the Hood Canal fall chum as well. Additionally, genetic stock identification (GSI) studies have shown them to be distinguishable from other Hood Canal chum stocks.

No hatchery plants of summer chum into the Union River have been recorded. If there were introductions of outside stocks in the region it is unlikely that they have had any genetic effect on the local stock. Union River Summer chum are believed to be a native stock unique in their run timing and genetic makeup.

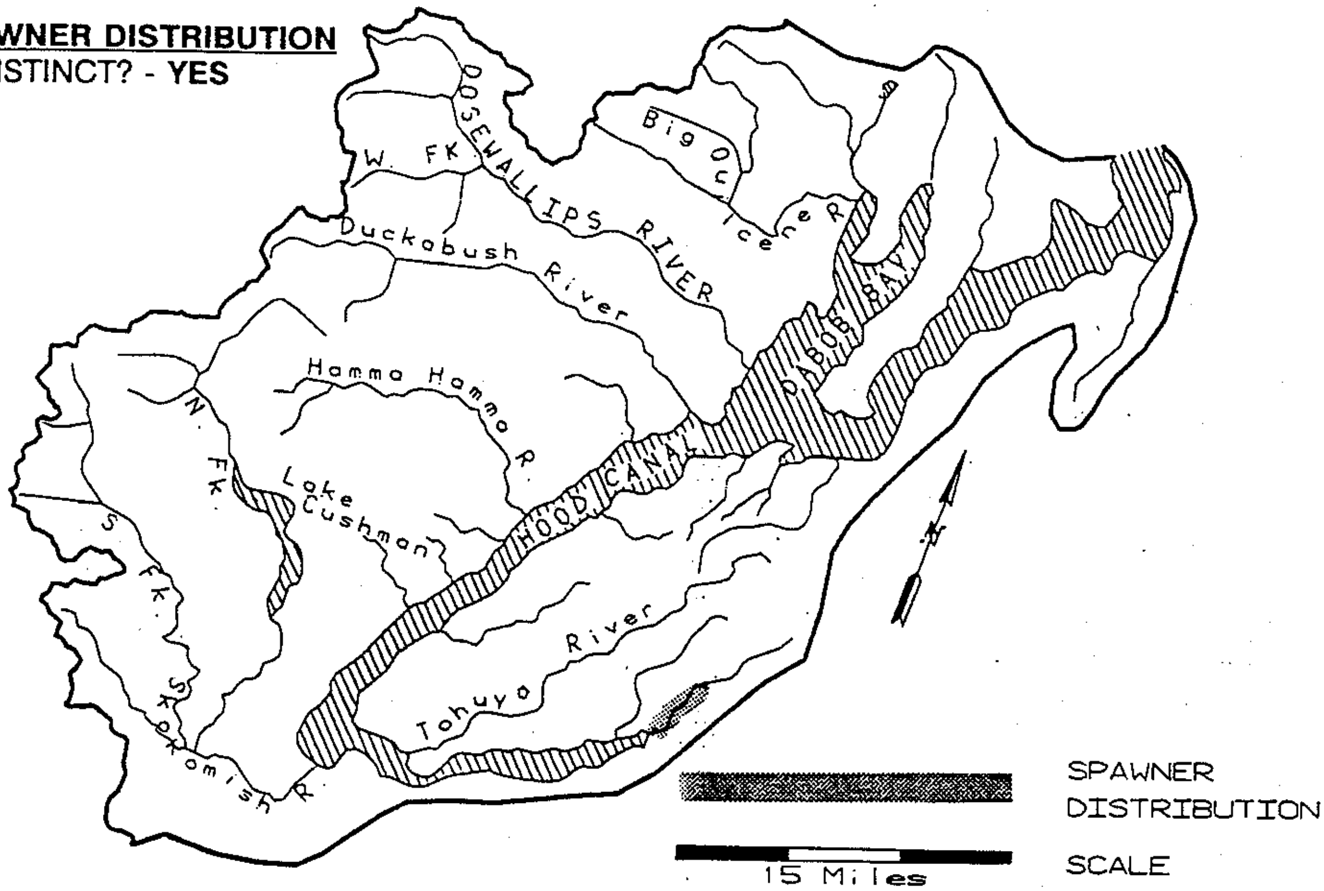
STOCK STATUS

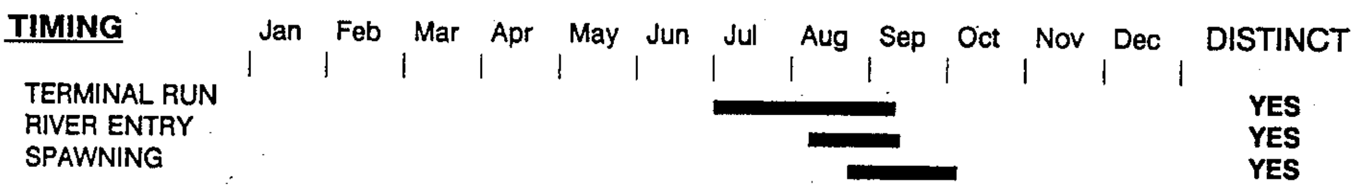
The status of the Union summer chum stock is Healthy.

Escapement data derived from spawning ground surveys are the only consistent information available on the stocks status. Escapement estimates are available from 1968 to the present and range from 40 to 2,000. In contrast to the Hood Canal summer chum stock, the abundance of the stock in the Union River has increased since 1978.

STOCK DEFINITION PROFILE for Union Summer Chum

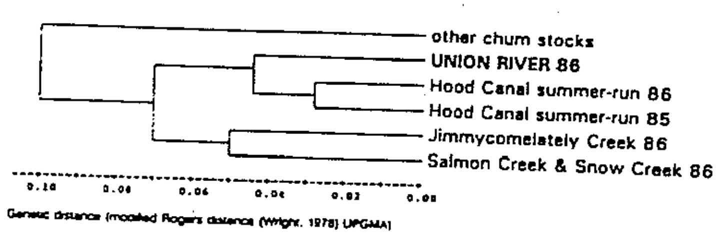
SPAWNER DISTRIBUTION
DISTINCT? - **YES**





BIOLOGICAL CHARACTERISTICS
DISTINCT? - **YES**

GENETICS - Analysis of a collection taken in 1986 (N=98) indicated that these fish are significantly different from all other chum stocks tested (21-locus G-test: **p**<0.05).

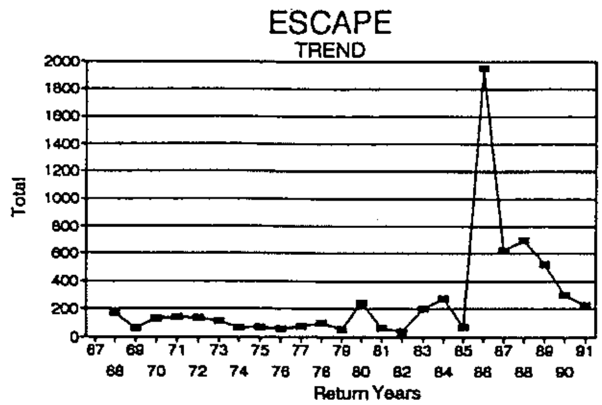


STOCK STATUS PROFILE for Union Summer Chum

STOCK ASSESSMENT

DATA QUALITY------> Good

Return Years	ESCAPE Total			
67				
68	169			
69	63			
70	134			
71	142			
72	136			
73	111			
74	70			
75	71			
76	59			
77	76			
78	99			
79	56			
80	241			
81	63			
82	42			
83	200			
84	272			
85	73			
86	1954			
87	622			
88	700			
89	521			
90	303			
91	229			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution, Timing, Genetics

STOCK STATUS
Healthy

SCREENING CRITERIA

OVERVIEW -- HOOD CANAL FALL CHUM STOCKS

NORTHEAST HOOD CANAL
DEWATTO
SOUTHEAST HOOD CANAL
LOWER SKOKOMISH T
UPPER SKOKOMISH LATE T

WEST HOOD CANAL T
HAMMA HAMMA LATE T
DUCKABUSH LATE T
DOSEWALLIPS LATE T
QUILCENE LATE T

STOCK DEFINITION AND ORIGIN

Hood Canal is a large fjord which branches off Admiralty Inlet and is separated from the rest of Puget Sound by the Kitsap Peninsula. The distance between the spawning streams of Hood Canal and the rest of Puget Sound creates a geographic separation between Hood Canal stocks and other Puget Sound chum stocks.

Fall chum salmon in this region enter the terminal area between the first week in October and the first week in January. Spawning begins about the third week in October and may continue through January. This long duration is a result of timing differences among the nine fall chum stocks in the area which are classified for management purposes as "early fall" and "late fall" stocks.

Fall chum spawning in this region are isolated from other Puget Sound chum stocks primarily through geographic separation. Hood Canal summer chum are separated by a clear difference in the spawning seasons from the fall stocks. Hood Canal fall chum were separated into ten stocks based primarily on geographic separation of the spawning grounds. However, in some cases run timing differences were also large enough to consider separation of stocks.

The West Hood Canal fall chum stock is comprised of chum spawning in small independent tributaries located on the west side of the canal. These fish were identified as a single stock for two reasons: (1) the proximity of many of these streams allows for the possibility of commingling of the spawners on the spawning grounds, and (2) large hatchery plants and/or major egg box projects using Hood Canal (Hoodsport) Hatchery stock are ongoing in these streams and have established runs with a similar genetic makeup. The Hood Canal Hatchery stock originated from Finch Creek, one of the west side independent tributaries. Accordingly, these fish were identified as a mixture of native and non-native fish.

The fall chum spawning on the east side of Hood Canal were divided into three stocks based on geographical distribution of the spawning grounds. Each stock is comprised of chum spawning in streams or tributaries that are in proximity to each other allowing for the possibility of commingling of fish on the spawning grounds, and yet are geographically separated from other chum spawning areas so as to consider them a separate stock. The three stocks are: Northeast Hood Canal fall chum, Dewatto fall chum and Southeast Hood Canal fall chum. Significant hatchery plants have been made into these streams and are ongoing. As a result, the origin of these stocks is considered a mixture of native and non-native fish.

The Dosewallips River has not received significant hatchery plants of other stocks and depends on wild spawning for its production. The spawning grounds of the Dosewallips fall chum are geographically separated from those of other Hood Canal chum. Accordingly, these fish were identified as a native stock.

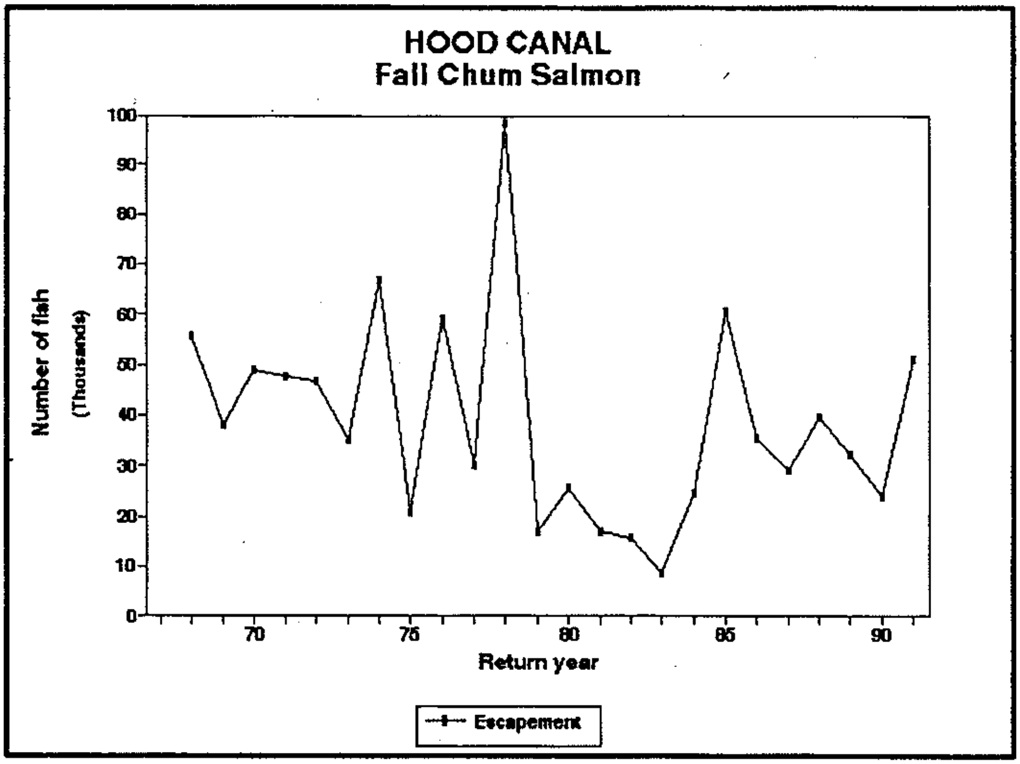
The remaining Hood Canal fall chum stocks were identified as separate stocks based solely on the geographical distribution of their spawning grounds. Hatchery plants have had an influence on these stocks so their origin is a mixture of native and non-native fish.

STOCK STATUS

Hood Canal fall chum are harvested in commercial and recreational fisheries in Johnstone Strait, Qualicum (east Vancouver Island), Georgia Strait, in past years in the Canadian portion of the Strait of Juan de Fuca, Nitinat, the U.S. portion of the Strait of Juan de Fuca, San Juan Islands, Admiralty Inlet (until 1988), Seattle area (Area 10) and in Port Gamble Bay (Area 9A), and in mainstem areas (Areas 12, 12B and 12C) of Hood Canal and the Skokomish River.

As a group, the Hood Canal fall chum escapements have exceeded the total escapement goal (revised in 1984) in only two out of the last seven years, but exhibited a slight increasing trend over the last decade. This increase is primarily due to the late fall Hamma Hamma, Duckabush, Quilcene and to some degree the Dosewallips runs. The other stocks where escapement goals can be examined show stable escapement levels but, for the most part, are below goal. However, fairly large numbers of spawners are found in all area streams.

Escapement data are shown in the figure below and give a good representation of the number of spawners in the area.



Information on individual fall chum salmon stocks is presented in the Stock Reports which follow.

HOOD CANAL -- NORTHEAST HOOD CANAL FALL CHUM

STOCK DEFINITION AND ORIGIN

Northeast Hood Canal fall chum salmon were identified as a separate stock because they are isolated from other Puget Sound chum stocks by a distinct spawning distribution.

Northeast Hood Canal fall chum spawn from mid-November through mid-December creating a temporal separation from the Hood Canal summer stocks and to some degree, from the later spawning (December-January) stocks in the Quilcene, Hamma Hamma, Dosewallips, Duckabush and Skokomish systems. The spawning grounds of the northeast Hood Canal fall chum as a group are isolated from other Hood Canal fall chum stocks by geography.

The natal tributaries of this stock drain the northwest side of the Kitsap Peninsula north of the town of Holly. These streams are characterized by low gradients and small drainage areas. The primary streams are Anderson, Big Beef, Seabeck and Stavis creeks. Fall chum spawning in these streams were identified as a single stock for two reasons: (1) spawner run timing is identical in these streams, (2) the spawning grounds are close enough in proximity to prevent geographic separation.

Hatchery plants in the northeast Hood Canal fall chum spawning streams have probably affected the genetic composition of native fish. Accordingly, this stock was classified as a mixed stock from a composite of native and hatchery fish.

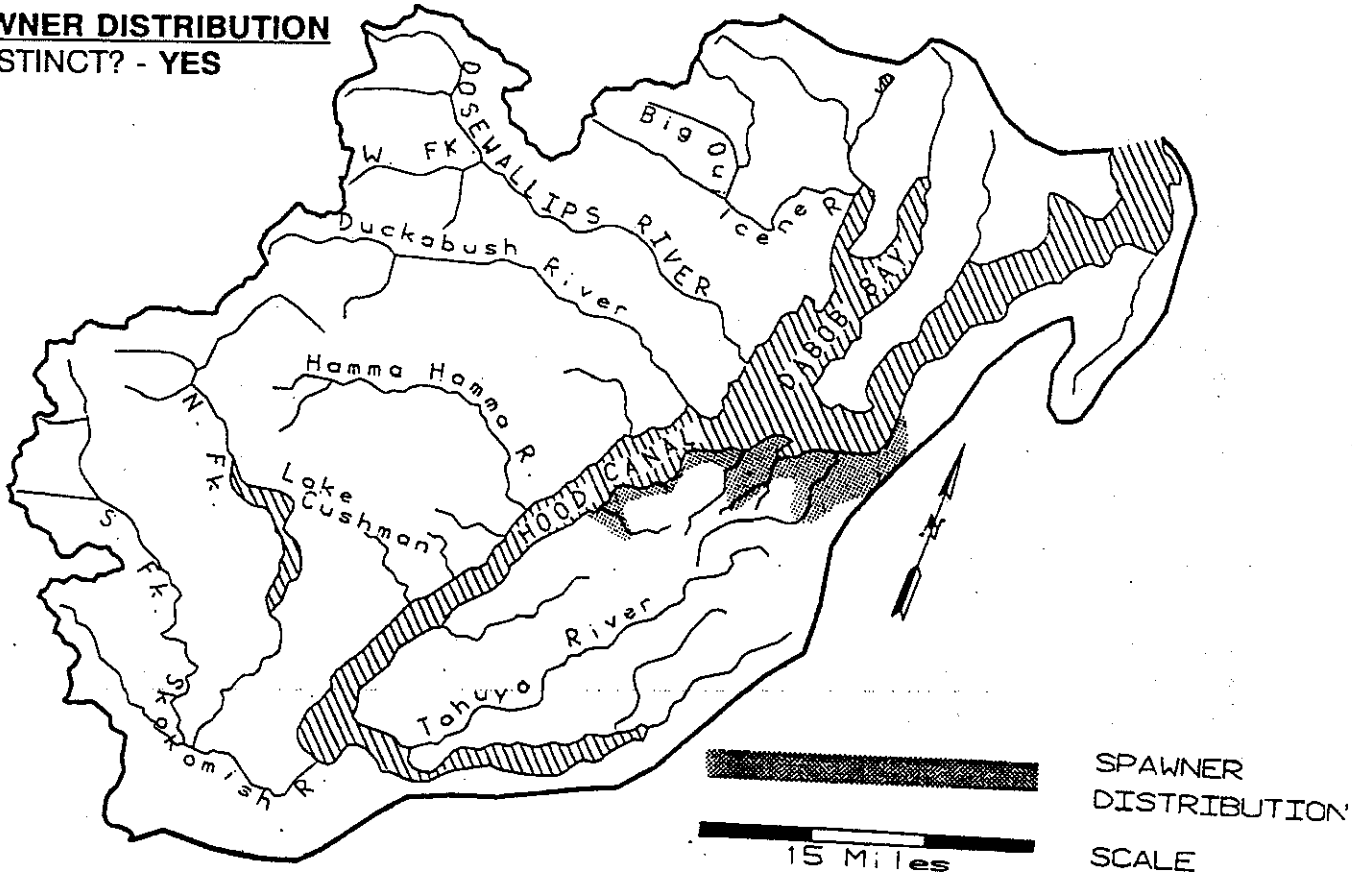
STOCK STATUS

The status of the Northeast Hood Canal fall chum stock is Healthy.

Escapement data derived from spawning ground surveys are the only consistent information available on the stocks status. Escapement estimates are available from 1968 to 1991 and range from 500 to 8,000. The last seven-year escapement estimate averaged just under 1,800 suggesting a healthy stock.

STOCK DEFINITION PROFILE for Northeast Hood Canal Fall Chum

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING											▬	▬	**UNK**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **UNKNOWN**

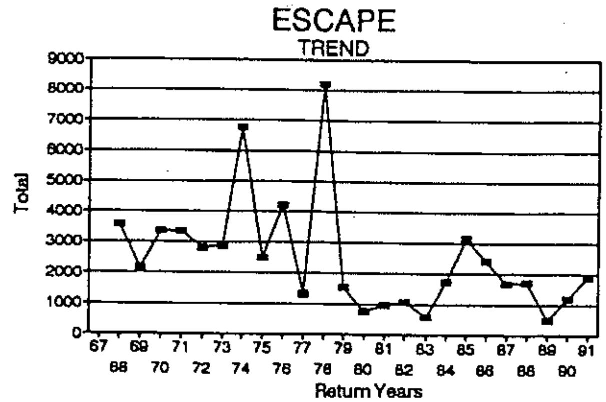
GENETICS - No data available.

STOCK STATUS PROFILE for Northeast Hood Canal Fall Chum

STOCK ASSESSMENT

DATA QUALITY-----> Fair

Return Years	ESCAPE Total			
67				
68	3565			
69	2167			
70	3370			
71	3360			
72	2811			
73	2897			
74	6762			
75	2484			
76	4226			
77	1317			
78	8207			
79	1518			
80	761			
81	976			
82	1081			
83	593			
84	1743			
85	3153			
86	2418			
87	1671			
88	1723			
89	478			
90	1183			
91	1873			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Composite

STOCK DISTINCTION
Distribution

STOCK STATUS
Healthy

SCREENING CRITERIA

HOOD CANAL -- DEWATTO FALL CHUM

STOCK DEFINITION AND ORIGIN

Dewatto fall chum salmon were identified as a separate stock because they are isolated from other Puget Sound chum stocks by a distinct spawning distribution. The Dewatto system enters Hood Canal near the Great Bend.

Dewatto-area fall chum spawn from mid-November through December creating a temporal separation from the Hood Canal summer stocks and, to some degree, from the later-spawning (December-January) late fall chum stocks in the Quilcene, Hamma Hamma, Dosewallips, Duckabush and Skokomish systems.

The natal tributaries of this stock drain Dewatto Bay and the area to the north and south of the bay. These streams are characterized by low gradients and small drainages. The primary streams are the Dewatto River itself and Shoe and White creeks. Fall chum spawning in these streams were identified as a single stock for two reasons: (1) spawner run timing is identical in these streams, (2) the spawning grounds are in close proximity so there is no significant geographical separation among them.

Hatchery plants and strays into the Dewatto-area fall stock spawning streams have probably affected the genetic composition of the native fish. Accordingly, this stock was classified as a mixed stock from a composite of native and hatchery fish.

STOCK STATUS

The status of Dewatto fall chum is Healthy.

Escapement data derived from spawning ground surveys are the only consistent information available on the stock's status. Escapement estimates are available from 1968 to the present and range from 300 to 4,600. The last seven-year escapement estimate averaged over 2,100, suggesting a healthy stock.

FACTORS AFFECTING PRODUCTION

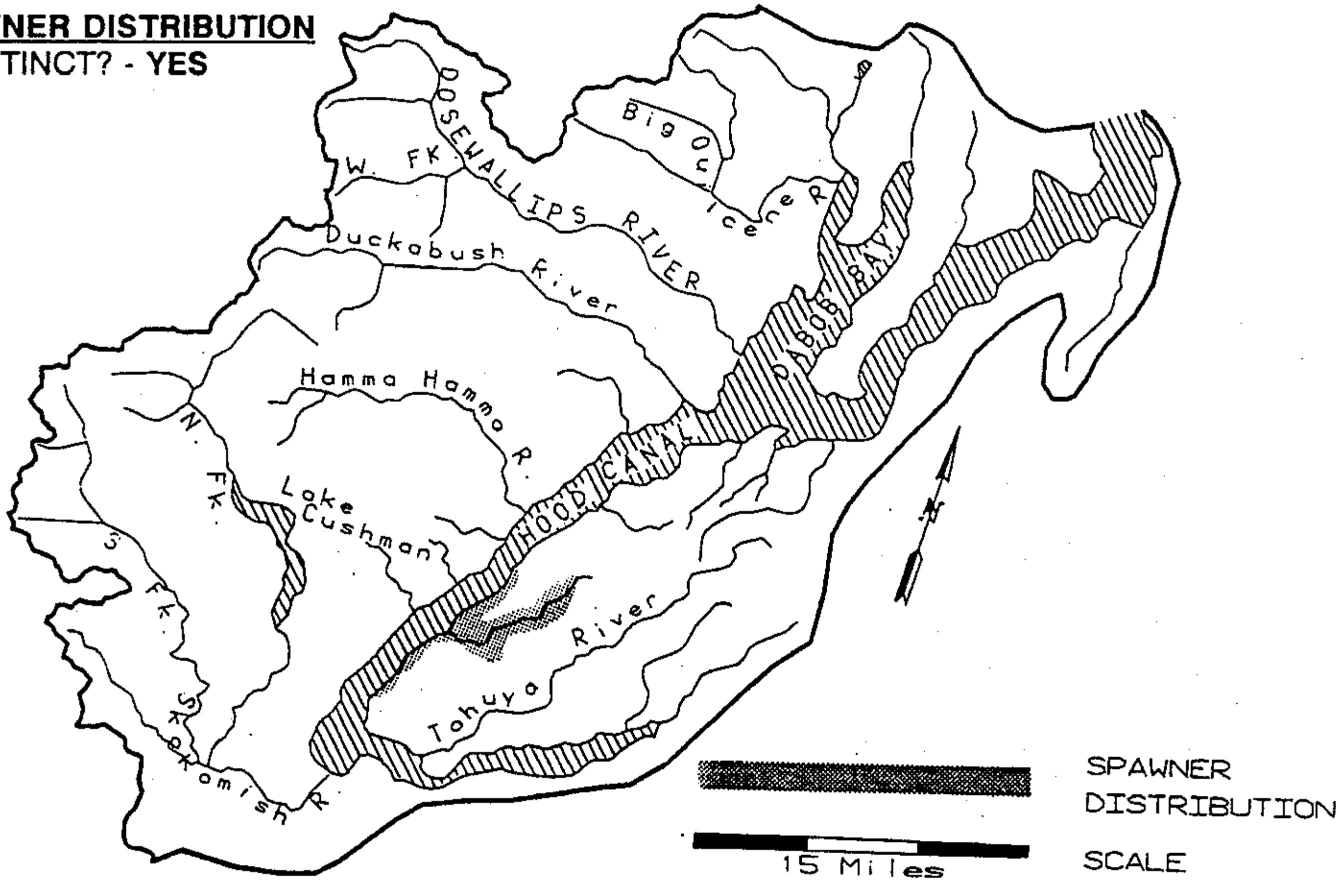
Habitat -- The principal natural limiting factor for salmon production in the Dewatto watershed is summer low flow which reduces, or, in extreme cases, dries up juvenile-rearing habitat. In addition, beaver dams, though generally beneficial to salmon, may be flooding spawning areas in the stream.

The Dewatto watershed has suffered some impacts from human activity, although the freshwater habitat for salmon is in relatively good condition. The primary human

STOCK DEFINITION PROFILE for Dewatto Fall Chum

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**UNK**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - **UNKNOWN**

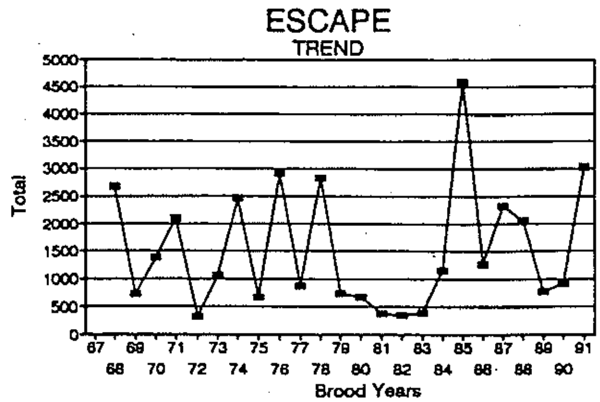
GENETICS - No data available.

STOCK STATUS PROFILE for Dewatto Fall Chum

STOCK ASSESSMENT

DATA QUALITY——> NOT AVAILABLE

Brood Years	ESCAPE Total			
67				
68	2690			
69	733			
70	1400			
71	2108			
72	331			
73	1062			
74	2465			
75	678			
76	2917			
77	881			
78	2833			
79	754			
80	676			
81	387			
82	360			
83	400			
84	1150			
85	4595			
86	1273			
87	2326			
88	2061			
89	782			
90	911			
91	3031			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Mixed

PRODUCTION TYPE

Composite

STOCK DISTINCTION

Distribution

STOCK STATUS

Healthy

SCREENING CRITERIA

activities affecting fish habitat include rural development (houses and hobby farms), road building and logging. All of these activities have resulted in reduction of riparian areas leading to loss of streamside shade and reduced sources of in-stream large woody debris. Bank protection activities associated with rural development have channelized parts of the stream, resulting in reduction of cover and hiding habitat. In addition to contributing to the loss of riparian areas, logging in the watershed has resulted in increased sediment load in the stream. Several culverts block access to spawning and juvenile-rearing habitat. Four-wheel drive vehicles driving in the stream bed in the lower one and one-half miles of the mainstem Dewatto may be damaging redds and at least temporarily destroying gravel structure. The effects of these activities on fish habitat are expected to worsen with increased development in the watershed.

Harvest Management -- Stock specific information is not available.

Hatchery -- Several hatcheries operate on Hood Canal rearing coho, spring and fall chinook, chum and pink salmon. There are enhancement efforts using remote site incubators as well. The effect of these releases on Dewatto fall chum is unknown.

Last ten years salmon releases into West Kitsap Streams

Release Year	Fall Chinook	Coho	Fall Chum
1982	13,346	508,710	515,141
1983	411,855	0	2,621,725
1984	134,310	63,400	143,359
1985	60,000	105,000	3,849,000
1986	0	0	1,028,000
1987	0	0	1,648,400
1988	0	110,000	1,747,000
1989	0	70,000	2,207,500
1990	45,000	90,000	2,723,080
1991	20,000	4,825	474,014
MEAN	124,902	135,991	1,695,722

HOOD CANAL -- SOUTHEAST HOOD CANAL FALL CHUM

STOCK DEFINITION AND ORIGIN

Southeast Hood Canal fall chum salmon were identified as a stock because they are isolated from other Puget Sound stocks by a distinct spawning distribution. Southeast Hood Canal fall chum spawn from early November through December creating a temporal separation from the Hood Canal summer chum stocks and, to some degree, from the later-spawning (December-January) late fall chum stocks in the Quilcene, Hamma Hamma, Dosewallips, Duckabush and Skokomish systems. The spawning grounds of the southeast Hood Canal fall chum as group are isolated from those of other Hood Canal fall chum stocks by geographic separation.

The natal tributaries of this stock drain the southwest side of the Kitsap Peninsula including the Tahuya River basin and those streams east of the Union River. The natal steams of this stock are characterized by low gradients and small drainages. The primary streams are Stimson, Big and Little Mission, Twanoh, Alderbrook, Rendsland, and Caldervin creeks as well as the Union and Tahuya rivers. The fall chum spawning in these streams were identified as a single stock for two reasons: (1) spawner run timing is identical in these streams, and (2) the spawning grounds are close enough in proximity to prevent geographic separation.

The extent of hatchery plants into the southeast Hood Canal fall chum spawning streams has probably affected the genetic composition of the stock. Accordingly, this stock was classified as a mixed stock from a composite of native and hatchery fish.

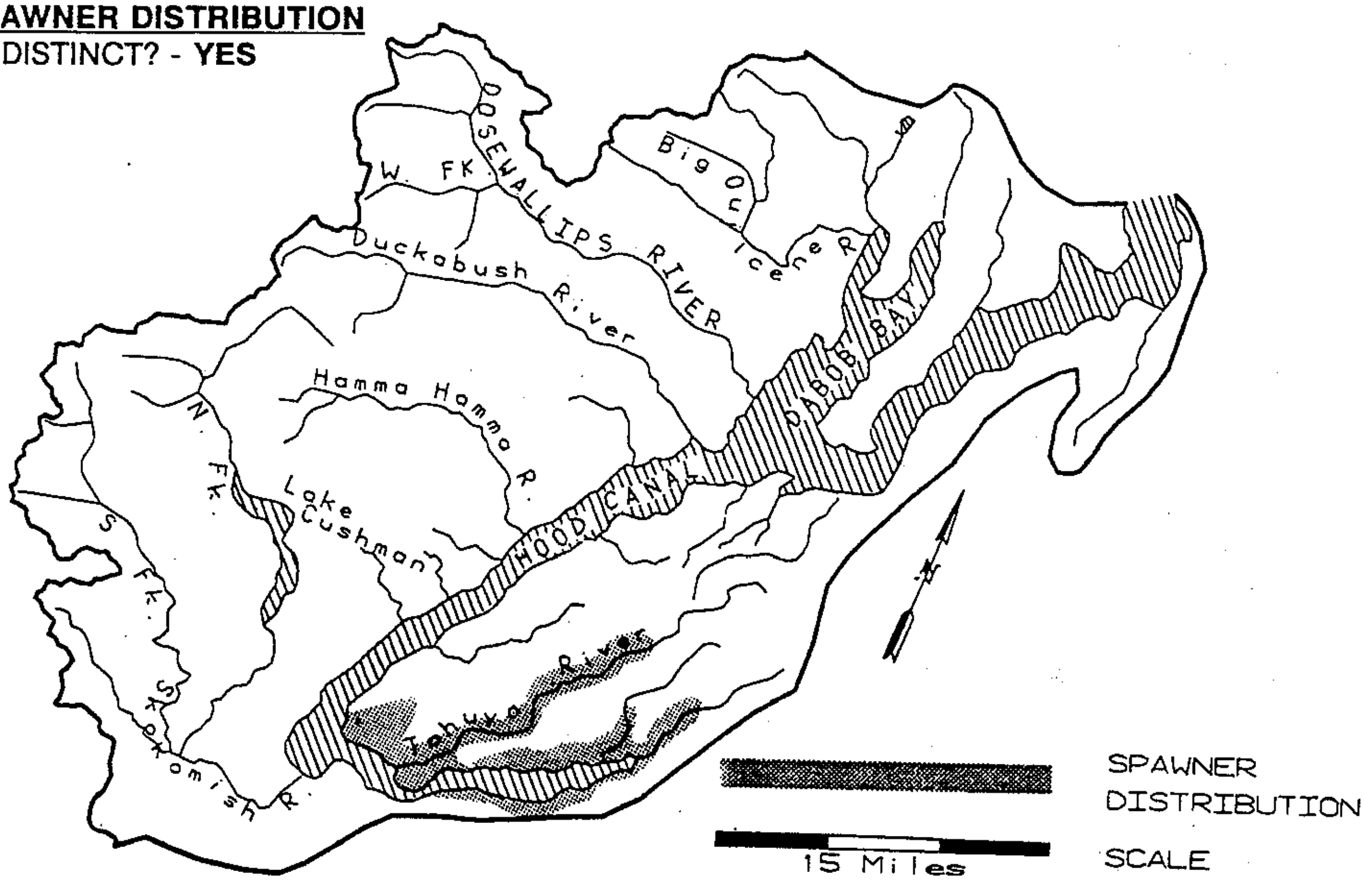
STOCK STATUS

The status of the southeast Hood Canal fall chum stock is Healthy.

Escapement data derived from spawning ground surveys are the only consistent information available on the stock's status. Escapement estimates are available from 1968 to 1991 and range from 1,200 to 21,000. The last seven-year escapement estimate averaged over 5,000, suggesting a healthy stock.

STOCK DEFINITION PROFILE for Southeast Hood Canal Fall Chum

SPAWNER DISTRIBUTION
DISTINCT? - **YES**

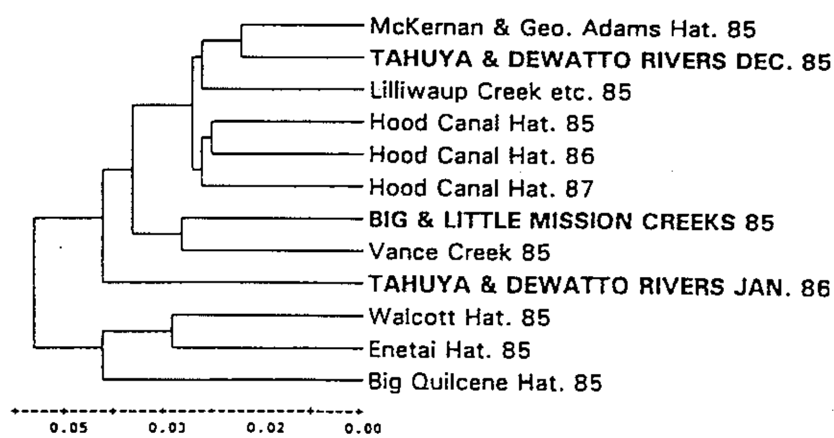


TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**UNK**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **UNKNOWN**

GENETICS - Analysis of two GSI collections from the Tahuya and Dewatto rivers (December 1985, N=100; January 1986, N=100), and a 1985 (N=112) collection from Big Mission + Little Mission creeks indicated that these fish add to the significant genetic heteogeneity of Hood Canal fall stock chum. However, individual pairwise tests with other Hood Canal collections were not always significant (21-locus G-tests: **p**>0.1).



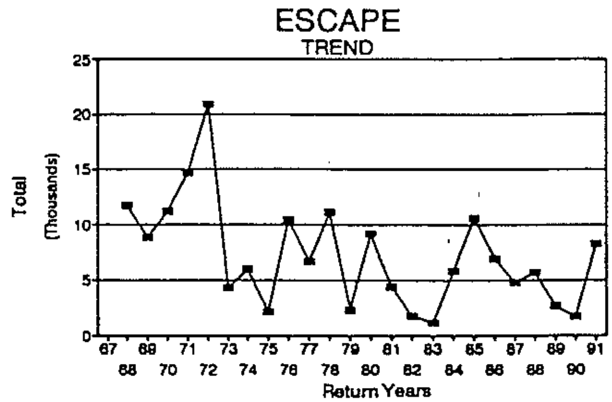
Genetic distance (modified Rogers distance (Wright, 1978) UPGMA)

STOCK STATUS PROFILE for Southeast Hood Canal Fall Chum

STOCK ASSESSMENT

DATA QUALITY------> Fair

Return Years	ESCAPE Total			
67				
68	11760			
69	8829			
70	11209			
71	14667			
72	20867			
73	4279			
74	6036			
75	2149			
76	10499			
77	6675			
78	11109			
79	2308			
80	9214			
81	4427			
82	1818			
83	1198			
84	5906			
85	10628			
86	6970			
87	4868			
88	5725			
89	2724			
90	1760			
91	8281			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Mixed

PRODUCTION TYPE

Composite

STOCK DISTINCTION

Distribution

STOCK STATUS

Healthy

SCREENING CRITERIA

HOOD CANAL -- LOWER SKOKOMISH FALL CHUM

STOCK DEFINITION AND ORIGIN

Lower Skokomish fall chum salmon were identified as a stock because they are isolated from other Washington chum stocks by a distinct spawning distribution and to some degree by a difference in run timing.

Production for this stock comes from a composite of naturally-spawning fish of wild and hatchery origin. Spawning occurs in the lower reaches of the Skokomish River mainstem, Purdy and Weaver creeks. Most of the naturally-spawning chum in Purdy and Weaver creeks are hatchery fish that spawn before reaching the hatcheries George Adams Hatchery and McKernan Hatchery, respectively. The distribution of these spawners is five miles downstream from the Upper Skokomish stock, creating a geographic separation between the two Skokomish chum stocks. Spawning occurs from November through December (early fall) and peaks nearly a month earlier than in the Upper Skokomish late fall chum stock, creating a separation in run timing as well. Because of the influence from hatchery plants, these fish are considered to be a mixed stock from a composite of wild and hatchery production.

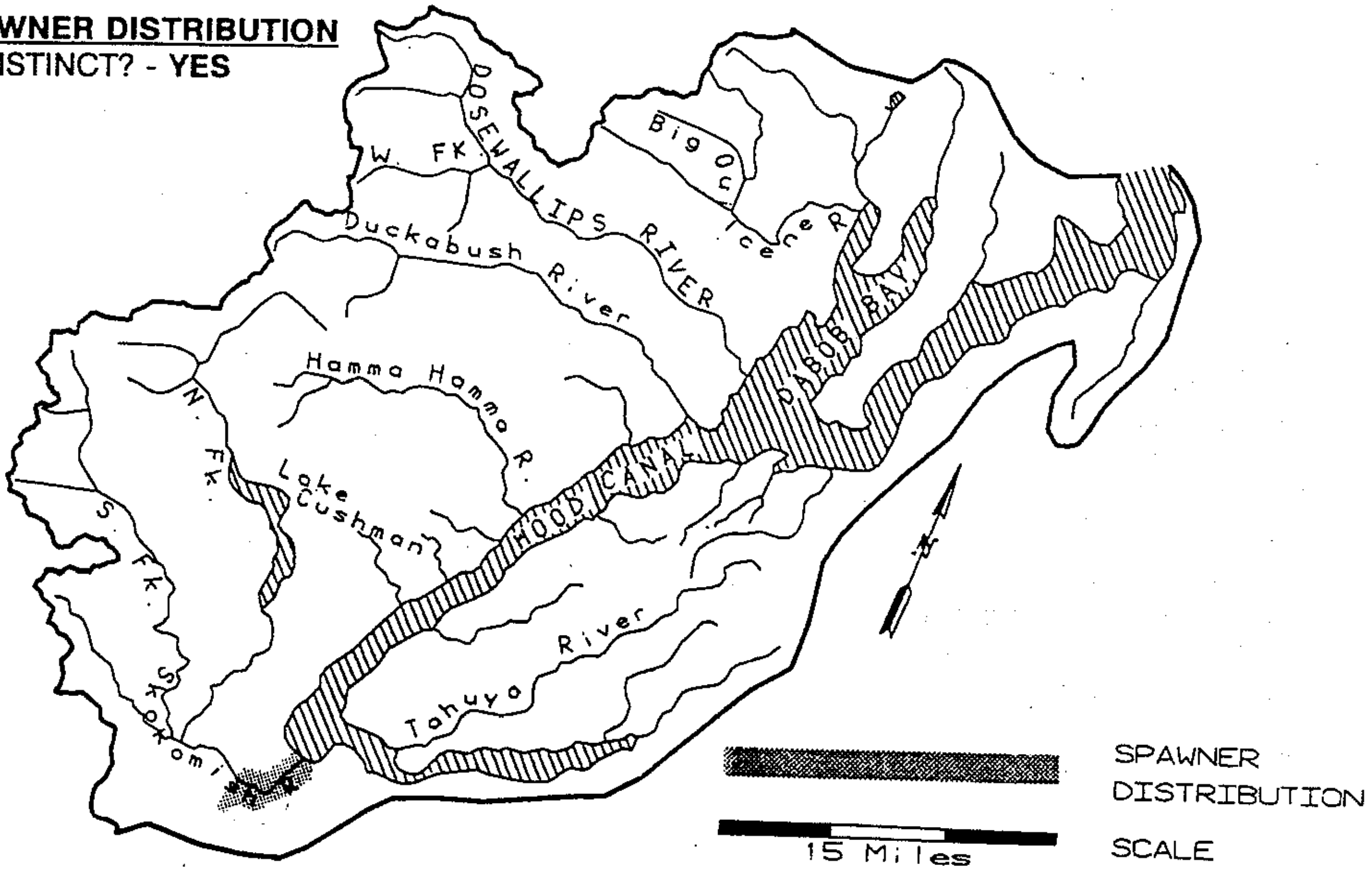
STOCK STATUS

The status of the Lower Skokomish fall chum stock is Unknown.

Spawning ground survey data and escapement information are not available for this stock, so the status is Unknown although large numbers of chum are released into Purdy and Weaver creeks. From 1983 through 1991, early fall chum fry releases into the Lower Skokomish River from the George Adams and McKernan hatcheries combined ranged from approximately five million to approximately 32 million and averaged about 21 million per year.

STOCK DEFINITION PROFILE for Lower Skokomish Fall Chum

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													UNK
RIVER ENTRY													UNK
SPAWNING													UNK

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **UNKNOWN**

GENETICS - No data available.

STOCK STATUS PROFILE for Lower Skokomish Fall Chum

STOCK ASSESSMENT

DATA QUALITY------> No Data

Brood Years	NO DATA			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Composite

STOCK DISTINCTION
Distribution, Timing

STOCK STATUS
Unknown

SCREENING CRITERIA

HOOD CANAL -- UPPER SKOKOMISH LATE FALL CHUM

STOCK DEFINITION AND ORIGIN

Upper Skokomish late fall chum salmon were identified as a stock because they are isolated from other Puget Sound chum stocks by a distinct spawning distribution and to some degree by a difference in run timing.

The Skokomish River is located on the west side of the south end of Hood Canal. This location provides some geographic separation from many of the other Hood Canal stocks. The Upper Skokomish stock spawns from December through late January. This timing is later than that of the east Hood Canal fall stocks and most of the west Hood Canal fall stocks, including the Lower Skokomish fall chum stock.

Natural spawning occurs in most tributaries of the system (e.g. Vance Creek and Richert Springs), however, the lower four miles of the North Fork accounts for the largest portion of the production. While genetic analysis of all the Skokomish tributaries is not available, an analysis of Vance Creek and North Fork Skokomish chum failed to show a difference, suggesting a single stock.

The Upper Skokomish late fall chum stock was separated from the lower Skokomish fall chum based on geographic distribution of the spawning grounds, the origin of the stock, and genetic evidence. The lower Skokomish chum spawn primarily in Purdy and Weaver creeks and have received significant (average>10,000 lbs. of fry per year) Hood Canal Hatchery chum plants since 1976. The chum spawning in these streams are no longer considered a native stock and are probably very similar to Hood Canal (Hoodsport) Hatchery stock. Electrophoretic analysis showed North Fork Skokomish fall chum to be significantly different from Hood Canal (Hoodsport) Hatchery stock. Additionally, the Upper Skokomish fall chum rely almost entirely on wild spawning for production and are believed to be a native stock.

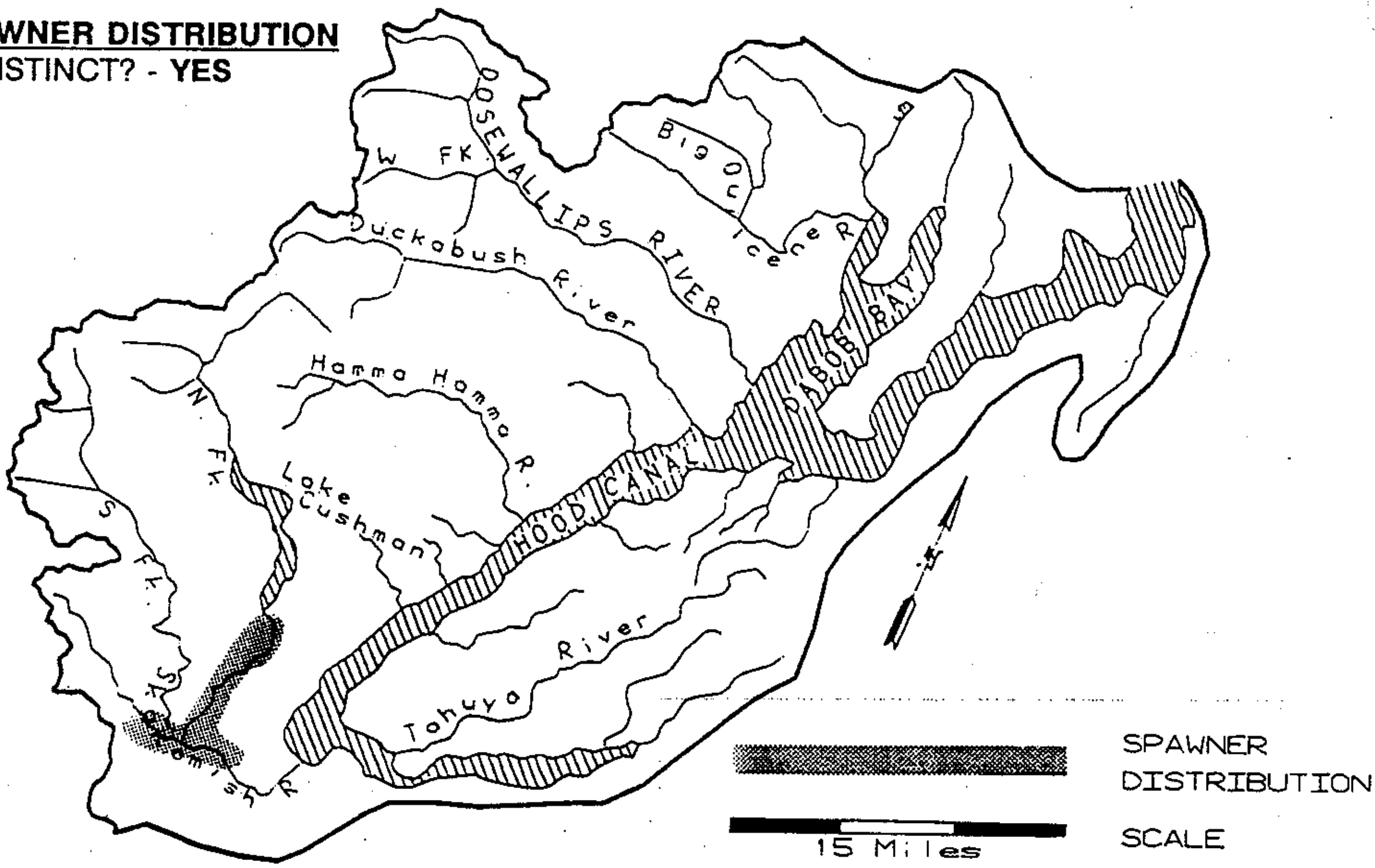
STOCK STATUS

The status of the Upper Skokomish late fall chum is Healthy.

Escapement data derived from spawning ground surveys are the only consistent information available on the stock's status. Escapement estimates are available from 1968 to 1991 and range from 850 to 10,000 leading to the conclusion that this is a Healthy stock.

STOCK DEFINITION PROFILE for Upper Skokomish Late Fall Chum

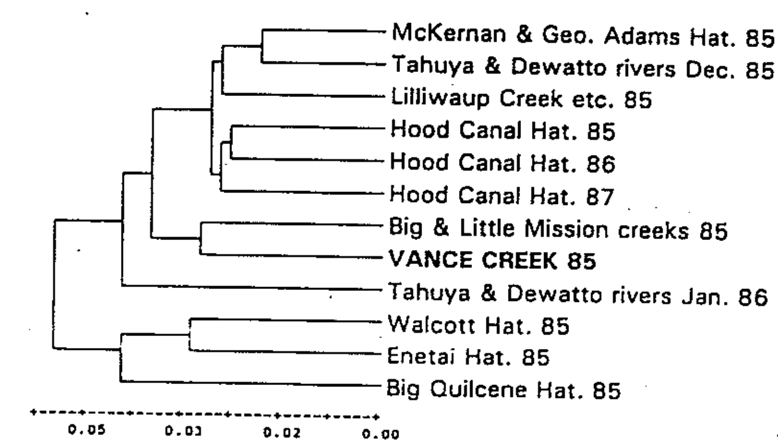
SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**NO**
RIVER ENTRY													**NO**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

GENETICS - Two GSI collections from wild-spawning populations (Vance Creek 1985, N=101; North Fork Skokomish 1991, N=77) and two hatchery collections (George Adams 1985, N=50; McKernan 1985, N=50) have been analyzed. The two wild-spawning populations add to the significant genetic heterogeneity of the Hood Canal fall chum stock. However, individual pairwise tests with other Hood Canal collections were not always significant (21-locus G-tests: $p>0.1$). The two hatchery collections were not significantly different from Hood Canal hatchery chum.



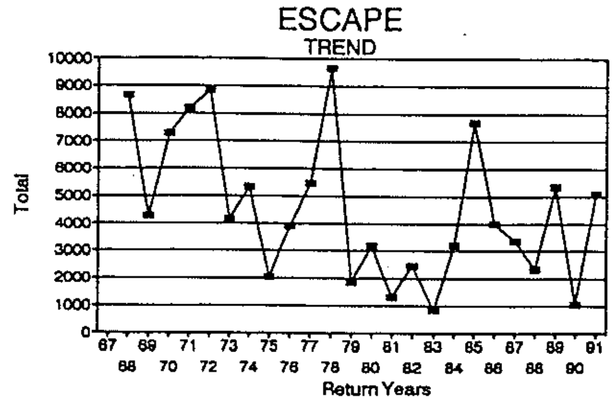
Genetic distance (modified Rogers distance (Wright, 1978) UPGMA)

STOCK STATUS PROFILE for Upper Skokomish Late Fall Chum

STOCK ASSESSMENT

DATA QUALITY------> Good

Return Years	ESCAPE Total			
67				
68	8659			
69	4286			
70	7281			
71	8169			
72	8846			
73	4173			
74	5326			
75	2053			
76	3911			
77	5481			
78	9676			
79	1852			
80	3176			
81	1310			
82	2465			
83	842			
84	3198			
85	7687			
86	3992			
87	3385			
88	2342			
89	5366			
90	1058			
91	5109			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Native

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution, Timing

STOCK STATUS

Healthy

SCREENING CRITERIA

HOOD CANAL -- WEST HOOD CANAL FALL CHUM

STOCK DEFINITION AND ORIGIN

West Hood Canal fall chum salmon are produced in numerous, small independent tributaries and were identified as a stock because they are isolated from other Puget Sound stocks by a distinct spawning distribution.

The spawning tributaries of the West Hood Canal fall chum stock are located along the west shoreline of Hood Canal. This west side distribution is thought to provide a geographic separation from the fall chum stocks spawning on the east side of Hood Canal. Additionally, West Hood Canal fall chum spawn from early November through mid-December (early fall) creating a temporal separation from the Hood Canal summer stocks and to some degree from the later-spawning (December-January) stocks in the Hamma Hamma, Dosewallips, Duckabush and Skokomish systems.

The extent of hatchery plants in the West Hood Canal fall stock spawning streams has probably affected the genetic composition of this stock. The natal tributaries of the West Hood Canal fall stock require separate descriptions. Hill Creek and Little Lilliwaup Creek are small in size but have a stable water supply apparently from spring sources while Clark, Miller and Sund creeks flow only seasonally (November-May). Nevertheless, most of these streams are close enough in proximity to allow the exchange of genetic material increasing the likelihood of a single stock. Additionally, intense hatchery introductions and straying from the nearby Hood Canal (Hoodsport) Hatchery stock in these streams either have established introduced runs or have diluted the native stock such that they can no longer be distinguished from the Hood Canal (Hoodsport) Hatchery stock.

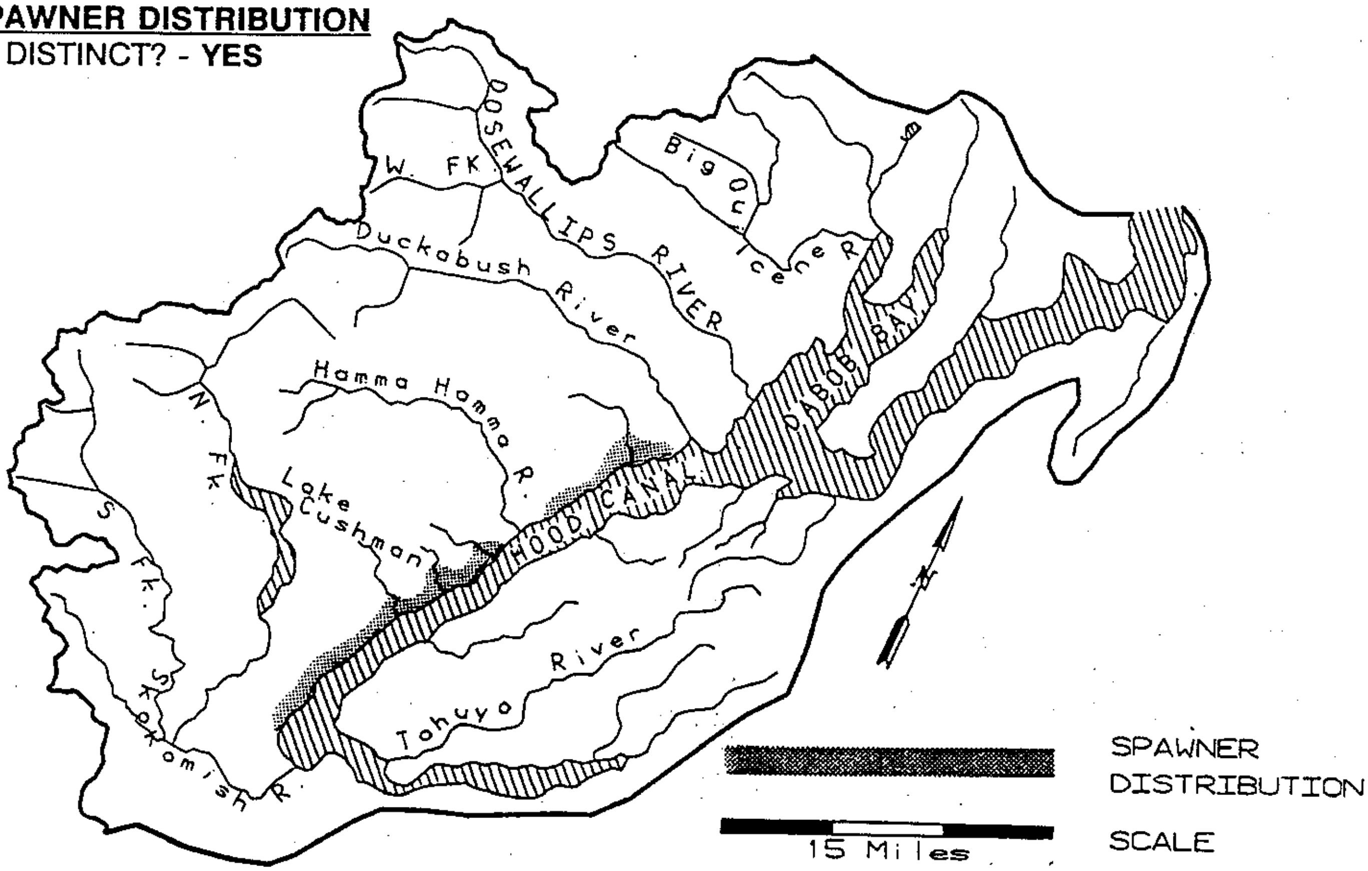
STOCK STATUS

The status of the West Hood Canal fall chum stock is Healthy.

Escapement data derived from spawning ground surveys are the only consistent information available on the stock's status. Escapement estimates are available from 1968 to 1991 and range from 3,500 to 37,000. Escapement levels have been stable over the last eight years, leading to the classification of this stock as Healthy.

STOCK DEFINITION PROFILE for West Hood Canal Fall Chum

SPAWNER DISTRIBUTION
DISTINCT? - **YES**

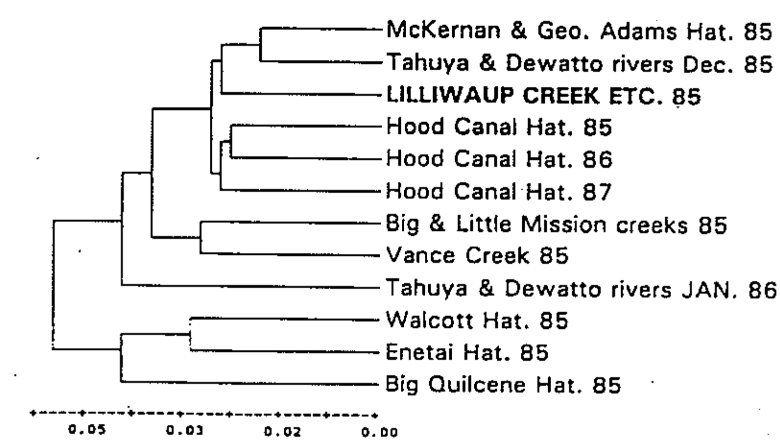


TIMING

TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													NO
RIVER ENTRY													NO
SPAWNING													NO

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

GENETICS - Analysis of a 1985 GSI combined collection from Lilliwaup, Eagle, Jorsted, and Fulton creeks (N=94) indicated that these fish add to the significant genetic heterogeneity of Hood Canal fall stock chum. However, individual pairwise tests with other Hood Canal collections were not always significant (21-locus G-tests: **p**>0.1).



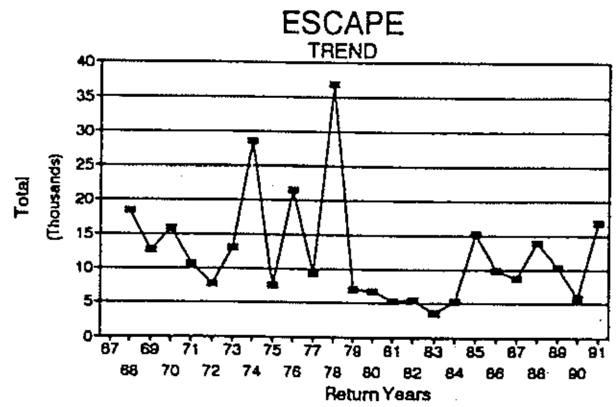
Genetic distance (modified Rogers distance (Wright, 1978) UPGMA)

STOCK STATUS PROFILE for West Hood Canal Fall Chum

STOCK ASSESSMENT

DATA QUALITY-----> Good

Return Years	ESCAPE Total			
67				
68	18418			
69	12619			
70	15907			
71	10761			
72	7852			
73	13110			
74	28610			
75	7536			
76	21401			
77	9358			
78	36868			
79	7042			
80	6754			
81	5374			
82	5501			
83	3517			
84	5298			
85	15316			
86	9946			
87	8811			
88	13967			
89	10338			
90	5790			
91	16934			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Mixed

PRODUCTION TYPE

Composite

STOCK DISTINCTION

Distribution, Timing

STOCK STATUS

Healthy

SCREENING CRITERIA

HOOD CANAL -- HAMMA HAMMA LATE FALL CHUM

STOCK DEFINITION AND ORIGIN

Hamma Hamma River late fall chum salmon were identified as a separate stock because they are isolated from other Puget Sound chum stocks by a distinct spawning distribution and to some degree a difference in run timing.

The Hamma Hamma River is located on the west side of the Hood Canal near the town of Eldon. The mouth of the Hamma Hamma River is seven miles from the Duckabush River, the closest spawning area with a late fall chum salmon stock. This distance creates a geographic separation between the two populations. The west side location of the Hamma Hamma River in Hood Canal provides a geographic separation from the east side Hood Canal stocks. Furthermore, the Hamma Hamma stock spawns relatively late for fall chum (mid-November through mid-January) providing some temporal separation from the east side Hood Canal fall stocks as well.

Significant plants of Finch Creek chum stock from the Hood Canal (Hoodsport) Hatchery have been made into John Creek, a tributary to the Hamma Hamma River. The run timing of these fish is earlier than that of the native late fall stock with some overlap occurring in late November. It is likely that mixing of the stocks has occurred during this time period that may have resulted in some hybridization. However, fish spawning later in the run are believed to be largely native stock. Spawning ground surveys in 1988, 1989 and 1991 showed a second peak in the spawning run indicating the presence of later-spawning fish.

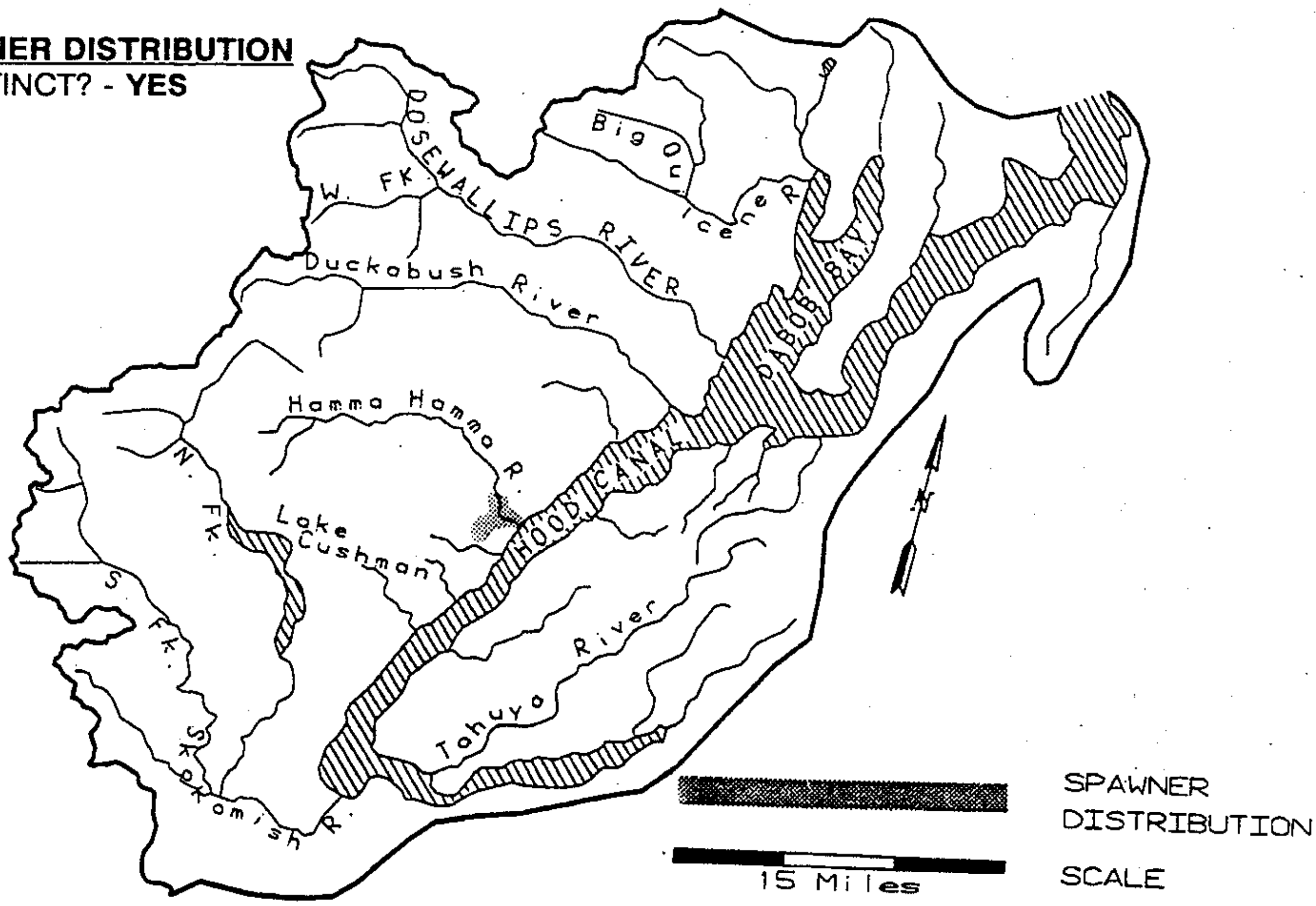
STOCK STATUS

The status of the Hamma Hamma late fall chum stock is Healthy.

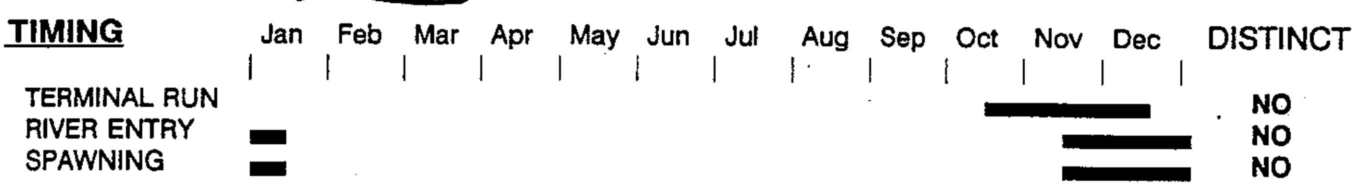
Escapement data derived from spawning ground surveys are the only consistent information available on the stock's status. Escapement estimates are available from 1968 to 1991 and range from 900 to 14,000 leading to the classification of this stock as Healthy.

STOCK DEFINITION PROFILE for Hamma Hamma Late Fall Chum

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

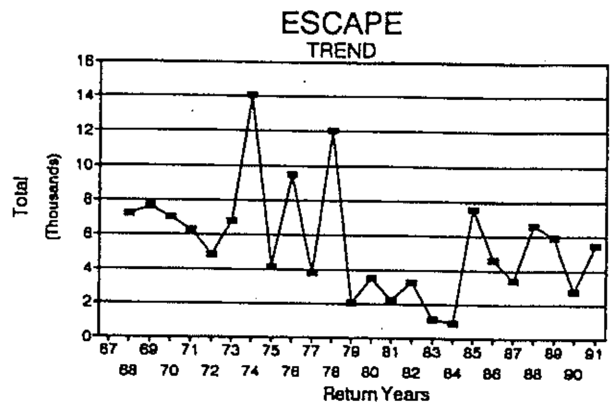
GENETICS - Preliminary analysis of a 1991 collection (N=145) indicated that these fish add to the significant genetic heterogeneity of the Hood Canal fall chum stock. However, individual pairwise tests with other Hood Canal collections were not always significant (21-locus G-tests: **p**>0.1).

STOCK STATUS PROFILE for Hamma Hamma Late Fall Chum

STOCK ASSESSMENT

DATA QUALITY------> Good

Return Years	ESCAPE Total			
67				
68	7189			
69	7637			
70	7022			
71	6294			
72	4840			
73	6812			
74	14070			
75	4140			
76	9510			
77	3833			
78	12051			
79	2051			
80	3536			
81	2239			
82	3317			
83	1130			
84	882			
85	7585			
86	4648			
87	3430			
88	6630			
89	5924			
90	2798			
91	5485			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Native

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution, Timing

STOCK STATUS

Healthy

SCREENING CRITERIA

HOOD CANAL -- DUCKABUSH LATE FALL CHUM

STOCK DEFINITION AND ORIGIN

Duckabush River late fall chum salmon were identified as a separate stock because they are isolated from other Puget Sound chum stocks by a distinct spawning distribution and to some degree a difference in run timing.

The Duckabush River is located on the west side of the Hood Canal just south of Black Point. The mouth of the Duckabush River is five miles from the Dosewallips River and seven miles from the Hamma Hamma River, the closest spawning areas with late fall chum stocks. This distance creates a geographic separation between the two populations. The west-side location of the Duckabush River in Hood Canal provides a geographic separation from the east side Hood Canal stocks. Furthermore, the Duckabush fall stock spawn relatively late for fall chum (mid-November through mid-January) providing some temporal separation between the east side Hood Canal fall stocks (which spawn November-December), as well as the earlier spawning West Hood Canal fall stock.

Significant plants of Hood Canal (Hoodsport) Hatchery stock have been made into Johnson Creek, a tributary to the Duckabush River. The run timing of these fish tends to be earlier than that of the native late fall stock with some overlap occurring in late November. It is likely that mixing of the stocks has occurred during this time period that may have resulted in some hybridization. However, fish spawning later in the run may still be largely native stock. Spawning ground surveys in 1988, 1989 and 1991 show a second peak in the spawning run indicating the presence of later spawning fish. No GSI information is available at this time.

STOCK STATUS

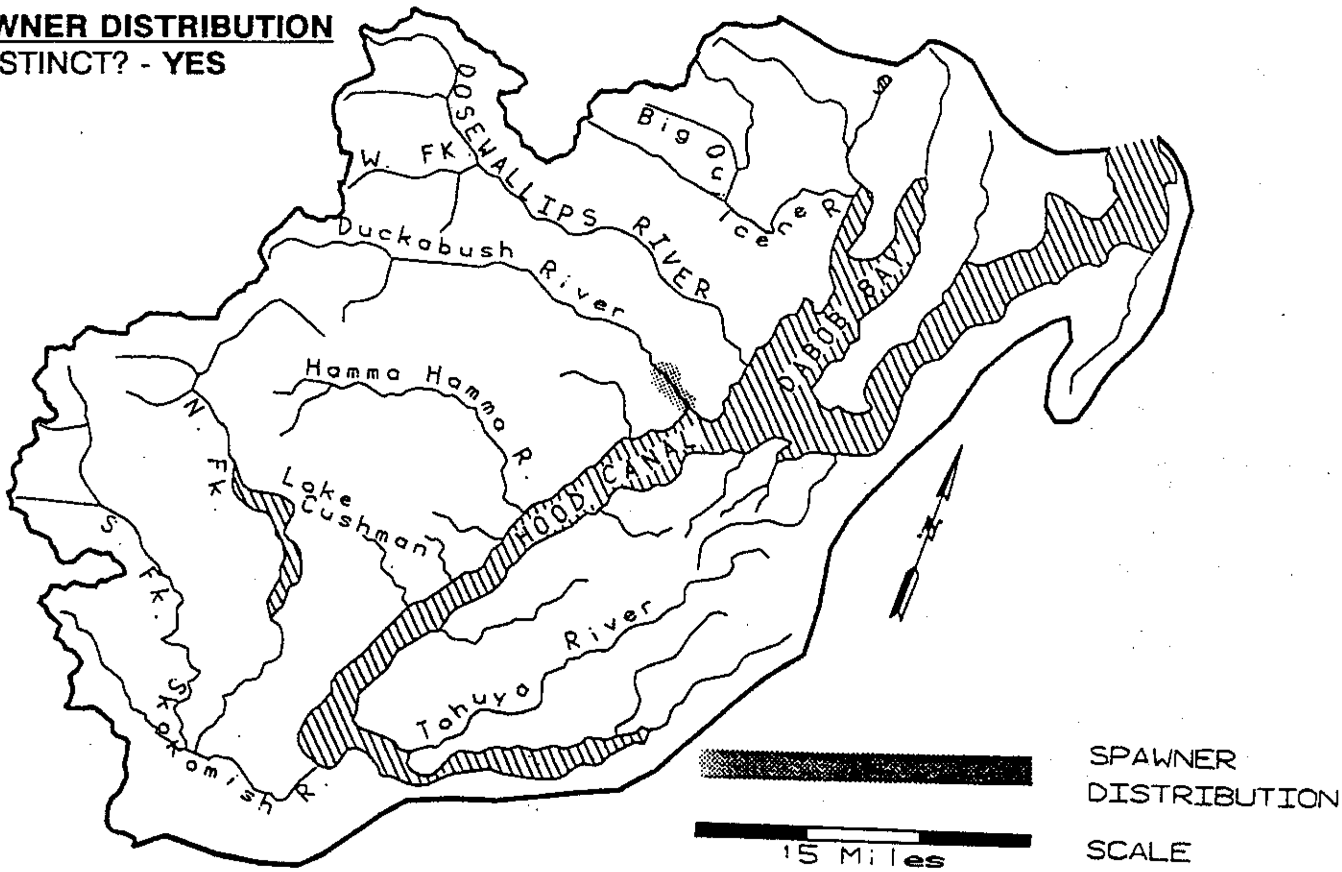
The status of the Duckabush late fall chum stock is Healthy.

Escapement data derived from spawning ground surveys are the only consistent information available on the stock's status. Escapement estimates are available from 1968 to 1991 and range from 74 to 4,700. Escapement levels have increased, averaging 1,900 the last ten years compared to 600 in the previous decade, leading to the classification of the stock as Healthy.

STOCK DEFINITION PROFILE for Duckabush Late Fall Chum

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN										▬	▬	▬	**NO**
RIVER ENTRY	▬										▬	▬	**NO**
SPAWNING	▬										▬	▬	**NO**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - **UNK**

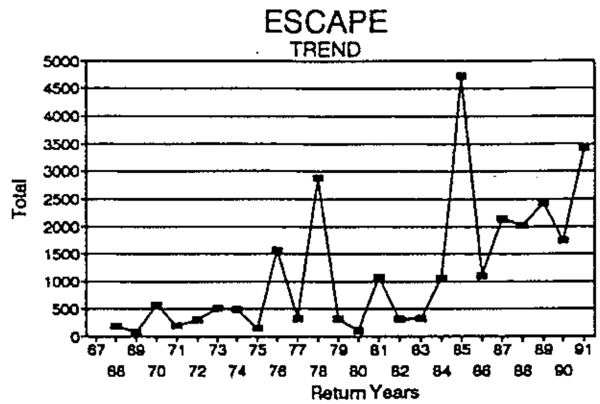
GENETICS - No GSI collections have been made from this river.

STOCK STATUS PROFILE for Duckabush Late Fall Chum

STOCK ASSESSMENT

DATA QUALITY------> Good

Return Years	ESCAPE Total			
67				
68	192			
69	74			
70	576			
71	198			
72	310			
73	504			
74	488			
75	164			
76	1570			
77	332			
78	2910			
79	325			
80	120			
81	1086			
82	321			
83	330			
84	1068			
85	4737			
86	1106			
87	2148			
88	2017			
89	2418			
90	1747			
91	3422			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Native

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution, Timing

STOCK STATUS

Healthy

SCREENING CRITERIA

HOOD CANAL -- DOSEWALLIPS LATE FALL CHUM

STOCK DEFINITION AND ORIGIN

Dosewallips River late fall chum were identified as a separate stock because they are isolated from other Puget Sound chum stocks by a distinct spawning distribution and to some degree a difference in run timing. The Dosewallips River is located on the west side of the Hood Canal near the town of Brinnon.

The mouth of the Dosewallips River is five miles from the Duckabush River, the closest spawning area with a late fall chum salmon stock. This distance is presumably enough to create a geographic separation between the two populations. The west-side location of the Dosewallips River in Hood Canal provides a geographic separation from the east side Hood Canal stocks. Furthermore, the Dosewallips fall stock spawn relatively late for fall chum (mid-November through mid-January) providing some temporal separation from the east side Hood Canal fall stocks (which spawn November-December), as well as from the earlier-spawning West Hood Canal fall stock.

Hatchery plants into the Dosewallips River have been minimal, however there have been significant hatchery operations in Walcott Slough located near the mouth of the Dosewallips River. These operations utilized Walcott chum, a Dosewallips native population, so that they probably have not had a significant impact on the Dosewallips stock which is considered a native stock.

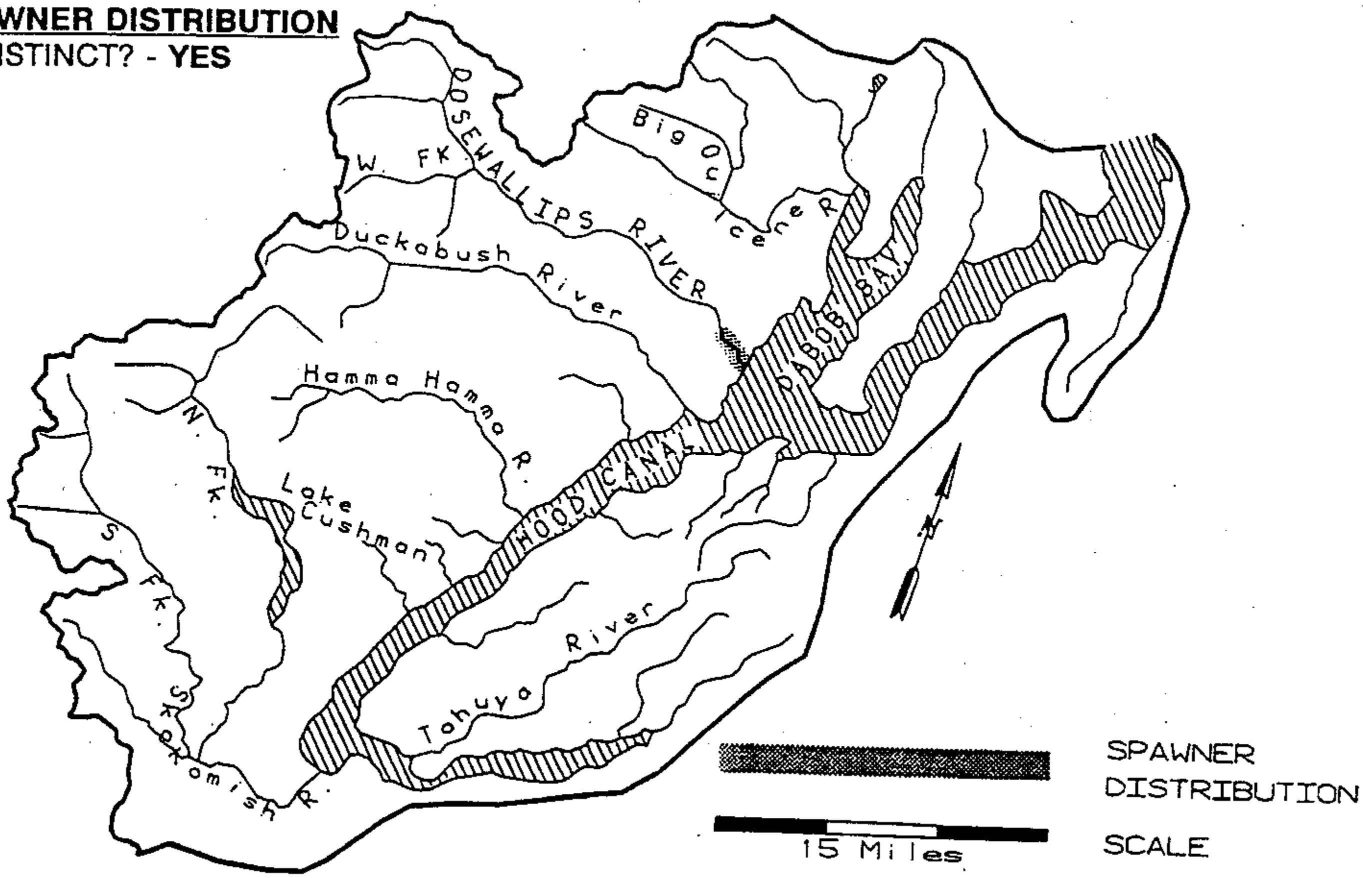
STOCK STATUS

The status of the Dosewallips late fall chum stock is Healthy.

Escapement data derived from spawning ground surveys are the only consistent information available on the stock's status. Escapement estimates are available from 1968 to 1991 and range from 80 to 7,300. Escapement levels have fluctuated over the last 30 years but appeared to be stable in the last eight years with the exception of 1990, when the escapement was estimated to be less than 100 chum salmon.

STOCK DEFINITION PROFILE for Dosewallips Late Fall Chum

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**NO**
RIVER ENTRY													**NO**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

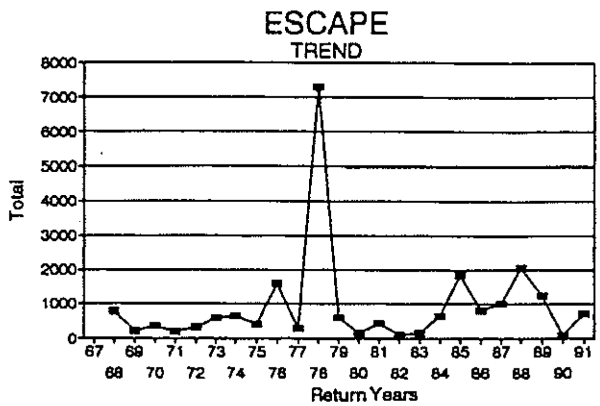
GENETICS - Preliminary analysis of a 1991 collection (N=105) indicated that these fish add to the significant genetic heterogeneity of the Hood Canal fall chum stock. However, individual pairwise tests with other Hood Canal collections were not always significant (21-locus G-tests: **p**>0.1).

STOCK STATUS PROFILE for Dosewallips Late Fall Chum

STOCK ASSESSMENT

DATA QUALITY------> Good

Return Years	ESCAPE Total			
67				
68	789			
69	211			
70	356			
71	206			
72	319			
73	602			
74	664			
75	419			
76	1620			
77	288			
78	7292			
79	597			
80	150			
81	437			
82	100			
83	152			
84	659			
85	1847			
86	819			
87	1006			
88	2074			
89	1260			
90	77			
91	719			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Native

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution, Timing

STOCK STATUS

Healthy

SCREENING CRITERIA

HOOD CANAL -- QUILCENE LATE FALL CHUM

STOCK DEFINITION AND ORIGIN

Quilcene late fall chum salmon were identified as a separate stock because they are isolated from other Puget Sound stocks by a distinct spawning distribution and to some degree run timing differences.

The spawning tributaries of the Quilcene late fall chum stock enter Quilcene Bay located on the north end of Hood Canal. The location of Quilcene and Dabob Bays creates a geographic separation from the fall chum stocks spawning on the east side of Hood Canal. Furthermore, the Quilcene late fall stock spawns relatively late for fall chum (mid-November through early January) providing some temporal separation from the east side Hood Canal fall stocks (which spawn in November and December), as well as from the earlier spawning West Hood Canal fall stock.

The majority of the spawning occurs in the Big Quilcene River. This run is supported by the Quilcene National Fish Hatchery located up river (RM 2.3) on a tributary (Penny Creek). The escapement is the result of a combination of natural spawning and hatchery fish that spawn before reaching the hatchery. Spawning also takes place in the Little Quilcene River and the independent drainages, Jackson and Spencer creeks. In some years chum spawning in the Little Quilcene appear to have a slightly later run timing but are probably not distinct from the rest of the Quilcene stock.

Genetic stock identification studies conducted on fall chum spawning in Big Quilcene River and Walcott Slough show them to be significantly different from the other Hood Canal fall chum stocks.

The Quilcene National Fish Hatchery initiated its chum program to rebuild the declining Quilcene River late fall chum run. The brood stock came from Walcott Slough, a small independent tributary adjacent to the Dosewallips River. It is highly probable that the Walcott chum and the Dosewallips late fall chum are the same stock. Quilcene late fall chum should be considered an introduced stock of fish from Walcott Slough.

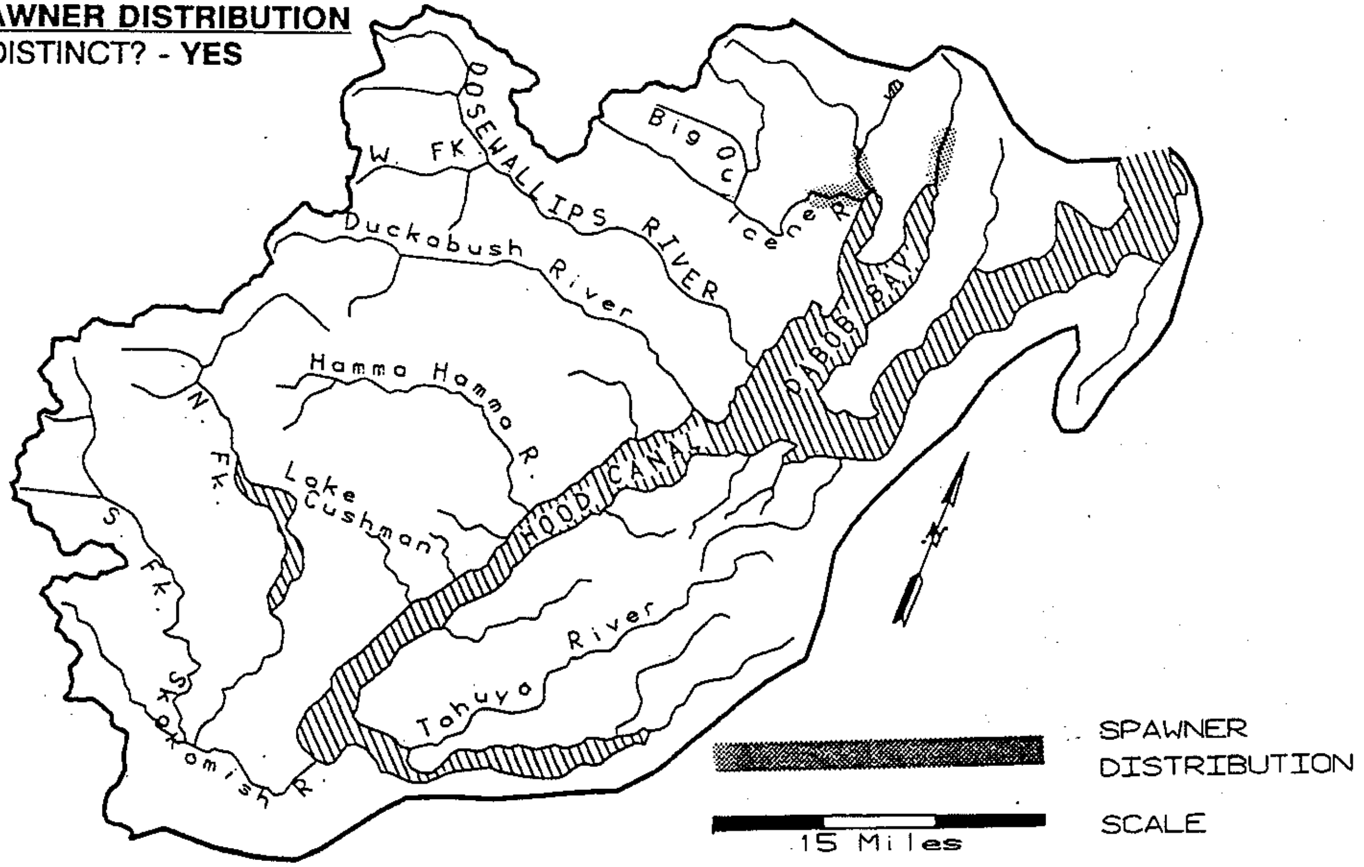
STOCK STATUS

The status of the Quilcene late fall chum stock is Healthy.

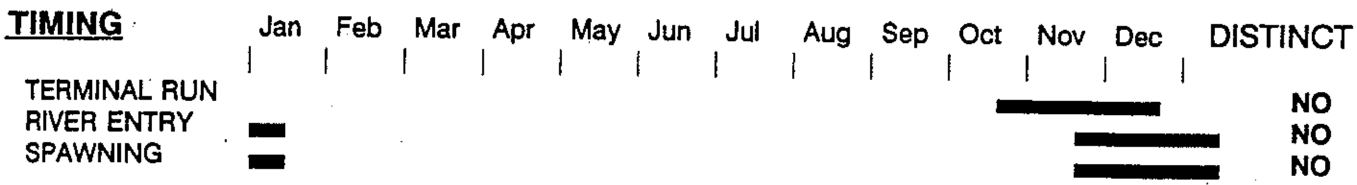
Escapement data derived from spawning ground surveys are the only consistent information available on the stock's status.

STOCK DEFINITION PROFILE for Quilcene Late Fall Chum

SPAWNER DISTRIBUTION
DISTINCT? - **YES**

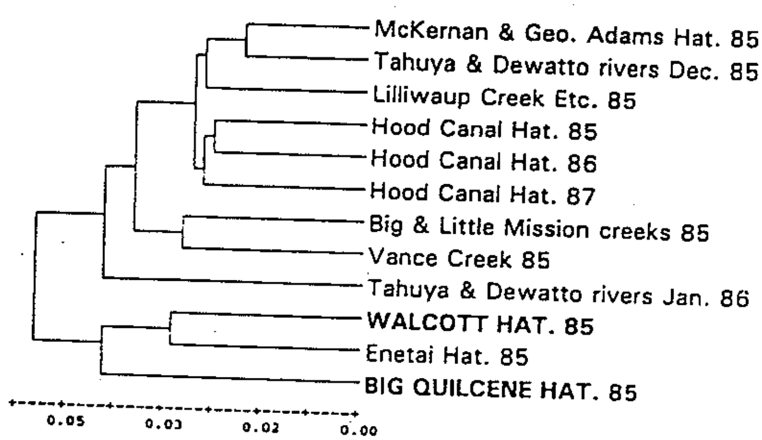


TIMING



BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

GENETICS - Analysis of two 1985 GSI collections (N=100) from the Quilcene and Walcott National Fish Hatcheries indicated that these fish add to the significant genetic heterogeneity of the Hood Canal fall chum stock. However, individual pairwise tests with other Hood Canal collections were not always significant (21-locus G-tests: **p**>0.1).



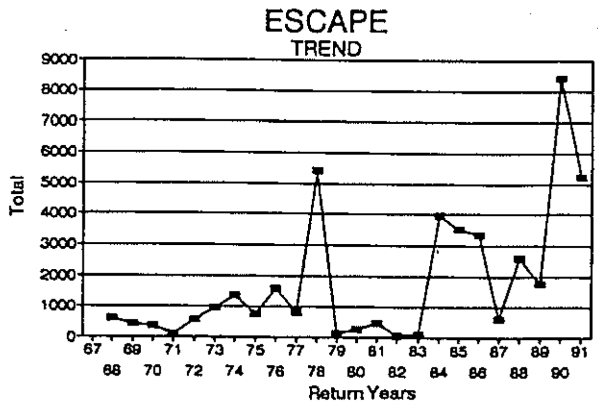
Genetic distance (modified Rogers distance (Wright, 1978) UPGMA)

STOCK STATUS PROFILE for Quilcene Late Fall Chum

STOCK ASSESSMENT

DATA QUALITY------> Good

Return Years	ESCAPE Total			
67				
68	614			
69	419			
70	356			
71	81			
72	585			
73	928			
74	1366			
75	751			
76	1580			
77	827			
78	5427			
79	117			
80	273			
81	462			
82	47			
83	81			
84	3969			
85	3535			
86	3358			
87	628			
88	2616			
89	1781			
90	8438			
91	5250			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Mixed

PRODUCTION TYPE

Composite

STOCK DISTINCTION

Distribution, Timing

STOCK STATUS

Healthy

SCREENING CRITERIA

Escapement estimates are available from 1968 to 1991 and range from 50 to 8,500. In large part due to the hatchery chum program, escapement has rebounded from a record low (47) in 1982 to an average of 3,700 over the last eight years.

OVERVIEW -- HOOD CANAL COHO STOCKS

NORTHEAST HOOD CANAL
DEWATTO
SOUTHEAST HOOD CANAL
SKOKOMISH
SOUTHWEST HOOD CANAL
HAMMA HAMMA
DUCKABUSH
DOSEWALLIPS
QUILCENE/DABOB BAYS

STOCK DEFINITION AND ORIGIN

Hood Canal includes all waters south and east of a line from Olele Point to Foulweather Bluff. Coho salmon utilize, to some degree, almost all of the accessible tributaries draining into Hood Canal. Coho returning to these tributaries typically enter freshwater from mid-September to mid-November and spawn from November to mid-January, with some variation observed between streams and between years within streams.

There have been substantial releases of hatchery-origin coho within this area, with significant yearling plants from the early 1950s to the mid-1980s and irregular fingerling/fry plants during that same time period. There are also annual yearling releases from the George Adams Hatchery on Purdy Creek, the Hood Canal (Hoodsport) Hatchery on Finch Creek, the Quilcene National Fish Hatchery and from pen-rearing programs in Port Gamble and Quilcene Bay. It should be noted that many of the early off-station yearling releases were not consistent with current optimal-size and time-of-release strategies, and their subsequent contribution to the wild spawning population is unknown. Straying rates from the on-station and pen rearing programs are also unknown, as are the potential survival differentials related to the various stocks introduced into this area. Additional to those considerations are questions regarding the spawning success in the wild of hatchery-origin coho and any distinctions between native and introduced stocks in terms of either temporal or physical spawning distributions. As a result of these uncertainties, all of the stocks in this area have been designated as probable mixtures of native and non-native stocks, without any inference as to the relative influence of those stocks within the current populations. There can be no confident quantification of the genetic impact of non-native stock introductions, regarding either a current presence of hatchery type components in these populations or hybridization of the native stock, until an effective genetic research tool is developed and implemented for coho salmon.

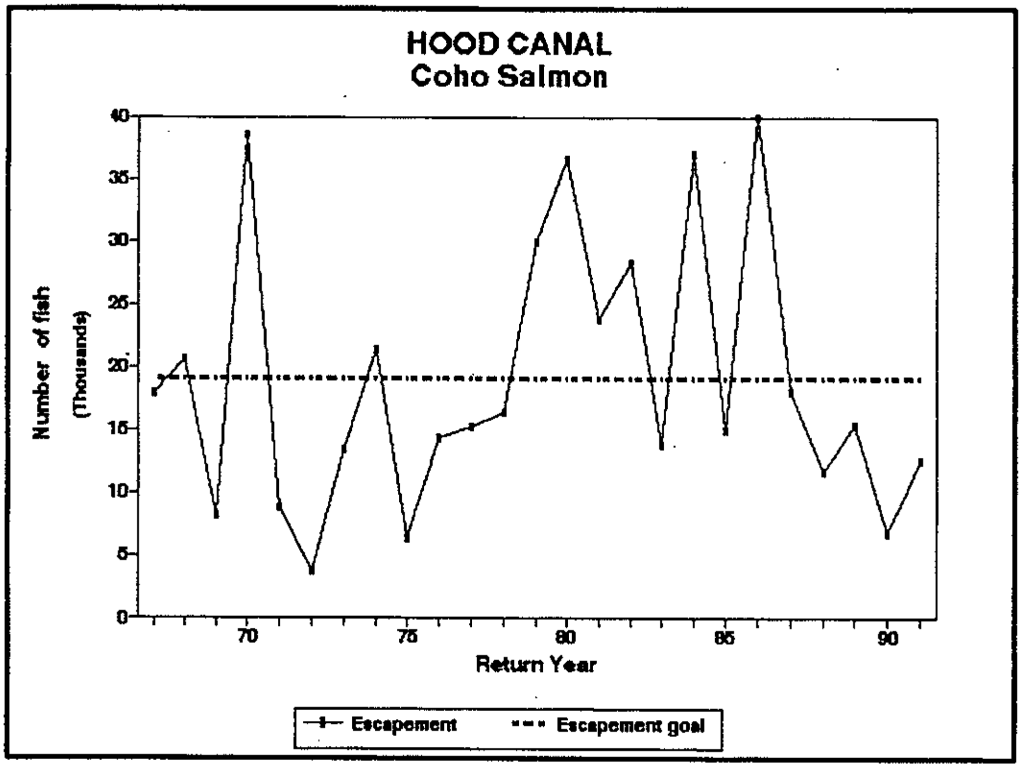
Given that there is no specific genetic determinant (GSI data) available and that there are no significant timing differences or any unique biological characteristics documented for these stocks, their distinction is primarily dependent upon geographic spawning separation. These distinctions are the result of subjective judgments regarding the probability of significant spawner interchange between drainages. Differences in off-station planting histories are assumed to result in dissimilar stock impacts, so those differences, where present, have provided secondary support for stock distinction based on geographic separation. Until genetic distinctions are discernable, these stock designations are tentative.

STOCK STATUS

Hood Canal-origin coho are primarily harvested in Canadian and Washington troll, net and sport fisheries. There are directed terminal-area fisheries in Port Gamble and Quilcene Bay to harvest surplus hatchery returns.

The total natural escapement goal for Hood Canal tributaries has been 19,100. Escapement estimates from 1967 to 1991 fluctuate over a broad range with escapements varying about the goal. The escapement goal has not been met in the last five years. Skokomish and Quilcene/Dabob Bay stocks are represented by long-term escapement data bases. The remaining individual stock performance evaluations are dependent upon relatively short stock assessment data bases (generally dating back to the early to mid-1980s) which provide no indication of present production's relationship with historic levels. Southeast Hood Canal, Dewatto, Northeast Hood Canal and Duckabush River coho stocks all demonstrate short-term severe declines in their escapements, while the Quilcene/Dabob Bay stock exhibits chronically low escapements all indicating cause for concern. By strict definition, the remainder of the stocks in Hood Canal have been classified as Healthy.

The figure below illustrates natural coho escapement trends in this basin. Note that although the current escapement goal is plotted for all years in this graph, specific escapement goals for harvest management purposes were not calculated until the late 1970s. Prior to 1979, Hood Canal coho were managed at the harvest rate appropriate for hatchery stocks.



Information on individual coho salmon stocks is presented in the Stock Reports which follow.

HOOD CANAL -- NORTHEAST HOOD CANAL COHO

STOCK DESCRIPTION AND ORIGIN

The Northeast Hood Canal coho salmon stock utilizes Big Anderson, Stavis, Seabeck, Big Beef, Little, Gamble, Miller, Lake and Kinman creeks on the east side of Hood Canal (Kitsap County) and Thorndyke and Shine Creeks on the west side (Jefferson County) as well as numerous smaller independent drainages. Coho from these streams were provisionally considered a single stock due to the geographic proximity and similar low-gradient character of these streams.

This stock does not exhibit a distinct temporal distribution, with most spawning occurring from early November to early January, and it does not display any documented unique biological characteristics. We believe there is limited straying to these tributaries from other Hood Canal drainages, so this stock has been defined on the basis of distinct geographic spawning distribution.

There have been very few off-station releases of hatchery-origin coho yearlings into this region (Minter stock in 1956 and 1962, George Adams in 1965 and 1966 and Green River in 1960). All of those releases were made into the Big Beef Creek system. There have been only six off-station fingerling/fry plants into either Big Beef, Seabeck or Stavis creeks between 1955 and 1979, utilizing Minter (1974, 1978 and 1979), George Adams (1969), Skykomish (1957) and Quilcene (1955) stocks. Releases were made into Shine and Thorndyke creeks of Quilcene stock (1955 and 1956), Green River stock (1964), Hood Canal stock (1965 and 1966) and Dungeness stock (1972, 1976 through 1982 an 1986). Since 1981, there have been substantial numbers (approximately 400,000) of extended-reared hatchery coho (primarily Dungeness stock) released annually from net pens in Port Gamble Bay and Quilcene Bay. Tag recoveries indicate that these fish stray into the nearby tributaries upon return. This stock is likely a mixture of native and introduced non-native stocks.

STOCK STATUS

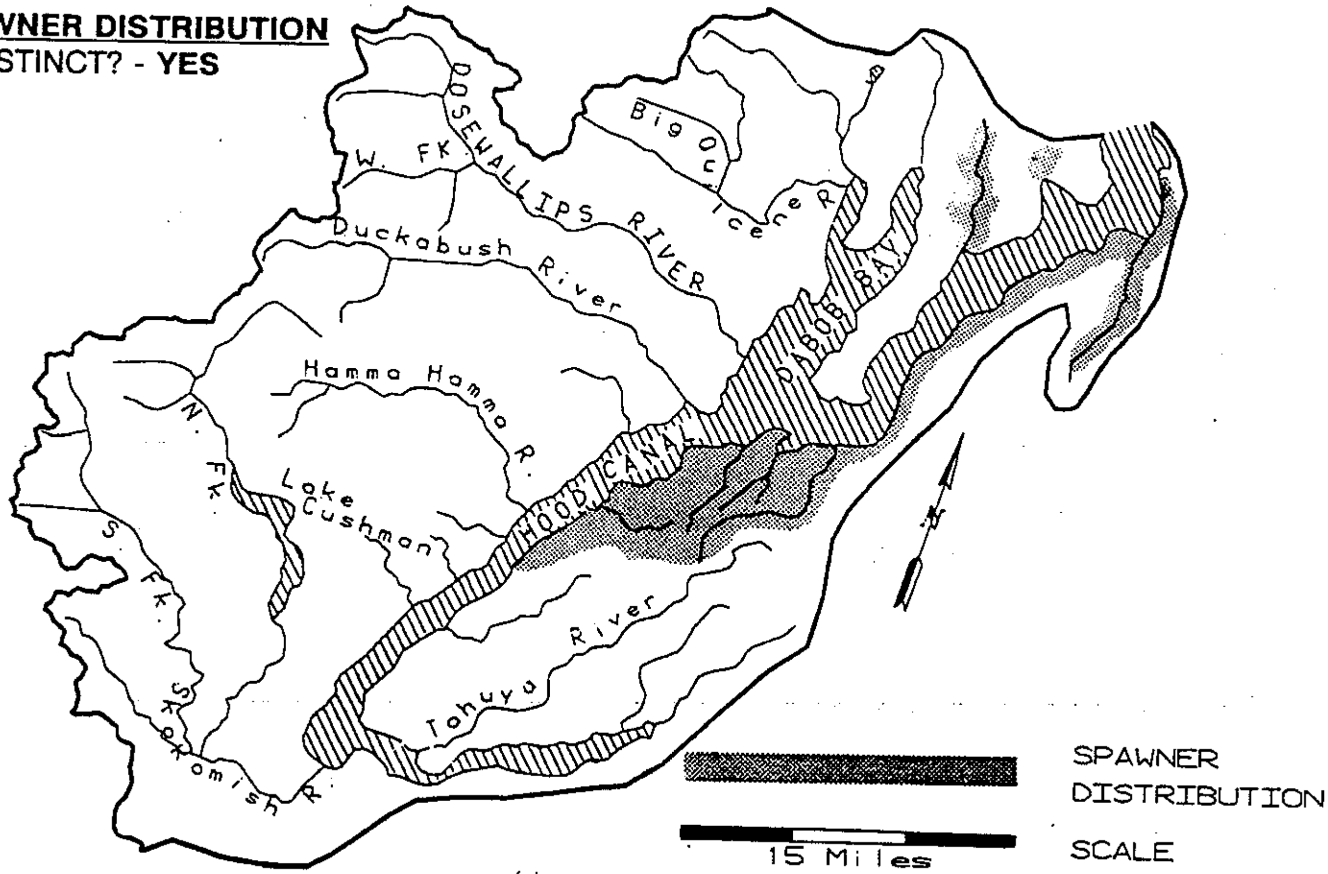
The status of this stock is Depressed.

Big Beef Creek has been the subject of an ongoing, intensive coho production study, and the results of that study have been used to represent this stock's production trend.

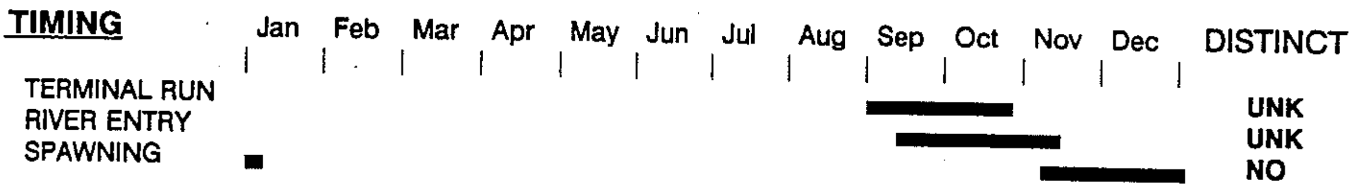
The last two escapements to Big Beef Creek are the lowest and third lowest in the data base (1978 to 1991). Although this does not meet the strict definition of a short-term severe decline, coupled with the fact that the 1987 to 1991 mean escapement (731) is only 55 percent of the mean for the preceding nine years (1,333), this stock's status has been judged to be Depressed.

STOCK DEFINITION PROFILE for Northeast Hood Canal Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING



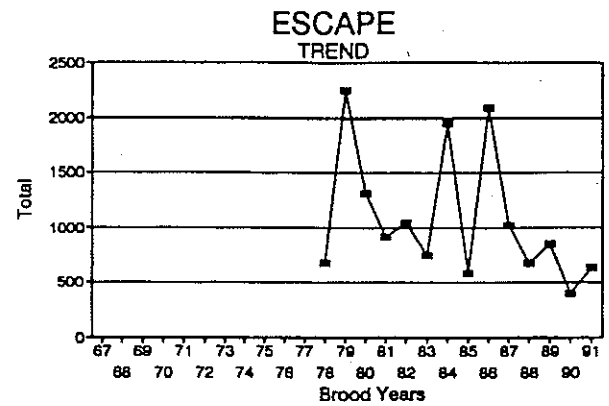
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

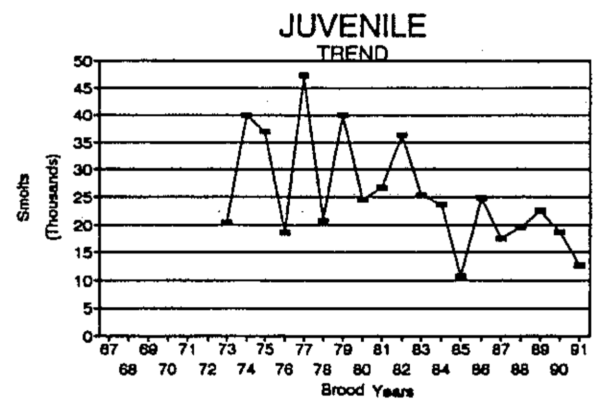
STOCK STATUS PROFILE for Northeast Hood Canal Coho

STOCK ASSESSMENT

DATA QUALITY------> Very Good

Brood Years	ESCAPE Total	JUVENILE Smolts		
67				
68				
69				
70				
71				
72				
73		20374		
74		39954		
75		37054		
76		18600		
77		47300		
78	675	20755		
79	2249	40076		
80	1308	24596		
81	922	26724		
82	1047	36346		
83	745	25446		
84	1948	23637		
85	589	10872		
86	2085	24800		
87	1028	17623		
88	675	19427		
89	850	22567		
90	395	18720		
91	636	12683		





AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Mixed

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution

STOCK STATUS

Depressed

SCREENING CRITERIA

Short-Term Severe Decline

FACTORS AFFECTING PRODUCTION

Habitat -- Northeast Hood Canal watersheds were logged early in this century, and riparian zones now consist mostly of second growth alder and mixed cedar, alder and fir. In recent years, road building, hobby farms, clear-cutting of second growth, and residential development, including increasing groundwater withdrawal, have impacted all of these watersheds and coho survival to an unknown extent through increased sediment loads, fish passage blockages, loss of riparian zone functions, and probably increased peak flows and decreased summer flows. Urban and suburban impacts are increasing in the Lake Symington area of the Big Beef Creek watershed. In addition, a major upstream and downstream passage problem exists at Lake Symington, an artificial lake. Outlet valve manipulation at the lake may have caused production losses. Recent reconstruction work and improved valve security should improve the situation.

Streams in the northern part of this area (Thorndyke, Shine and Gamble creeks) are generally lower gradient streams in gentle terrain that have excessive fine sediment loads and beaver dams. Streams in the southern part of this area are located in steep ravines with unstable soils and have excessive coarse sediment loads due to the increase in landslides. These coarse sediment loads probably contribute to greater channel instability and exacerbation of the "low-flow problem" with subsurface flows. The exact impacts are unknown at this time, however studies are beginning in these areas.

Harvest Management -- Significant harvest of this stock occurs in Canadian and U.S. offshore fisheries as well as Puget Sound fisheries in the Seattle area (Area 10). Coho are harvested at hatchery rates in net fisheries in Port Gamble Bay (Area 9A) which target salt water pen-reared coho returning to Port Gamble Bay. The rest of the adjacent marine area is harvested at rates designed to meet wild coho escapement goals. Fresh water sport harvest is thought to be low due to the small size of the streams.

Hatchery -- There have been sporadic off-station fingerling/fry releases into these tributaries in the past. The Port Gamble S'Klallam Tribe annually releases approximately 400,000 coho yearlings from salt water net pens in Port Gamble Bay. Preliminary studies of adult returns to Port Gamble Bay streams, as well as to Big Beef, Shine and Kinman creeks, suggest there could be straying of net pen as well as other hatchery-reared coho into streams in the area, however hatchery influence on composition and survival of the native stock has not been determined.

Last ten years salmon releases into West Kitsap Streams

Release Year	Fall Chinook	Coho	Fall Chum
1982	13,346	508,710	515,141
1983	411,855	0	2,621,725
1984	134,310	63,400	143,359
1985	60,000	105,000	3,849,000
1986	0	0	1,028,000
1987	0	0	1,648,400
1988	0	110,000	1,747,000
1989	0	70,000	2,207,500
1990	45,000	90,000	2,723,080
1991	20,000	4,825	474,014
MEAN	124,902	135,991	1,695,722

HOOD CANAL -- DEWATTO COHO

STOCK DESCRIPTION AND ORIGIN

This stock does not exhibit a distinct temporal distribution, with most spawning occurring in November to early January, and it does not display any documented unique biological characteristics. We believe there is limited straying to this drainage from other Hood Canal drainages, so this stock has been defined on the basis of distinct geographic spawning distribution.

There were occasional off-station releases of hatchery-origin coho yearlings into this drainage between 1954 and 1979. George Adams (1965, 1966 and 1971), Dungeness (1977 to 1979) and Minter (1954 and 1956) stocks were all utilized. There have also been relatively infrequent off-station fingerling/fry releases into this area between 1955 and 1979, primarily utilizing Minter Creek (South Sound) stock with single releases of Quilcene-, Skykomish- and George Adams-origin fish. This stock is likely a mixture of the native and introduced non-native stocks.

STOCK STATUS

The Dewatto coho stock is considered Depressed.

There are good escapement index data available back to 1981 for the Dewatto River and one of its tributaries. Those data have been used to represent this stock's production trend.

Index escapement data show that two of the last five escapements (1987 and 1990) have been below the previous low observation of 1983, indicating a severe short-term decline. Those two index counts are brood-related, however, the 1987 to 1991 mean is less than one-half of the mean for the period 1981 to 1986. If escapements continue at this lower level, a screening criterion of chronically low may be appropriate.

FACTORS AFFECTING PRODUCTION

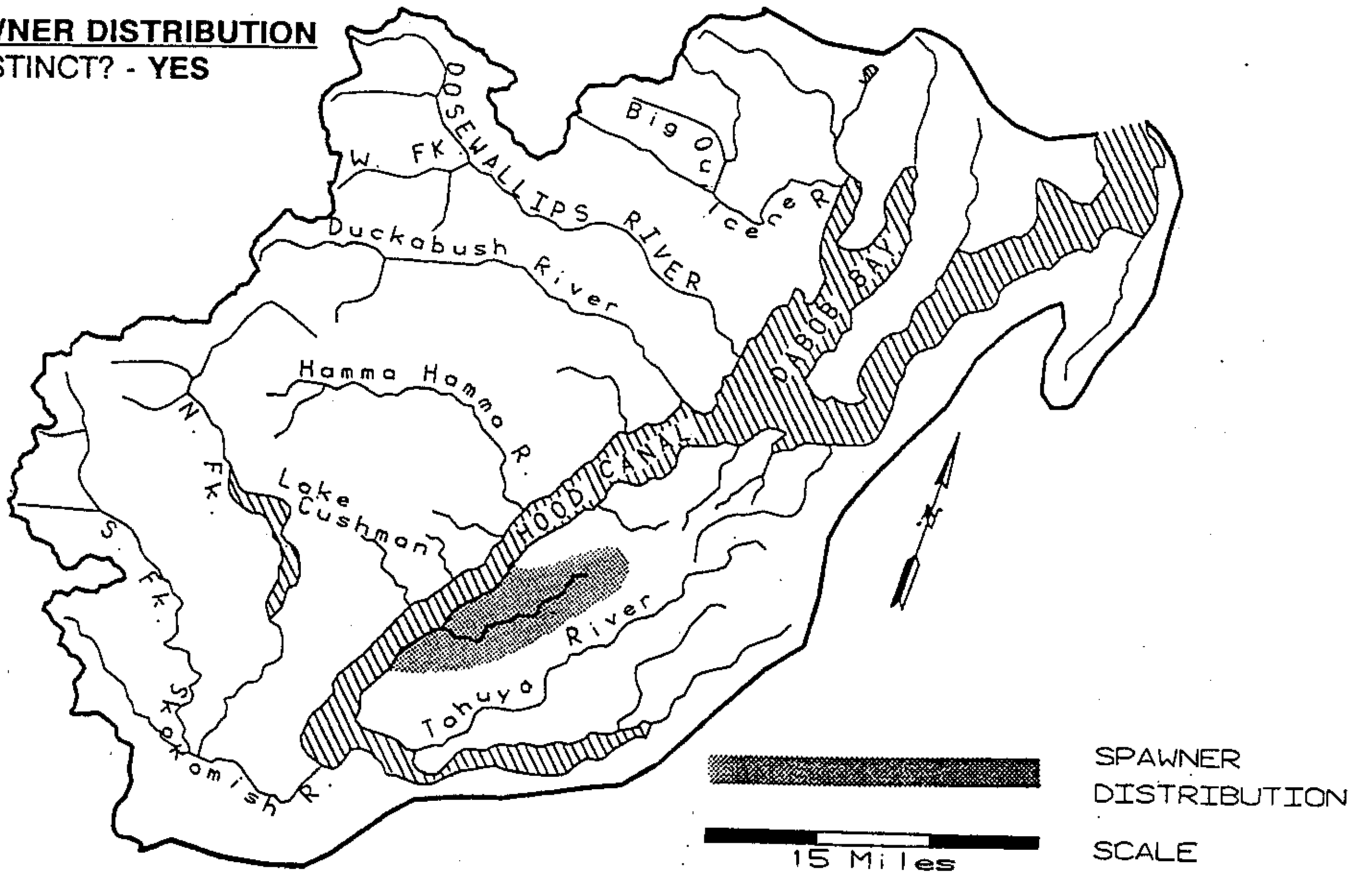
Habitat -- The principal natural limiting factor for salmon production in the Dewatto watershed is summer low flow which reduces or, in extreme cases, dries up juvenile-rearing habitat. In addition, beaver dams, though generally beneficial to salmon, may be flooding spawning areas in the stream.

The Dewatto watershed has not been heavily impacted by human activity, and the freshwater habitat for salmon is in relatively good condition. The primary human activities affecting fish habitat include rural development (houses and hobby farms), road building and logging. All of these activities have resulted in reduction of riparian

STOCK DEFINITION PROFILE for Dewatto Coho

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS

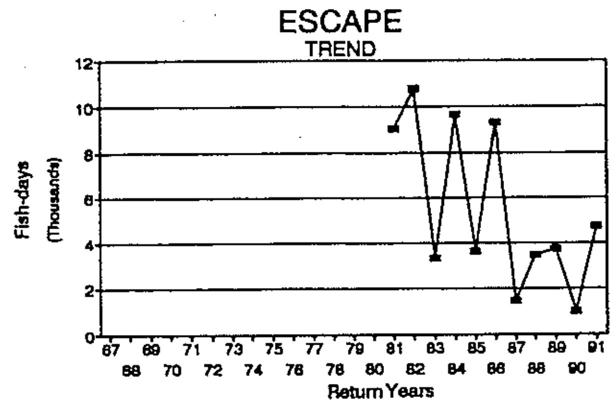
DISTINCT? - **NO**

STOCK STATUS PROFILE for Dewatto Coho

STOCK ASSESSMENT

DATA QUALITY-----> Good

Return Years	ESCAPE Fish-days			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81	9033			
82	10767			
83	3328			
84	9689			
85	3630			
86	9296			
87	1494			
88	3492			
89	3745			
90	1010			
91	4709			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Short-Term Severe Decline

areas leading to loss of streamside shade and reduced sources of in-stream large woody debris. Bank protection activities associated with rural development have channelized parts of the stream, resulting in reduction of cover and hiding habitat. In addition to contributing to the loss of riparian areas, logging in the watershed has resulted in increased sediment load in the stream. Several culverts block access to spawning and juvenile rearing habitat. Four-wheel drive vehicles driving in the stream bed in the lower one and one-half miles of the mainstem Dewatto may be damaging redds and at least temporarily destroying gravel structure. The effects of these activities on fish habitat are expected to worsen with increased development in the watershed.

Harvest Management – Hood Canal-origin coho, including the Dewatto stock, are harvested primarily in Canadian troll, net and sport fisheries and in Washington net and sport fisheries.

Preterminal Areas - In many of the Washington preterminal fisheries, the harvest rates on Hood Canal coho are determined by the annual status of the weakest stock, which in recent years has included all of Hood Canal coho. From 1988 through 1990, an average of 83 percent of the harvest of Hood Canal-origin coho occurred in preterminal areas. Of this 83 percent, half occurred in Canadian fisheries and half in Washington fisheries. In recent years Canadian catches have increased to about 45 percent of each year's total Hood Canal run.

The total harvest rate on Hood Canal coho (in aggregate) was approximately 77 percent from 1988 through 1990.

Terminal Areas - In Hood Canal, the harvest rate for all coho is established to meet natural spawning targets. Prior to 1991, the average amount of harvest of Hood Canal-origin coho occurred in Hood Canal was 17 percent. No stock-specific information on harvest of Dewatto coho is available.

With the exception of fisheries directed at hatchery coho returning to the USFWS Quilcene National Fish Hatchery, there have been no commercial coho fisheries in Hood Canal since 1990.

The Dewatto River closed to sport fishing in 1992.

Hatchery – There are coho rearing and/or release programs at the George Adams Hatchery on Purdy Creek, the Hood Canal (Hoodsport) Hatchery on Finch Creek, the Quilcene National Fish Hatchery on the Big Quilcene River and from net pens in Quilcene Bay and Port Gamble Bay. The effect of these hatchery fish on Dewatto coho is unknown.

Last ten years salmon releases into West Kitsap Streams

Release Year	Fall Chinook	Coho	Fall Chum
1982	13,346	508,710	515,141
1983	411,855	0	2,621,725
1984	134,310	63,400	143,359
1985	60,000	105,000	3,849,000
1986	0	0	1,028,000
1987	0	0	1,648,400
1988	0	110,000	1,747,000
1989	0	70,000	2,207,500
1990	45,000	90,000	2,723,080
1991	20,000	4,825	474,014
MEAN	124,902	135,991	1,695,722

HOOD CANAL -- SOUTHEAST HOOD CANAL COHO

STOCK DESCRIPTION AND ORIGIN

The southeast Hood Canal coho salmon stock does not exhibit a distinct temporal distribution, with most spawning occurring from early November to early January, and it does not display any documented unique biological characteristics. We believe there is limited straying to these tributaries from other Hood Canal drainages, so this stock has been defined on the basis of distinct geographic spawning distribution.

There were periodic off-station releases of hatchery origin coho yearlings into this region between 1952 and 1976. Minter Creek stock was predominantly utilized (releases in 1952 to 1954, 1956, 1958, 1962, 1965 and 1976) along with Dungeness (1976), George Adams (1965, 1966, 1971 and 1973) and Green River (1960 and 1966) stocks. There were also significant off-station fingerling/fry plants into these tributaries between 1955 and 1984, primarily utilizing Minter, George Adams and Green River stocks. Most of these releases were into the Tahuya and Union rivers, Big Mission and Stimson creeks and Lake Erdman. This stock is likely a mixture of the native and introduced non-native stocks.

STOCK STATUS

The status of the southeast Hood Canal coho stock is Depressed.

There are good index escapement data available back to 1981 for four Tahuya River tributaries, Big Mission Creek and the Union River and two of its tributaries. Those data have been used to represent this stock's production trend.

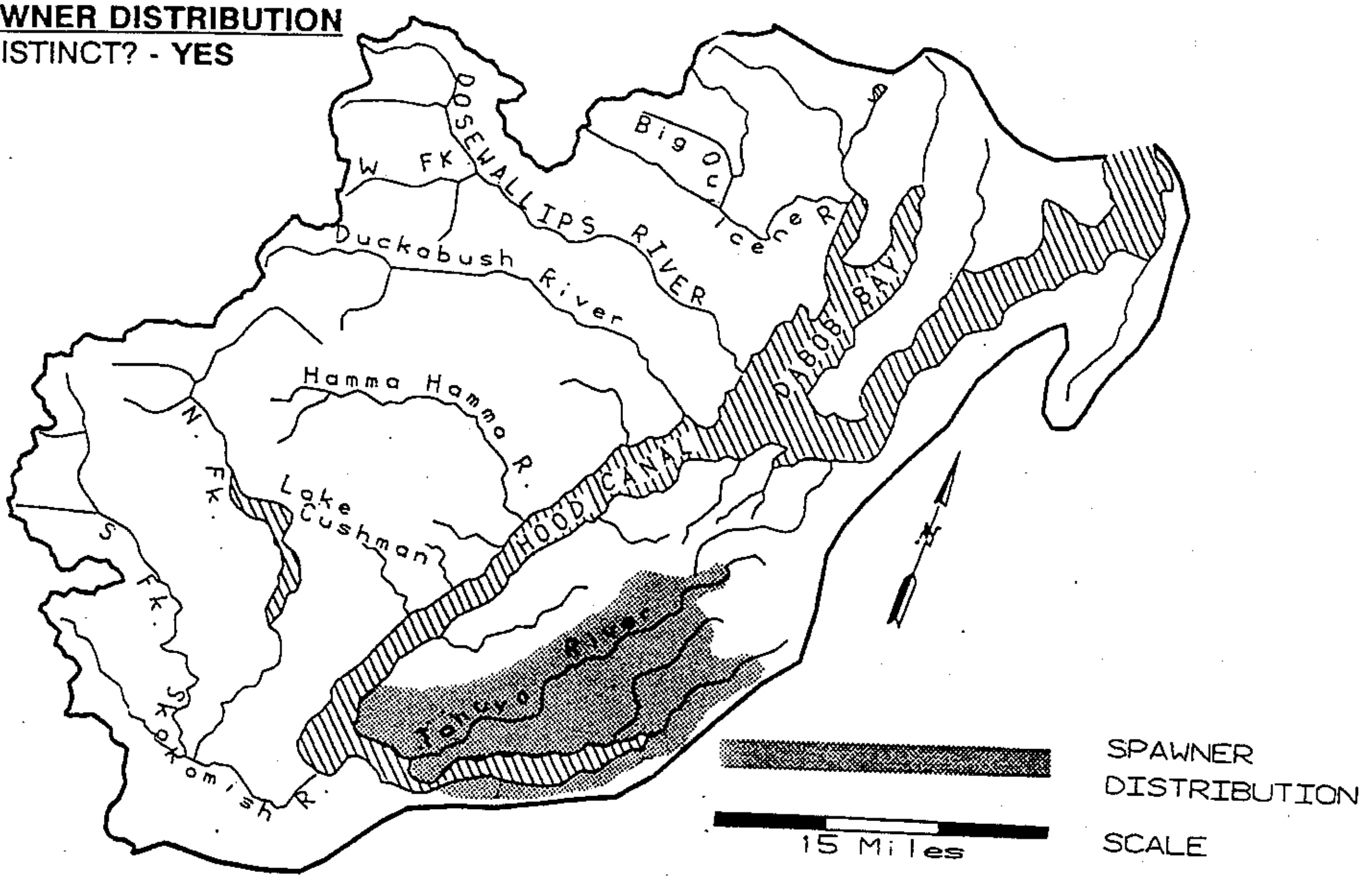
Escapement index data show that the last four escapements have approximated or been below the previous low observation of 1983, indicating a severe short-term decline. Those index counts in 1988 to 1991 have only been 1/3 to 1/2 of the mean for the period 1981 to 1986. If escapements continue at this lower level, consideration of a screening criterion of chronically low may be appropriate.

FACTORS AFFECTING PRODUCTION

Habitat -- Primary tributaries on the Kitsap Peninsula utilized by Southeast Hood Canal coho include the Tahuya River, Big Mission Creek, and Union River. These streams can be characterized as low to moderate gradient with fair to excellent gravel quality. Riparian corridors are in generally good condition, with second growth mixed deciduous and conifer trees predominating. The primary limiting factor to coho production is summer low flows; many of the upper watershed tributaries in this area go dry annually.

STOCK DEFINITION PROFILE for Southeast Hood Canal Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													UNK
RIVER ENTRY													UNK
SPAWNING													NO

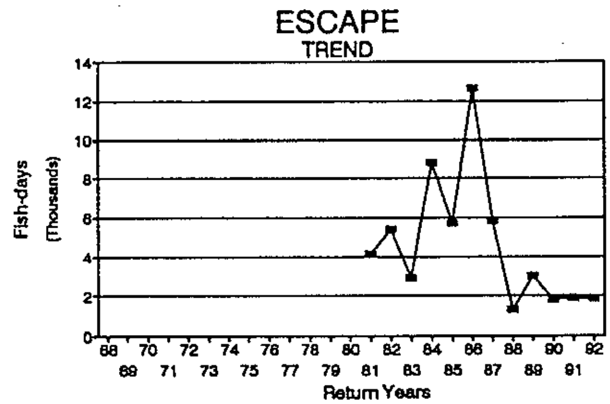
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **UNKNOWN**

STOCK STATUS PROFILE for Southeast Hood Canal Coho

STOCK ASSESSMENT

DATA QUALITY——> Very Good

Return Years	ESCAPE Fish-days			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81	4146			
82	5401			
83	2925			
84	8824			
85	5691			
86	12651			
87	5840			
88	1308			
89	3010			
90	1828			
91	1872			
92	1840			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Short-Term Severe Decline

Urban and suburban impacts are increasing however, with considerable development along the Union River near Belfair. Summer low flows are undoubtedly being affected by legal and illegal surface and groundwater withdrawals from shallow aquifers as large industrial forest lands continue to be subdivided into small parcels. The entrances to many small lakes previously inhabited by coho have screens installed by the Department of Wildlife for recreational trout programs. These screens prevent coho from utilizing the lakes. The screen structures themselves exacerbate low flow problems. A major flow diversion on the Union River to supply the City of Bremerton causes significant low flow problems. Overwinter survival may be affected by wetland losses due to draining and/or filling. Water quality is good overall but is deteriorating due to hobby farm livestock and increasing urban stormwater releases. A commercial horse farm on the Tahuya River is probably causing water quality problems in the lower river and estuary. Forest practices contribute sediments to these streams and increase winter peak flows. Poaching and disturbance in these streams will continue as the area becomes developed. Nearshore marine habitat is generally quite good, but increased bulkheading can be expected.

Harvest Management -- Southeast Hood Canal coho are primarily harvested in Canadian troll, net and sport fisheries and in Washington net and sport fisheries.

Preterminal Areas - In many of the Washington preterminal fisheries, the harvest rates on Hood Canal coho are determined by the annual status of the weakest stock, which in recent years has included all of Hood Canal coho. In the remaining preterminal fisheries, the harvest rates are driven by other considerations. The average amount of the harvest of Hood Canal coho that occurred in preterminal areas was 83 percent for 1988 through 1990. Of this 83 percent, half occurred in Canadian fisheries and half in Washington fisheries. In recent years, Canadian catches have increased to about 45 percent of each year's total run.

Terminal Areas - In the terminal area, Hood Canal and the Skokomish River, the harvest rate for Hood Canal coho is established to meet the natural spawning escapement target. The average amount of the harvest occurring in the terminal area is 17 percent.

The total harvest rate (landed catch only) on Hood Canal coho was approximately 76.5 percent from 1988 through 1990.

With the exception of fisheries directed at hatchery coho returning to the USFWS Quilcene National Fish Hatchery, there have been no commercial coho fisheries in Hood Canal since 1990.

The marine waters of Hood Canal are open to sport fishing year round. The Union and Tahuya rivers and Big Mission Creek are now closed to sport fishing.

Hatchery -- There are coho rearing and release programs at the George Adams Hatchery on Purdy Creek, the Hood Canal (Hoodsport) Hatchery on Finch Creek, the Quilcene National Fishery Hatchery on the Big Quilcene River and from net pens in Quilcene Bay and Port Gamble Bay. The effect of these hatchery coho on the Southeast Hood Canal Stock is not known.

Last ten years salmon releases into West Kitsap Streams

Release Year	Fall Chinook	Coho	Fall Chum
1982	13,346	508,710	515,141
1983	411,855	0	2,621,725
1984	134,310	63,400	143,359
1985	60,000	105,000	3,849,000
1986	0	0	1,028,000
1987	0	0	1,648,400
1988	0	110,000	1,747,000
1989	0	70,000	2,207,500
1990	45,000	90,000	2,723,080
1991	20,000	4,825	474,014
MEAN	124,902	135,991	1,695,722

HOOD CANAL -- SKOKOMISH COHO

STOCK DEFINITION AND ORIGIN

We believe there is limited straying into this drainage from other Hood Canal coho salmon stocks, so the Skokomish coho stock has been defined on the basis of distinct geographic spawning distribution. It does not exhibit a unique spawn timing (late October to early January), however, there have been limited observations of large, later-timed spawners in the North Fork. It is not clear whether these characteristics are evidence of a distinct later-returning stock or the expression of a broad, variable natural run timing.

There have been substantial off-station coho releases into this system, particularly from George Adams Hatchery on Purdy Creek. Between 1954 and this facility's first releases in 1962, there were several off-station releases of fry and fingerlings into Purdy Creek utilizing Quilcene, Samish, Green River, Hood Canal and Skykomish stocks. On-station yearling releases since then have been primarily George Adams stock with the additional use of Puyallup (1970 and 1981), Minter Creek (1971, 1979 and 1982), Hood Canal (Hoodsport) (1962, 1967 and 1981), Green River (1963) and Sol Duc (1981) stocks. Off-station releases of hatchery-origin yearlings into this system, outside of Purdy Creek, have been infrequent (George Adams in 1965, 1966 and 1971, Hood Canal (Hoodsport) in 1965 and 1966, Green River in 1966 and Sol Duc stock in 1975). Fingerling/fry releases were fairly consistent from 1958 to 1973, utilizing a variety of stocks, but primarily Hood Canal and George Adams fish from the mid-1960s on. George Adams fingerlings were released into this system in 1979, 1980 and 1984 through 1986. This stock is likely a mixture of the native and introduced non-native stocks.

STOCK STATUS

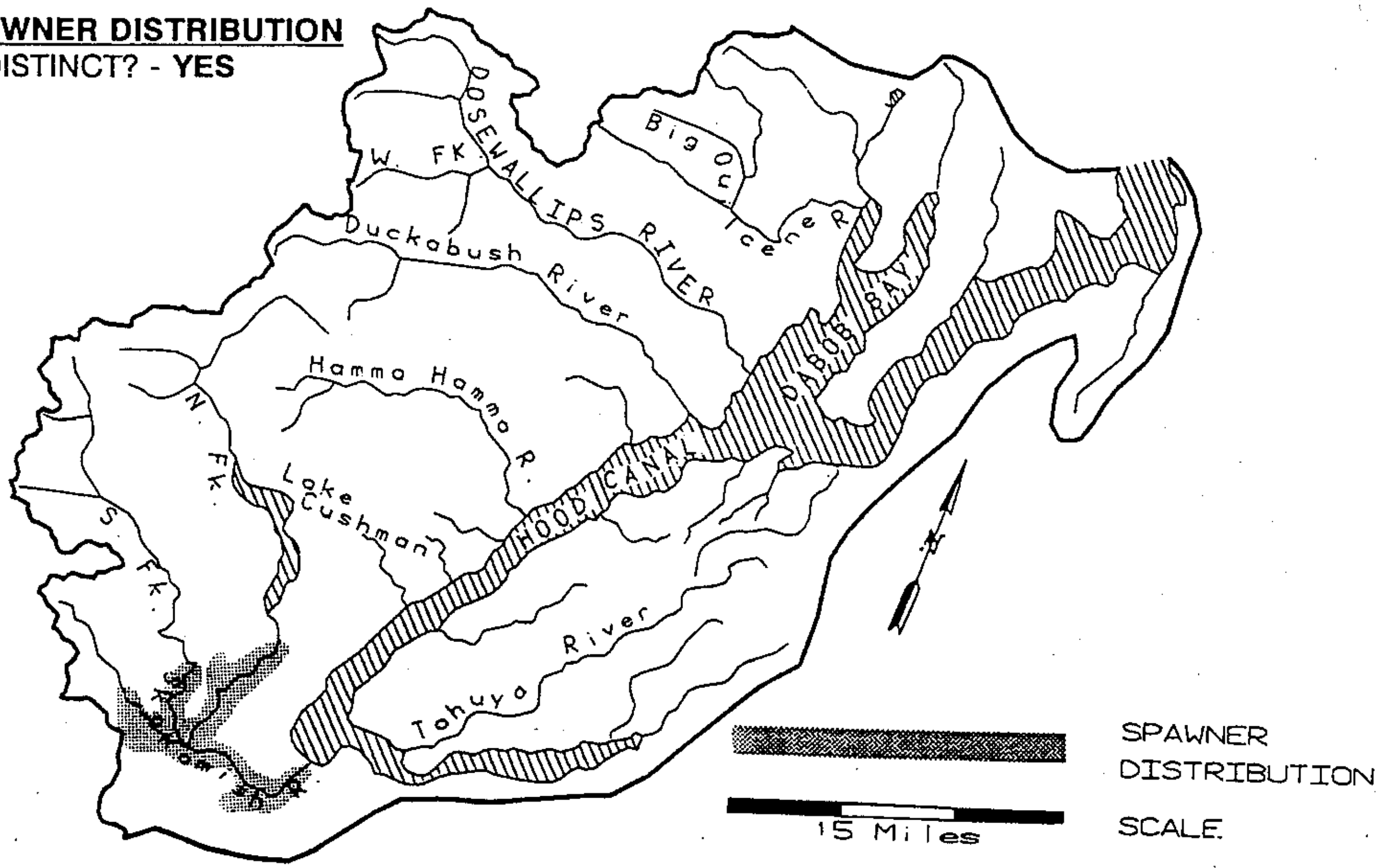
The status of the Skokomish coho stock is nominally Healthy. However this classification was based on run construction data which are no longer being used by the state and tribes for this inventory.

The only available escapement data for this stock are index escapement estimates dating back to 1983. These data do not include a North Fork Skokomish index, so their usefullness may be limited.

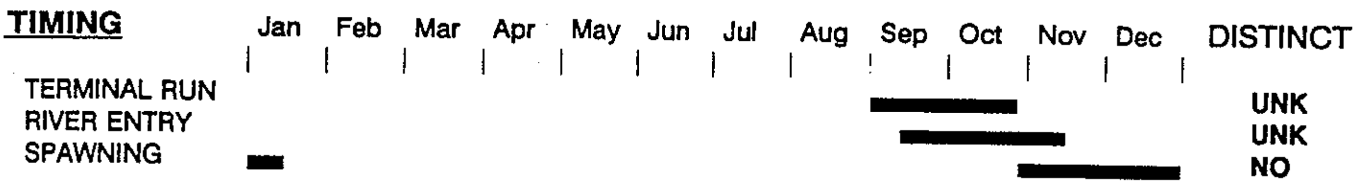
The two lowest index counts observed over this limited period occurred in 1988 and 1991, indicating a short-term severe decline characteristic of Depressed stocks. If production continues at this level, the classification of Depressed based on chronically low production should be considered as well.

STOCK DEFINITION PROFILE for Skokomish Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING



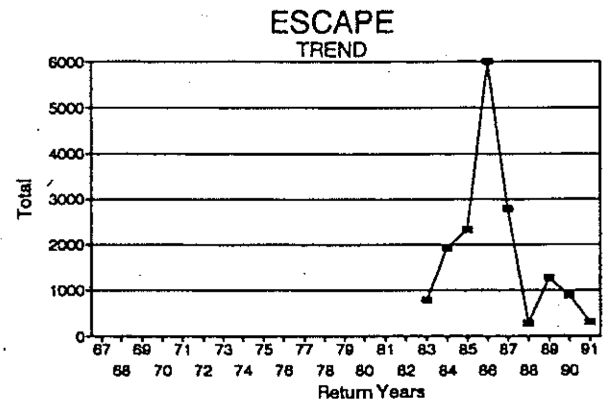
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **UNKNOWN**

STOCK STATUS PROFILE for Skokomish Coho

STOCK ASSESSMENT

DATA QUALITY-----> Fair

Return Years	ESCAPE Total			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83	790			
84	1921			
85	2329			
86	5991			
87	2791			
88	277			
89	1277			
90	904			
91	315			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Composite

STOCK DISTINCTION
Distribution

STOCK STATUS
Healthy

SCREENING CRITERIA

FACTORS AFFECTING PRODUCTION

Habitat -- Habitat suitable for coho production is limited in the Skokomish system, and what habitat exists has been degraded by a variety of human activities. Coho use most of the accessible habitat in the system, however there are few high-quality tributaries available to them. The canyon at RM 7 on the South Fork Skokomish, while passable to steelhead, may be impassable to coho.

Summer low flows produce dry stream beds in some areas. Annual winter flooding flushes juvenile fish from their overwintering habitat and damages redds or destroys them completely. Channel aggradation, high sediment loads and unstable stream beds affect egg incubation and pre-emergent fry survival even in the absence of flooding.

There is a deficiency of large woody debris in the system as result of forest practices, agricultural activity and residential development, all of which removed large conifers from riparian areas. The absence of large conifers means that riparian areas will be unable to provide large woody debris now and in the near future.

Estuarine productivity has been impacted by reduction of sediment delivered to the outer estuary resulting in loss of eelgrass, and increased sediment in near shore areas. The Cushman hydropower project has reduced the Skokomish River total instream flow by about 40 percent. Flows in the North Fork Skokomish have been reduced by the Cushman Dam located at RM 17.3.

Dikes and revetments along the lower South Fork and mainstem Skokomish have cut off valuable side channels and overwintering areas. Agricultural land use has led to filling in useful off-channel habitat.

These impacts have led to degradation of the estuarine environment, an important transition area for juvenile coho migrating to sea.

Harvest Management -- Hood Canal-origin coho, including the Skokomish stock, are harvested primarily in Canadian troll, net and sport fisheries and in Washington net and sport fisheries.

<u>Preterminal Areas</u> - In many of the Washington preterminal fisheries, the harvest rates on Hood Canal coho are determined by the annual status of the weakest stock, which in recent years has included all of Hood Canal coho. From 1988 through 1990, an average of 83 percent of the harvest of Hood Canal-origin coho occurred in preterminal areas. Of this 83 percent, half occurred in Canadian fisheries and half in Washington fisheries. In recent years Canadian catches have increased to about 45 percent of each year's total Hood Canal run.

The total harvest rate on Hood Canal coho (in aggregate) was approximately 77 percent from 1988 through 1990.

Terminal Areas - In Hood Canal, the harvest rate for all coho is established to meet natural spawning targets. Prior to 1991, an average of 17 percent of the harvest of Hood Canal-origin coho occurred in Hood Canal.

With the exception of fisheries directed at hatchery coho returning to the USFWS Quilcene National Fish Hatchery, there have been no commercial coho fisheries in Hood Canal since 1990.

The marine waters of Hood Canal are open to sport fishing year round. A sport fishery on the lower Skokomish River has been open from the end of July to the end of January in most years since the early 1980's. Currently, the river is open during the month of August, closed from September 1 through October 31 and opens again from November 1 through December 15. All coho must be released.

No stock-specific information on harvest of naturally-spawning Skokomish coho is available.

Hatchery -- There are coho rearing and/or release programs at the George Adams Hatchery, the Hood Canal Hatchery (Hoodsport), the Qulicene National Fishery in Quilcene and from net pens in Quilcene Bay and Port Gamble Bay. The effect of these programs on naturally-spawning Skokomish coho is unknown.

Last ten years salmon releases into the Skokomish-Dosewallips Basin

Release Year	Spring Chinook	Summer Chinook	Fall Chinook	Chum	Coho	Pink
1982	25,906	0	6,553,671	21,928,520	620,011	916,675
1983	0	19,724	7,159,353	38,931,555	529,474	0
1984	0	0	6,286,887	30,365,182	749,000	254,800
1985	0	0	7,032,376	55,225,215	699,900	0
1986	0	0	9,197,536	38,594,000	1,289,100	974,700
1987	0	0	6,339,416	41,844,500	403,800	0
1988	0	0	7,910,510	40,589,500	606,400	5,002,800
1989	0	0	12,897,987	38,221,100	1,077,886	0
1990	183,100	0	12,478,127	34,744,100	373,400	827,900
1991	193,377	0	5,984,598	20,907,988	1,214,100	0
MEAN	134,128		8,184,046	36,135,166	756,307	1,595,375

HOOD CANAL -- SOUTHWEST HOOD CANAL COHO

STOCK DESCRIPTION AND ORIGIN

The southwest Hood Canal coho salmon stock does not exhibit any documented unique biological characteristics, and its spawning timing (early November to late December) is not substantially different from that of other Hood Canal coho stocks. The stock has been defined on the basis of geographic spawning distribution.

There were sporadic off-station releases of hatchery yearlings between 1954 and 1976 in this area. Hood Canal stock was released three times (1963, 1965 and 1966), Dungeness twice (1954 and 1976) and Quilcene once (1955). Fry/fingerling releases were fairly consistent from 1954 through 1966, utilizing a wide variety of stocks, and George Adams fingerlings were released into this area in 1976 and 1984 through 1986. All off-station releases in this region were made into Eagle, Jorstad and Lilliwaup creeks. Additionally, there have been on-station yearling releases from Hood Canal (Hoodsport) Hatchery into Finch Creek on a regular basis since 1954. Prior to 1960, most of the releases were Dungeness and Quilcene fish and, from 1960 to 1979, Hood Canal (Hoodsport) and George Adams hatchery stocks were predominant (Dungeness stock was used from 1977 to 1979). From 1982 to present, the emphasis has been on early run production, utilizing Sol Duc, Baker (Skagit) and Capilano (Canada) stocks. These on-station releases may have contributed some stray spawners to local tributaries. This stock is likely a mixture of the native and introduced non-native stocks.

STOCK STATUS

The status of the Southwest Hood Canal coho stock is Healthy.

The only available data for this stock are index escapement estimates for Eagle and Jorstad creeks, and that data base is inconsistent and comparable only from 1980 through 1983 and from 1988 through 1991.

The data base indicates that production has been relatively stable. Index escapement totals for the latest four years are all greater than the previous low which was observed in 1982, and the 1991 escapement estimate is the second highest in this limited data base.

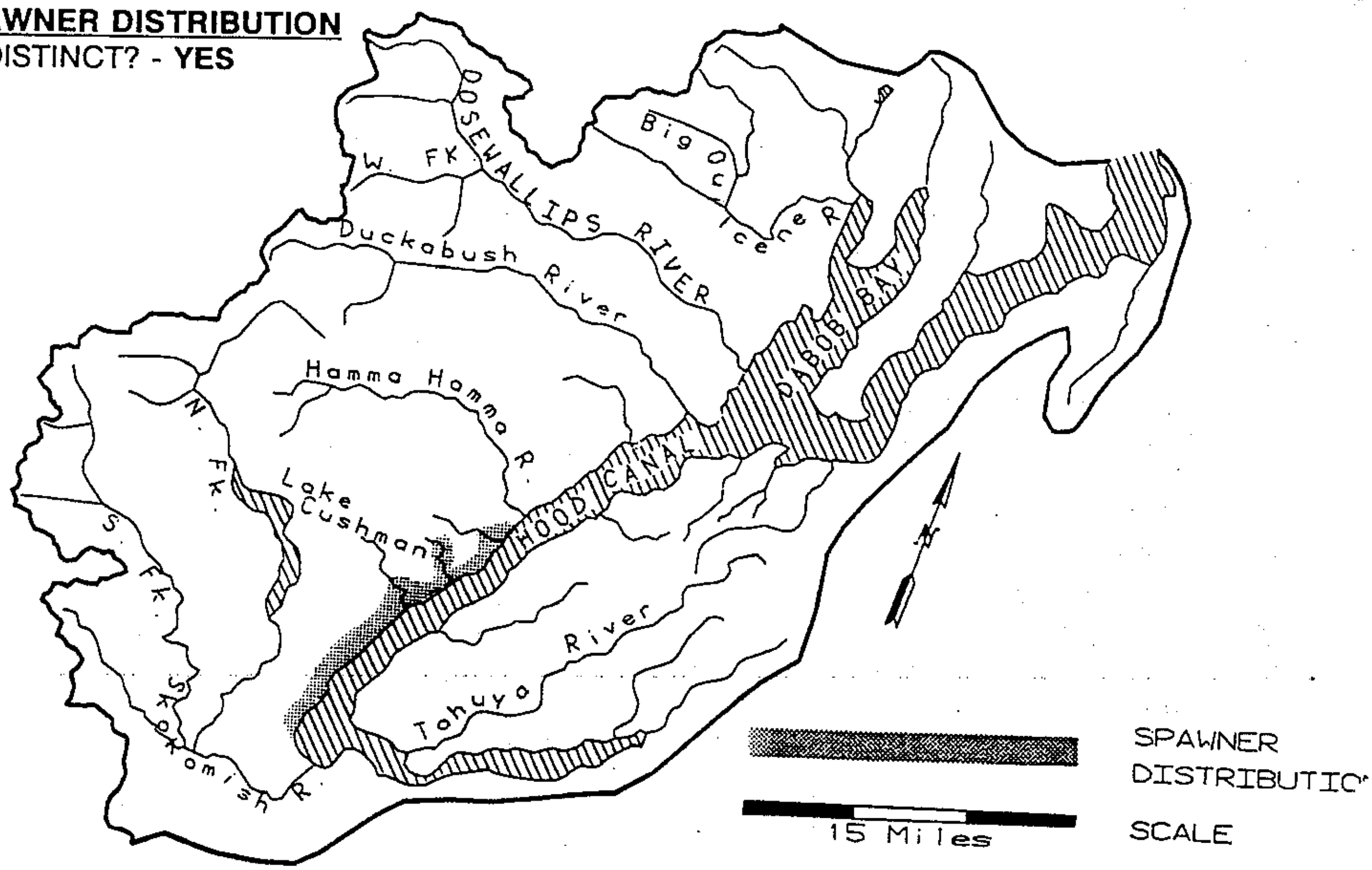
FACTORS AFFECTING PRODUCTION

Habitat -- Southwest Hood Canal coho spawn and rear in independent tributaries draining into Hood Canal between the Skokomish and Hamma Hamma rivers including Clark, Sund, Miller, Eagle, Jorsted and Little Lilliwaup creeks and the Lilliwaup River.

These streams are relatively short and some have high stream gradients with cascades

STOCK DEFINITION PROFILE for Southwest Hood Canal Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**NO**

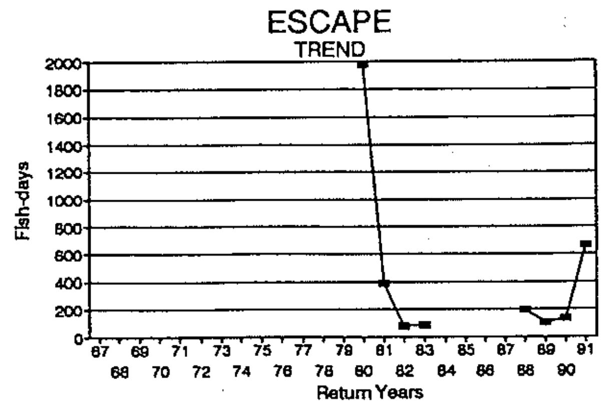
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **UNKNOWN**

STOCK STATUS PROFILE for Southwest Hood Canal Coho

STOCK ASSESSMENT

DATA QUALITY------> Fair

Return Years	ESCAPE Fish-days			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80	1974			
81	392			
82	76			
83	86			
84				
85				
86				
87				
88	195			
89	102			
90	135			
91	668			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Healthy

SCREENING CRITERIA

resulting in limited habitat accessible to anadromous fish. Spawning and incubating gravels tend to be unstable due to high stream velocities. Stream channels are generally moderately to tightly confined and provide few off-channel areas with reduced stream velocity for overwintering juveniles. Low summer flows limit summer rearing habitat for juveniles. In some areas, creek beds dry up altogether.

Forest practices in the area have likely increased fine sediments carried by streams. These sediments are unlikely to be deposited in spawning gravels in high-velocity streams but are deposited in estuaries where they may reduce productivity. Logging in riparian zones has resulted in loss of large conifers which are the sources of high-quality in-stream large woody debris.

Hatchery weirs on Finch and Enetai creeks prevent upstream migration although some fish make it past the hatchery weirs during freshets.

Harvest Management -- Hood Canal-origin coho, including the Southwest Hood Canal stock, are harvested primarily in Canadian troll, net and sport fisheries and in Washington net and sport fisheries.

Preterminal Areas - In many of the Washington preterminal fisheries, the harvest rates on Hood Canal coho are determined by the annual status of the weakest stock, which in recent years has included all of Hood Canal coho. From 1988 through 1990, an average of 83 percent of the harvest of Hood Canal-origin coho occurred in preterminal areas. Of this 83 percent, half occurred in Canadian fisheries and half in Washington fisheries. In recent years Canadian catches have increased to about 45 percent of each year's total Hood Canal run.

The total harvest rate on Hood Canal coho (in aggregate) was approximately 77 percent from 1988 through 1990.

Terminal Areas - In Hood Canal, the harvest rate for all coho is established to meet natural spawning targets. Prior to 1991, an average of 17 percent of the harvest of Hood Canal-origin coho occurred in Hood Canal.

With the exception of fisheries directed at hatchery coho returning to the USFWS Quilcene National Fish Hatchery, there have been no commercial coho fisheries in Hood Canal since 1990.

The marine waters of Hood Canal are open to sport fishing year round. There are no sport fisheries in tributaries utilized by the Southwest Hood Canal coho stock.

No stock-specific information on harvest of Southwest Hood Canal coho is available.

Hatchery -- There are coho rearing and/or release programs at the George Adams

Hatchery, the Hood Canal Hatchery (Hoodsport), the Quilcene National Fishery in Quilcene and from net pens in Quilcene Bay and Port Gamble Bay. The effect of these programs on Southwest Hood Canal coho is unknown.

Last ten years salmon releases into the Skokomish-Dosewallips Basin

Release Year	Spring Chinook	Summer Chinook	Fall Chinook	Chum	Coho	Pink
1982	25,906	0	6,553,671	21,928,520	620,011	916,675
1983	0	19,724	7,159,353	38,931,555	529,474	0
1984	0	0	6,286,887	30,365,182	749,000	254,800
1985	0	0	7,032,376	55,225,215	699,900	0
1986	0	0	9,197,536	38,594,000	1,289,100	974,700
1987	0	0	6,339,416	41,844,500	403,800	0
1988	0	0	7,910,510	40,589,500	606,400	5,002,800
1989	0	0	12,897,987	38,221,100	1,077,886	0
1990	183,100	0	12,478,127	34,744,100	373,400	827,900
1991	193,377	0	5,984,598	20,907,988	1,214,100	0
MEAN	134,128		8,184,046	36,135,166	756,307	1,595,375

HOOD CANAL -- HAMMA HAMMA COHO

STOCK DESCRIPTION AND ORIGIN

The Hamma Hamma coho salmon stock does not exhibit any documented unique biological characteristics, and its spawning timing (early November to late December) is not substantially different from that of other Hood Canal coho stocks. It has been defined on the basis of geographic spawning distribution.

There were sporadic off-station releases of hatchery yearlings between 1954 and 1980 in this drainage. Hood Canal (Hoodsport) stock was used in three years (1963, 1965 and 1966), Quilcene once (1955), Green River once (1966), Minter Creek once (1976), George Adams once (1971) and Dungeness four times (1954, 1973, 1979 and 1980). Fry/fingerling releases were fairly consistent from 1952 through 1963, utilizing a wide variety of stocks. George Adams fingerlings were released into this area in 1970, 1971, 1985 and 1986. This stock is likely a mixture of the native and introduced non-native stocks.

STOCK STATUS

The status of the Hamma Hamma coho stock is Healthy.

The only available data are index escapement estimates for John Creek, dating back to 1982 with a gap in 1985. These data have been used to represent this stock's production trend.

This data set indicates that production has fluctuated over a rather broad range, however, none of the index escapement values for the last five years were lower than the historic low observed in 1984.

FACTORS AFFECTING PRODUCTION

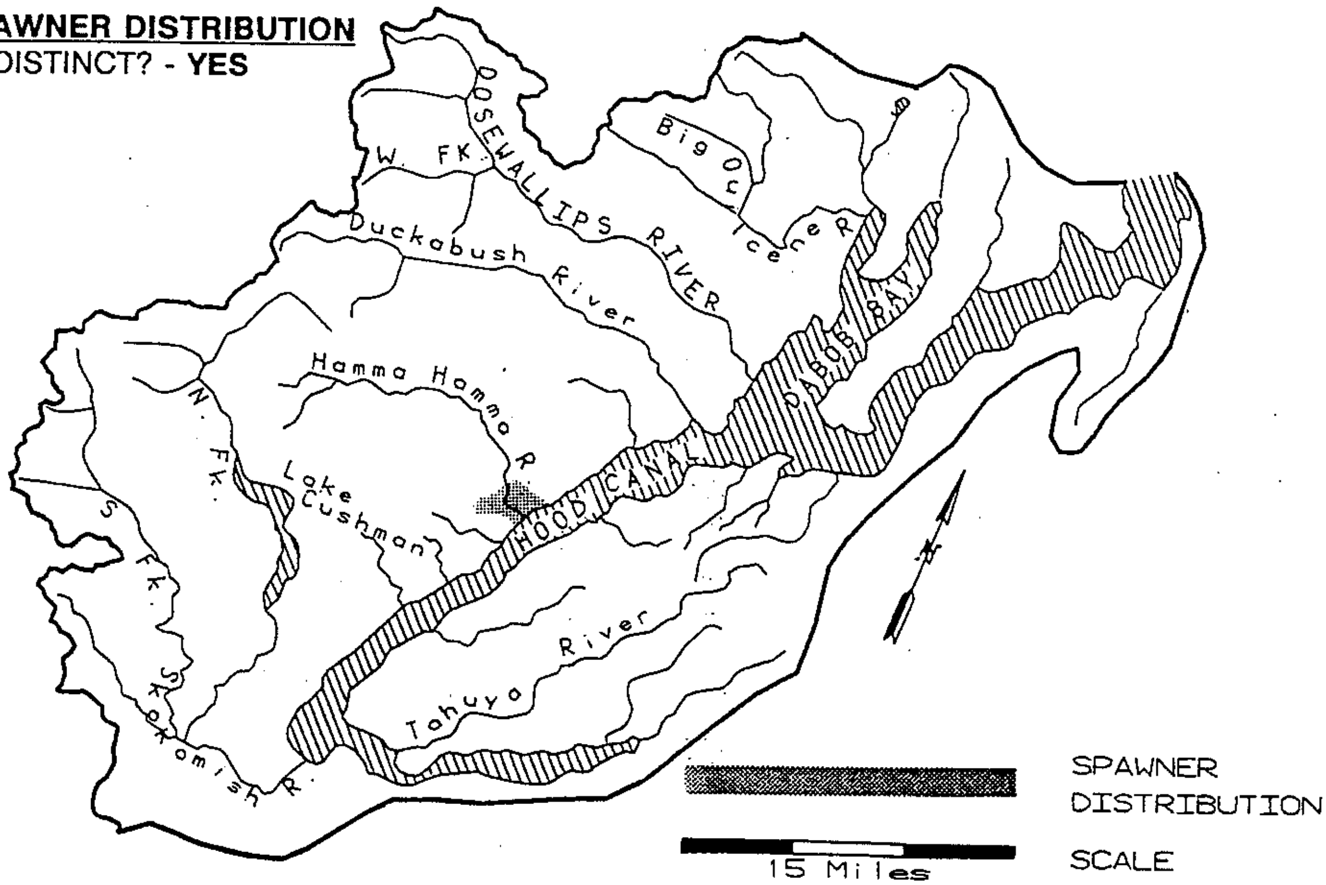
Habitat -- The Hamma Hamma system has limited summer and winter habitat for anadromous fish. The mainstem Hamma Hamma has less than two miles of accessible habitat, and only one tributary, John Creek, with about two miles of accessible habitat, can be used by coho.

Forest practices have reduced the tree canopy throughout the basin which probably increases in fine sediment production and water temperature. Logging in riparian areas has led to a reduction in large woody debris in the stream channel. This effect will continue to be felt in the near future.

The estuary provides important transitional habitat for juvenile coho migrating to sea, however dikes along the river mouth may have reduced estuarine productivity.

STOCK DEFINITION PROFILE for Hamma Hamma Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**NO**

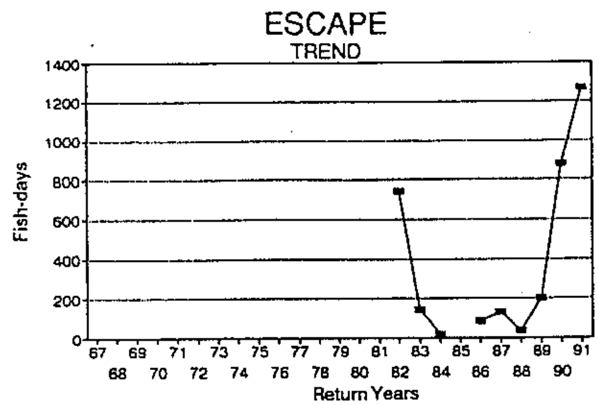
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

STOCK STATUS PROFILE for Hamma Hamma Coho

STOCK ASSESSMENT

DATA QUALITY------> Fair

Return Years	ESCAPE Fish-days			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82	743			
83	141			
84	17			
85				
86	87			
87	130			
88	38			
89	202			
90	882			
91	1269			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Healthy

SCREENING CRITERIA

Harvest Management -- Hood Canal-origin coho, including the Hamma Hamma stock, are harvested primarily in Canadian troll, net and sport fisheries and in Washington net and sport fisheries.

Preterminal Areas - In many of the Washington preterminal fisheries, the harvest rates on Hood Canal coho are determined by the annual status of the weakest stock, which in recent years has included all of Hood Canal coho. From 1988 through 1990, an average of 83 percent of the harvest of Hood Canal-origin coho occurred in preterminal areas. Of this 83 percent, half occurred in Canadian fisheries and half in Washington fisheries. In recent years Canadian catches have increased to about 45 percent of each year's total Hood Canal run.

The total harvest rate on Hood Canal coho (in aggregate) was approximately 77 percent from 1988 through 1990.

Terminal Areas - In Hood Canal, the harvest rate for all coho is established to meet natural spawning targets. Prior to 1991, an average of 17 percent of the harvest of Hood Canal-origin coho occurred in Hood Canal.

With the exception of fisheries directed at hatchery coho returning to the USFWS Quilcene National Fish Hatchery hatcheries, there have been no commercial coho fisheries in Hood Canal since 1990.

The marine waters of Hood Canal are open to sport fishing year round. The sport fishery on the lower Hamma Hamma was open from either October 15 or August 1 through January 31 throughout the 1980's and early 1990's. This fishery closed in 1993.

No stock-specific information on harvest of Hamma Hamma coho is available.

Hatchery -- There are coho rearing and/or release programs at the George Adams Hatchery, the Hood Canal (Hoodsport) Hatchery, the Quilcene National Fishery in Quilcene and from net pens in Quilcene Bay and Port Gamble Bay. The effect of these programs on Hamma Hamma coho is unknown.

Last ten years salmon releases into the Skokomish-Dosewallips Basin

Release Year	Spring Chinook	Summer Chinook	Fall Chinook	Chum	Coho	Pink
1982	25,906	0	6,553,671	21,928,520	620,011	916,675
1983	0	19,724	7,159,353	38,931,555	529,474	0
1984	0	0	6,286,887	30,365,182	749,000	254,800
1985	0	0	7,032,376	55,225,215	699,900	0
1986	0	0	9,197,536	38,594,000	1,289,100	974,700
1987	0	0	6,339,416	41,844,500	403,800	0
1988	0	0	7,910,510	40,589,500	606,400	5,002,800
1989	0	0	12,897,987	38,221,100	1,077,886	0
1990	183,100	0	12,478,127	34,744,100	373,400	827,900
1991	193,377	0	5,984,598	20,907,988	1,214,100	0
MEAN	134,128		8,184,046	36,135,166	756,307	1,595,375

HOOD CANAL -- DUCKABUSH COHO

STOCK DESCRIPTION AND ORIGIN

The Duckabush coho salmon stock does not exhibit any documented unique biological characteristics, and its spawning timing (November to early January) is not substantially different from that of other Hood Canal coho stocks. It has been defined on the basis of geographic spawning distribution.

There were infrequent off-station releases of hatchery yearlings between 1954 and 1980 in this area. Hood Canal (Hoodsport) stock was planted in three years (1963, 1965 and 1966), Quilcene once (1955), Minter once (1976), Green River once (1966) and Dungeness three times (1954, 1979 and 1980). Fry/fingerling releases were fairly consistent from 1952 through 1964, utilizing a wide variety of stocks. George Adams fingerlings were released into this area from 1984 through 1986. This stock is probably a mixture of the native and introduced non-native stocks.

STOCK STATUS

The status of the Duckabush coho stock is Depressed.

The only available data are index escapement estimates for Fulton, Hatchery and Pierce creeks dating back to 1981. That data base has been used to represent this stock's production trend.

The three-index data set indicates that production has been relatively stable over a rather narrow range (the large index escapement value in 1981 is the result of returns from the last yearling release in 1980). However, two of the last five years' index totals (1988 and 1989) are lower than the previous historic low observed in 1984, indicating a severe short-term decline. It should be noted that the last two index totals (1990 and 1991) are the two highest in this limited data set and, if that trend continues, this stock will attain a Healthy status in the next two years.

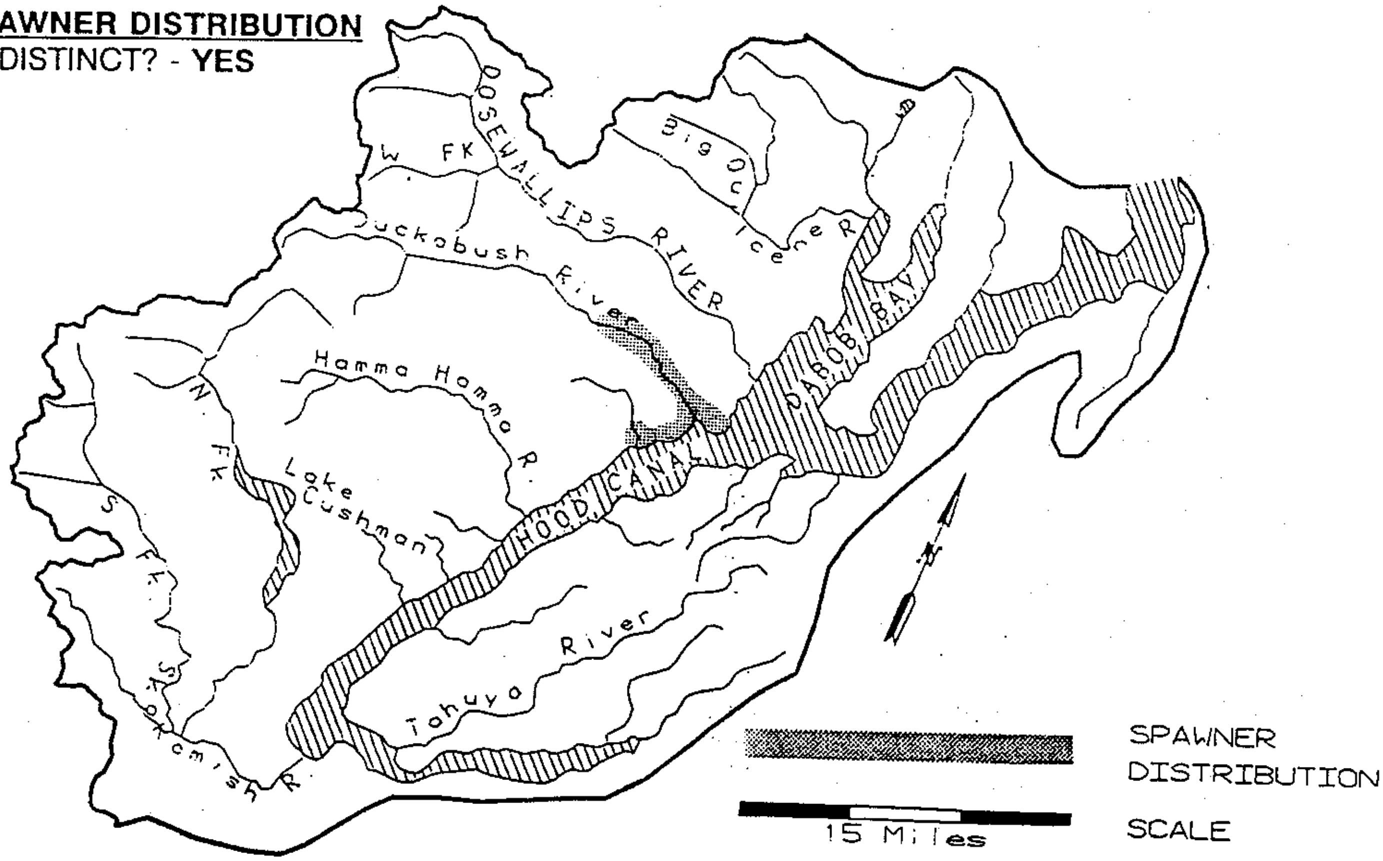
FACTORS AFFECTING PRODUCTION

Habitat -- The anadromous portion of the mainstem Duckabush River available to coho is rather short, approximately seven miles long. From RM 3.5 to 7.0 the stream gradient is moderate with numerous cascades. The stream flows through a moderately to tightly confined valley with limited winter rearing capacity. Spawning gravel in this area consists mainly of patch gravel. The lower three-mile portion of the mainstem flows through a loosely confined valley with a relatively low gradient where there are some excellent riffles and side channels for spawning.

Residential development along the lower two miles of the mainstem has resulted in loss

STOCK DEFINITION PROFILE for Duckabush Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

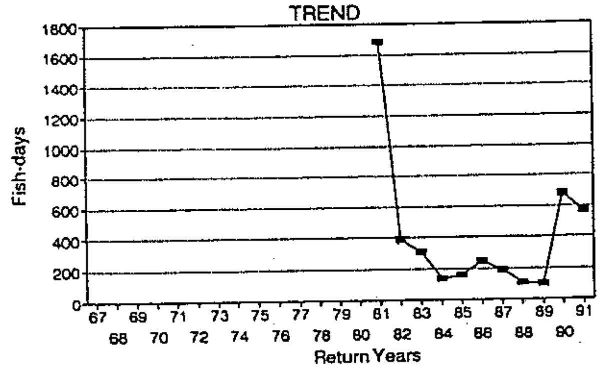
STOCK STATUS PROFILE for Duckabush Coho

STOCK ASSESSMENT

DATA QUALITY------> Fair

Return Years	ESCAPE Fish-days			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81	1682			
82	386			
83	308			
84	135			
85	155			
86	246			
87	191			
88	106			
89	97			
90	682			
91	566			

ESCAPE
TREND



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Short-Term Severe Decline

of riparian vegetation and in dike construction to alleviate flooding. Diking in the lower mile of the mainstem has probably led to the loss of rearing habitat and may promote scouring of spawning habitat.

Coho utilize the mainstem and the few tributaries available for spawning and rearing, however the tributaries are short, and both the mainstem and tributaries have been impacted by past logging practices and residential development.

Summer low flows may restrict salmon production, and because the amount of winter rearing habitat in the basin is low, winter floods may also limit production.

Harvest Management -- Hood Canal-origin coho, including the Duckabush stock, are harvested primarily in Canadian troll, net and sport fisheries and in Washington net and sport fisheries.

Preterminal Areas - In many of the Washington preterminal fisheries, the harvest rates on Hood Canal coho are determined by the annual status of the weakest stock, which in recent years has included all of Hood Canal coho. From 1988 through 1990, an average of 83 percent of the harvest of Hood Canal-origin coho occurred in preterminal areas. Of this 83 percent, half occurred in Canadian fisheries and half in Washington fisheries. In recent years Canadian catches have increased to about 45 percent of each year's total Hood Canal run.

The total harvest rate on Hood Canal coho (in aggregate) was approximately 77 percent from 1988 through 1990.

Terminal Areas - In Hood Canal, the harvest rate for all coho is established to meet natural spawning targets. Prior to 1991, an average of 17 percent of the harvest of Hood Canal-origin coho occurred in Hood Canal.

With the exception of fisheries directed at hatchery coho returning to the USFWS Quilcene National Fish Hatchery, there have been no commercial coho fisheries in Hood Canal since 1990.

The marine waters of Hood Canal are open to sport fishing year round. The sport fishery on the lower Hamma Hamma was open from either October 15 or August 1 through January 31 throughout the 1980's and early 1990's. This fishery closed in 1993.

No stock-specific information on harvest of Hamma Hamma coho is available.

Hatchery -- There are coho rearing and/or release programs at the George Adams Hatchery, the Hood Canal Hatchery (Hoodsport), the Quilcene National Fishery in Quilcene and from net pens in Quilcene Bay and Port Gamble Bay. The effect of these programs on Duckabush coho is unknown.

Last ten years salmon releases into the Skokomish-Dosewallips Basin

Release Year	Spring Chinook	Summer Chinook	Fall Chinook	Chum	Coho	Pink
1982	25,906	0	6,553,671	21,928,520	620,011	916,675
1983	0	19,724	7,159,353	38,931,555	529,474	0
1984	0	0	6,286,887	30,365,182	749,000	254,800
1985	0	0	7,032,376	55,225,215	699,900	0
1986	0	0	9,197,536	38,594,000	1,289,100	974,700
1987	0	0	6,339,416	41,844,500	403,800	0
1988	0	0	7,910,510	40,589,500	606,400	5,002,800
1989	0	0	12,897,987	38,221,100	1,077,886	0
1990	183,100	0	12,478,127	34,744,100	373,400	827,900
1991	193,377	0	5,984,598	20,907,988	1,214,100	0
MEAN	134,128		8,184,046	36,135,166	756,307	1,595,375

HOOD CANAL -- DOSEWALLIPS COHO

STOCK DESCRIPTION AND ORIGIN

The Dosewallips coho salmon stock does not exhibit any documented unique biological characteristics and its spawn timing (early November to late December) is not substantially different than that of surrounding stocks. It has been defined on the basis of geographic spawning distribution.

There were periodic off-station releases of hatchery yearlings between 1954 and 1980 in this drainage. Dungeness-origin yearlings were released in five years (1954 and 1977 through 1980), Hood Canal (Hoodsport) three times (1963, 1965 and 1966), George Adams once (1971), Quilcene once (1955), Minter once (1976) and Green River once (1966). Fry/fingerling releases were fairly consistent from 1952 through 1963, utilizing a wide variety of stocks. George Adams fingerlings were released into this area in 1985 and 1986. This stock is probably a mixture of the native and introduced non-native stocks.

STOCK STATUS

The status of the Dosewallips coho stock is currently Healthy.

The only available data for this stock are index escapement estimates for Rocky Brook Creek, which date back to 1981 with gaps in 1985 and 1987. That data set has been used to represent this stock's production trend.

The index data set indicates that escapements have fluctuated widely and that the zero count in 1984 has not been equalled in recent years. Although the strict definition of a short-term severe decline has not been met, the 1989 and 1990 index escapement estimates are the second and third lowest, respectively, in this limited data base, which suggests close monitoring of this stock in the future would be advisable.

FACTORS AFFECTING PRODUCTION

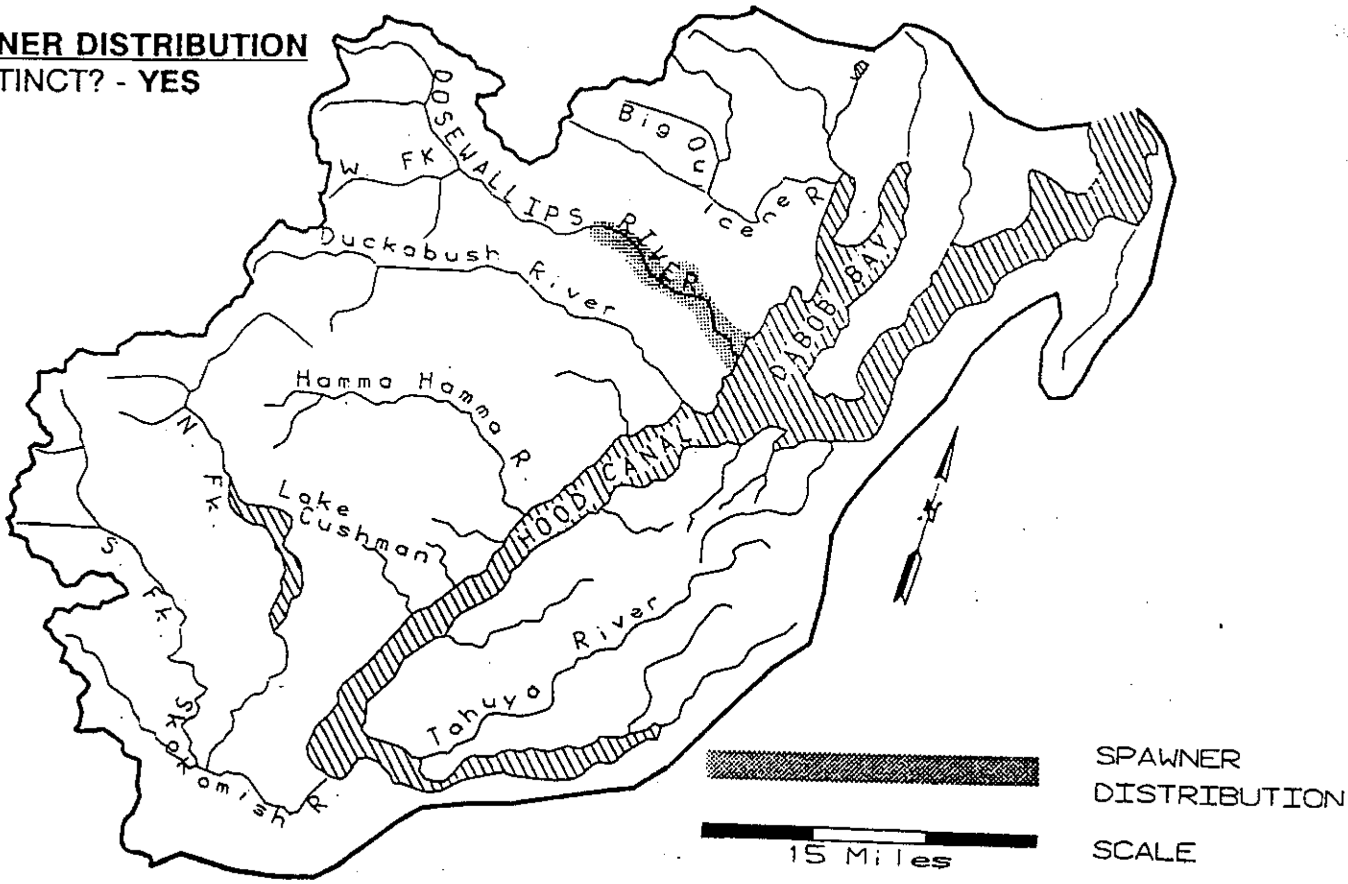
Habitat -- Habitat conditions in the upper half of the watershed, located within the Olympic National Park, are very good. Logging and road-building on steep, unstable soils further down the watershed have led to culvert blow-outs and debris torrents which have increased sediment loads in the streams and scoured streambeds.

The most significant habitat impacts have come from the conversion of the once-forested flood plain along the lower river to agricultural land near the turn of the century. At that time, the land was cleared and the river was diked to channel the flow to the south side of the river valley. This activity led to loss of side channels which provide spawning habitat and to the loss of large woody debris in the lower river. More recently,

STOCK DEFINITION PROFILE for Dosewallips Coho

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS

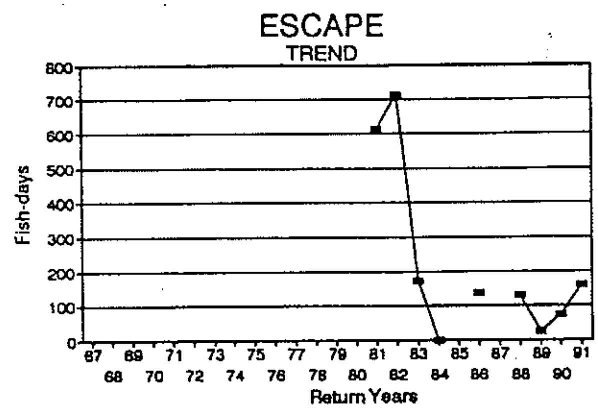
DISTINCT? - **NO**

STOCK STATUS PROFILE for Dosewallips Coho

STOCK ASSESSMENT

DATA QUALITY-----> Fair

Return Years	ESCAPE Fish-days			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81	614			
82	713			
83	175			
84	0			
85				
86	137			
87				
88	130			
89	26			
90	74			
91	162			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Healthy

SCREENING CRITERIA

residential development near the mouth of the river has resulted in further destruction or channelization of formerly very productive side channels.

Harvest Management -- Hood Canal-origin coho, including the Dosewallips stock, are harvested primarily in Canadian troll, net and sport fisheries and in Washington net and sport fisheries.

Preterminal Areas - In many of the Washington preterminal fisheries, the harvest rates on Hood Canal coho are determined by the annual status of the weakest stock, which in recent years has included all of Hood Canal coho. From 1988 through 1990, an average of 83 percent of the harvest of Hood Canal-origin coho occurred in preterminal areas. Of this 83 percent, half occurred in Canadian fisheries and half in Washington fisheries. In recent years Canadian catches have increased to about 45 percent of each year's total Hood Canal run.

The total harvest rate on Hood Canal coho (in aggregate) was approximately 77 percent from 1988 through 1990.

Terminal Areas - In Hood Canal, the harvest rate for all coho is established to meet natural spawning targets. Prior to 1991, an average of 17 percent of the harvest of Hood Canal-origin coho occurred in Hood Canal.

With the exception of fisheries directed at hatchery coho returning to the USFWS Quilcene National Fish Hatchery, there have been no commercial coho fisheries in Hood Canal since 1990.

The marine waters of Hood Canal are open to sport fishing year round. The sport fishery on the lower Dosewallips is closed to the taking of coho salmon.

No stock-specific information on harvest of Dosewallips coho is available.

Hatchery -- There are coho rearing and/or release programs at the George Adams Hatchery, the Hood Canal (Hoodsport) Hatchery , the Quilcene National Fishery in Quilcene and from net pens in Quilcene Bay and Port Gamble Bay. The effect of these programs on Dosewallips coho is unknown.

Last ten years salmon releases into the Skokomish-Dosewallips Basin

Release Year	Spring Chinook	Summer Chinook	Fall Chinook	Chum	Coho	Pink
1982	25,906	0	6,553,671	21,928,520	620,011	916,675
1983	0	19,724	7,159,353	38,931,555	529,474	0
1984	0	0	6,286,887	30,365,182	749,000	254,800
1985	0	0	7,032,376	55,225,215	699,900	0
1986	0	0	9,197,536	38,594,000	1,289,100	974,700
1987	0	0	6,339,416	41,844,500	403,800	0
1988	0	0	7,910,510	40,589,500	606,400	5,002,800
1989	0	0	12,897,987	38,221,100	1,077,886	0
1990	183,100	0	12,478,127	34,744,100	373,400	827,900
1991	193,377	0	5,984,598	20,907,988	1,214,100	0
MEAN	134,128		8,184,046	36,135,166	756,307	1,595,375

HOOD CANAL -- QUILCENE / DABOB BAYS COHO

STOCK DEFINITION AND ORIGIN

The Quilcene/Dabob bays coho salmon stock does not exhibit a unique temporal distribution, with spawning timing being quite variable between years. There are no readily discernable distinct biological characteristics, however, this stock may have experienced genetic input from hatchery releases to a greater degree than other coho stocks in Hood Canal (see below). This stock likely experiences a significant degree of spawning segregation from other Hood Canal natural populations.

There have been frequent introductions of hatchery-origin coho into this region. Hatchery yearlings were released into this area in 1955 and 1956 (Quilcene stock), 1964 (Green River), 1965 and 1966 (Hood Canal), 1972, 1976 through 1982 and 1986 (all Dungeness stock). These releases were made primarily into Tarboo Creek and the Little Quilcene River. There were sporadic fingerling/fry releases between 1954 and 1963 utilizing a broad variety of Puget Sound stocks. There has been a comprehensive off-station fry/fingerling release program in Dabob Bay from 1978 to present using Dungeness and Quilcene stocks. Additionally, there have been large numbers of coho (300,000 to 600,000) released on-station annually at the USFWS Quilcene National Fish Hatchery on Penny Creek, a tributary of the Big Quilcene River. Beginning in 1986, extended-reared hatchery-origin coho (100,000 to 300,000 per year) have been released from net pens in Quilcene Bay. This stock is likely a hybrid of native stock and introduced non-native stocks.

STOCK STATUS

The status of this stock is currently considered Depressed.

The escapement index data base is rather brief for this stock (1984 through 1991).

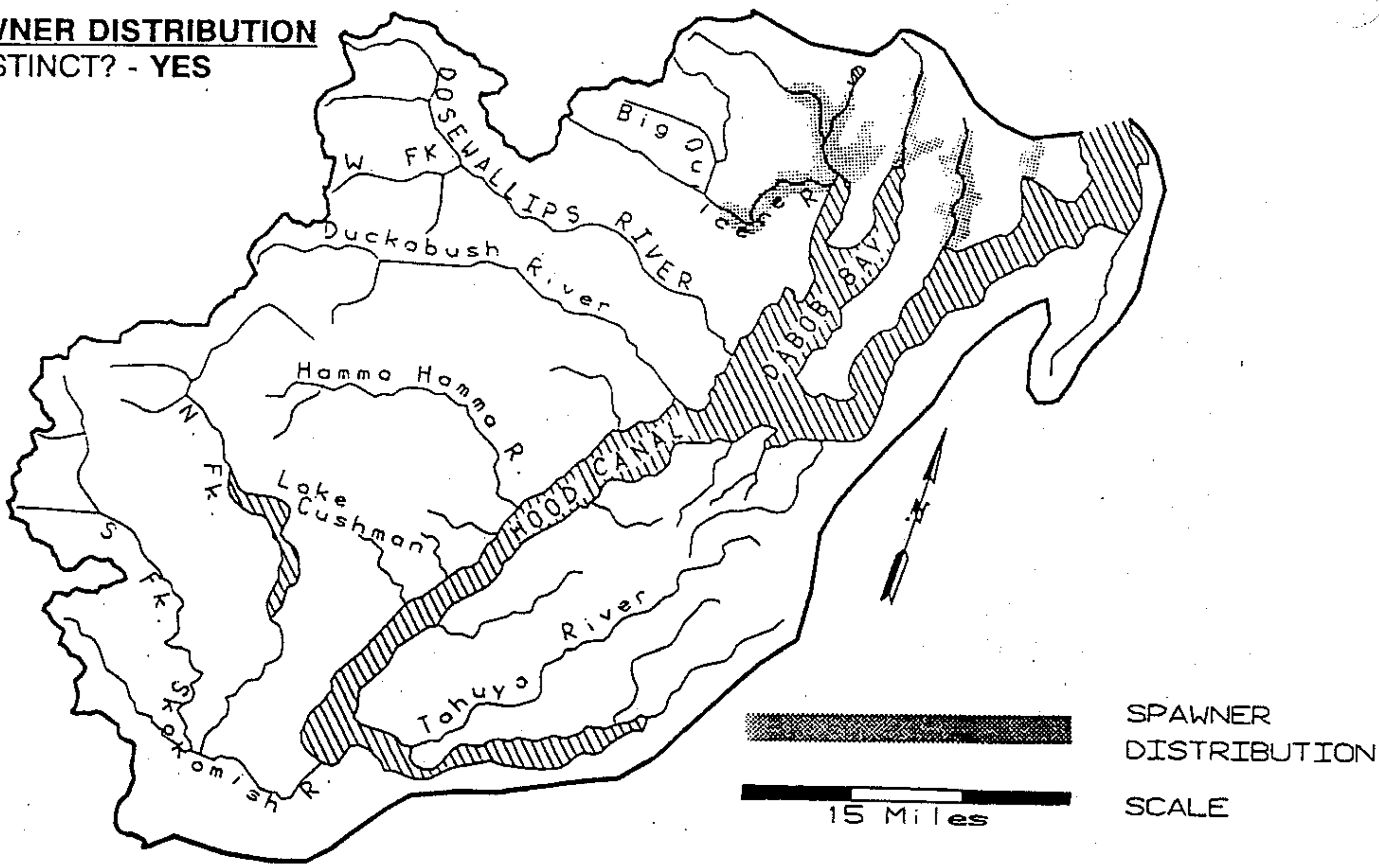
Index counts are variable over the short history of the data base, but they do indicate chronically low escapement levels.

FACTORS AFFECTING PRODUCTION

Habitat -- Streams supporting wild coho production in the Quilcene area include the Big Quilcene River, Little Quilcene River, Spencer, Jackson, Donovan and Tarboo creeks. Habitat characteristics vary widely. The Big Quilcene River is the only large stream, followed in size by the Little Quilcene River and Spencer Creek and the other small streams. The larger streams, along with Jackson Creek, attain steep gradients fairly quickly where habitat is not accessible or not conducive to spawning or rearing for coho. The lower ends contain fair to excellent habitat. The marine shoreline habitats

STOCK DEFINITION PROFILE for Quilcene/Dabob Bays Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**NO**

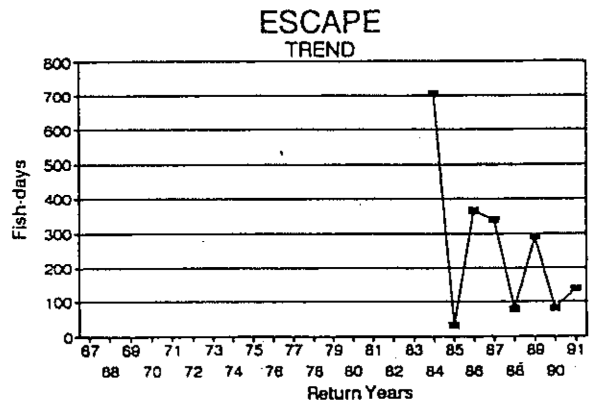
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

STOCK STATUS PROFILE for Quilcene/Dabob Bays Coho

STOCK ASSESSMENT

DATA QUALITY-----> Good

Return Years	ESCAPE Fish-days		ESCAPE Peak ct.	
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84	704		22	
85	33		3	
86	366		19	
87	341		24	
88	80		10	
89	291		26	
90	82		5	
91	140		13	



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Composite

STOCK DISTINCTION
Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Chronically Low

are largely undeveloped, with the exception of a commercial shellfish operation. Most residential lots have bulkheads of some sort.

In general, water quality in the fresh and salt waters is good, although summer low flows may contribute to high summer water temperatures. The primary limiting factor for coho production in these streams is probably summer low flows. Production may also be limited by pool volume which is affected by stream gradient and available pool-forming features such as instream large woody debris. Lack of overwinter habitat due to diking and wetland filling may also limit production.

Harvest Management -- No stock-specific information is available. Harvest impacts in the preterminal area are assumed to be similar to those for all other Hood Canal coho stocks. In the Quilcene Bay/Dabob Bay terminal area, net fishery harvest rates are set to harvest the full hatchery surplus so harvest rates on Quilcene/Dabob bays natural coho are undoubtedly higher than those measured for the remainder of Hood Canal.

Hatchery -- There are coho rearing and release programs at three hatcheries on Hood Canal tributaries and at several net pen complexes in or near Quilcene and Dabob bays. The effect of these programs on the Quilcene/Dabob Bays coho stock is not known.

Last ten years salmon releases into the Quilcene Basin

Release Year	Spring Chinook	Chum	Coho
1982	152,245	1,474,949	1,298,041
1983	206,979	995,738	620,812
1984	529,549	1,218,671	866,959
1985	457,019	2,358,907	598,328
1986	204,355	2,599,971	875,680
1987	221,463	2,549,091	1,405,131
1988	136,146	2,217,147	871,119
1989	120,924	2,044,704	1,394,313
1990	211,300	2,634,174	1,090,801
1991	304,791	1,664,227	1,561,802
MEAN	254,477	1,975,758	1,058,299

OVERVIEW -- HOOD CANAL PINK STOCKS

HAMMA HAMMA
DUCKABUSH
DOSEWALLIPS

STOCK DEFINITION AND ORIGIN

Pink salmon spawning in this region are isolated from other Washington pink salmon stocks through geographic separation of the spawning grounds. Additionally, genetic studies have shown that, as a group, the Hood Canal pink salmon stocks are distinct from other Washington pink stocks.

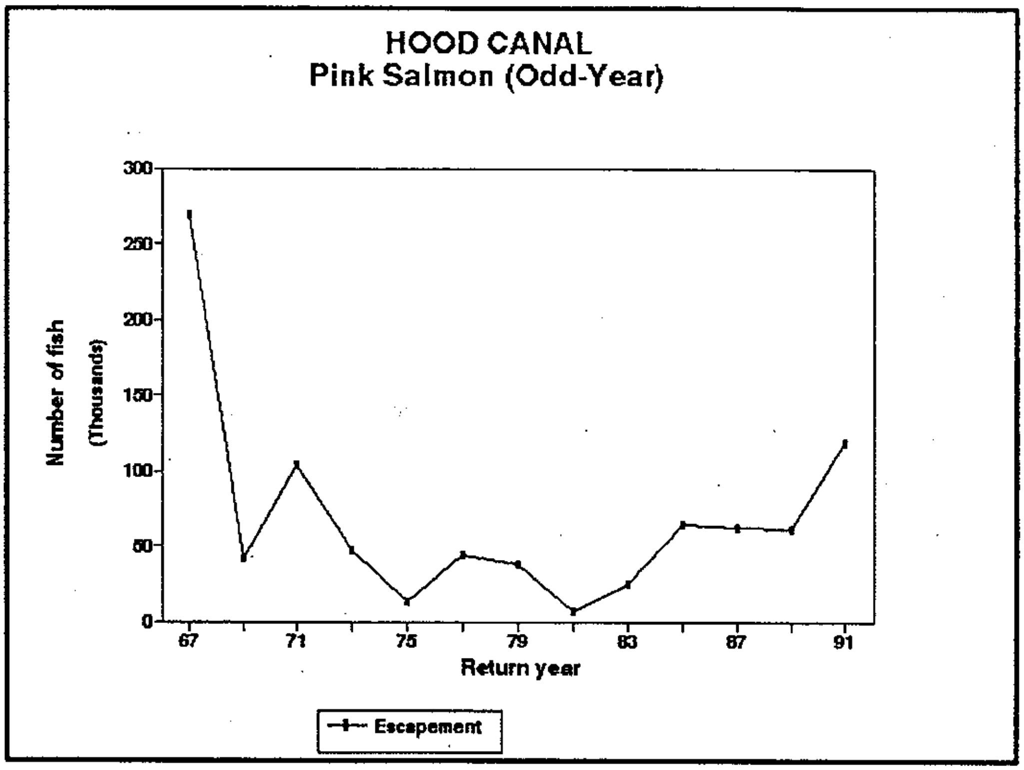
Hood Canal pink salmon were separated into three stocks based solely on geographic separation of their spawning grounds. The mouths of the Hamma Hamma, Duckabush and Dosewallips rivers are separated by at least five miles. It was assumed that the homing ability of Hood Canal pink salmon allowed them to return to their natal streams. However, genetic studies failed to show any differences among these stocks. Therefore, these three stocks may be separate populations of the same stock.

A few releases of pink salmon from Hood Canal (Hoodsport) Hatchery have been made in some of these streams but probably have not had a significant impact on the native pink populations. All three of these stocks have been characterized as native.

STOCK STATUS

As a group, these pink salmon are harvested in Canadian and U.S. fisheries. Relatively few Hood Canal pink salmon are harvested in the Strait of Juan de Fuca and north Puget Sound commercial fisheries. A few are harvested in the terminal areas in Hood Canal. There are no agreed-to escapement goals for the Hood Canal pink stocks. Escapement levels and run sizes of Hood Canal pinks from 1963 through 1967 were well above any other recorded counts. The status of the Hamma Hamma and Duckabush stocks is Healthy based on current escapement levels and an increasing trend in escapement over the last ten broods. The status of the Dosewallips pink stock is considered Depressed due to low escapements.

Escapement data are shown in the figure below, and they give a good representation of the number of spawners in the area.



Information on individual pink salmon stocks is presented in the Stock Reports which follow.

HOOD CANAL -- HAMMA HAMMA PINK

STOCK DEFINITION AND ORIGIN

Hamma Hamma River pink salmon are odd-year, single age-class fish geographically separated from other Puget Sound pink stocks. Spawning takes place primarily in the mainstem Hamma Hamma and in John Creek, the major accessible tributary.

Pink salmon enter the river beginning in August through early October, and hold briefly in the larger pools until they are ready to spawn. Spawning begins in September and continues through October with the peak generally occurring in mid-October.

Genetic analysis has shown that the pink stock in the Hamma Hamma River is not significantly different from pink stocks in the Dosewallips and Duckabush rivers. However, when these three Hood Canal tributaries are pooled, the aggregate is significantly different from other recognized pink salmon stocks.

These fish are believed to be of native origin with no hatchery influence.

STOCK STATUS

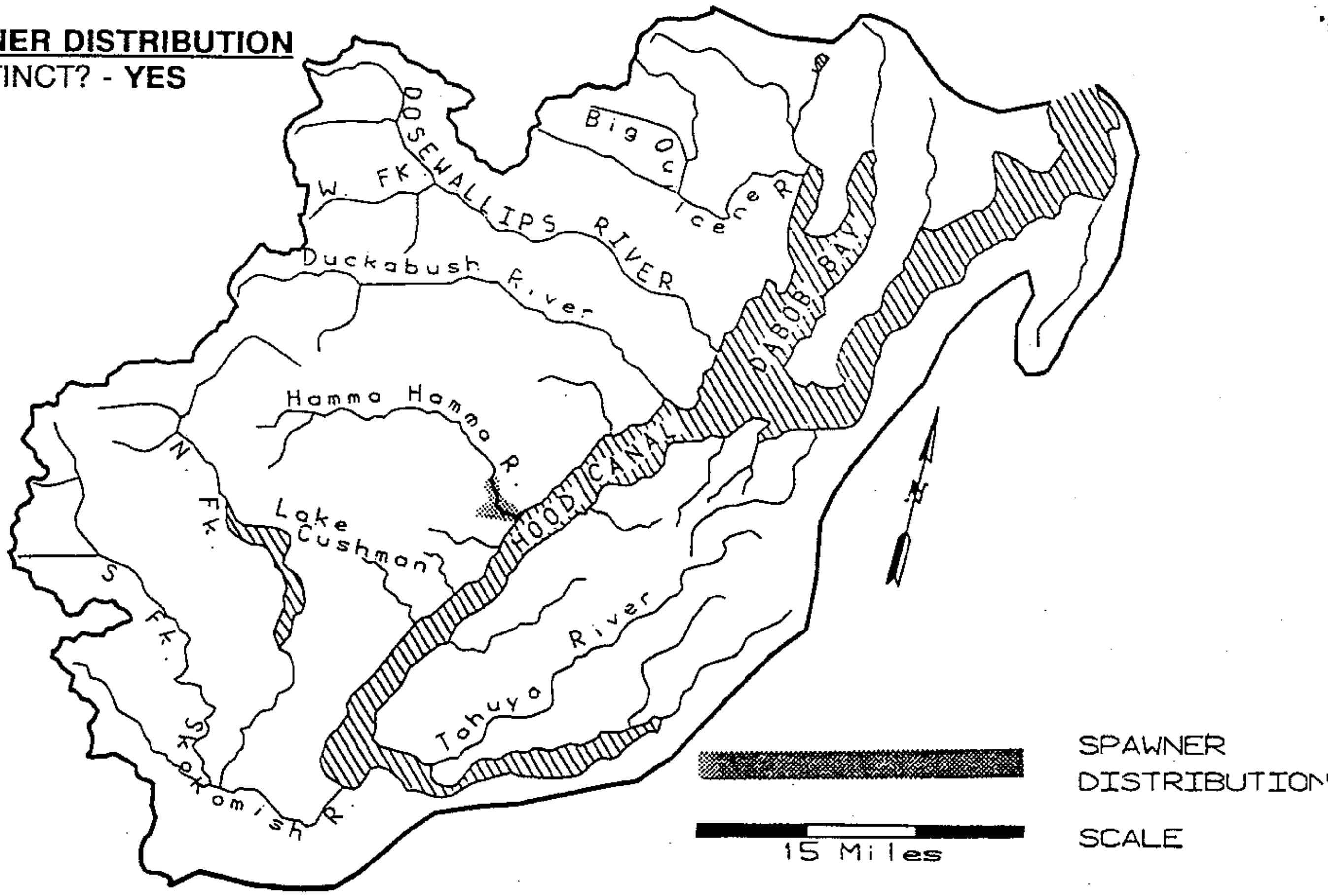
The status of the Hamma Hamma pink stock is Healthy.

The estimated number of pink salmon returning to the Hamma Hamma River during the past 30 years has ranged from 2,000 to 38,000. The accuracy of these estimates is felt to be very good because of spawner distribution and survey methodology. Escapement levels of these fish have been stable over the last several cycles.

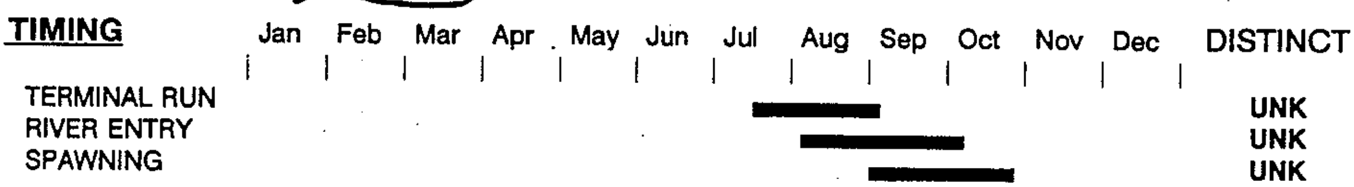
STOCK DEFINITION PROFILE for Hamma Hamma Pink

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS

DISTINCT? - **NO**

GENETICS - This stock is not significantly different from the two other stocks recognized in Hood Canal [two collections from Hamma Hamma River, (N=136); 28-locus G-tests: **p**>0.05].

STOCK STATUS PROFILE for Hamma Hamma Pink

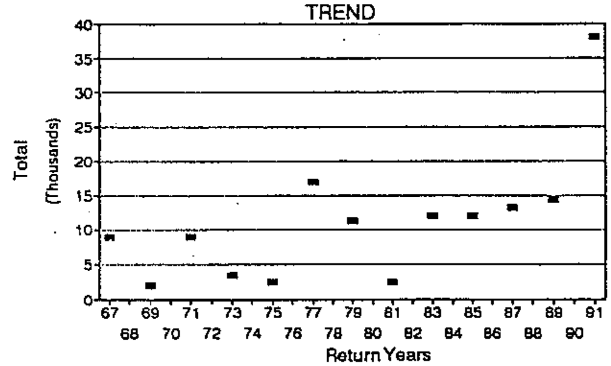
STOCK ASSESSMENT

DATA QUALITY------> Good

Return Years	ESCAPE Total			
67	9000			
68				
69	2000			
70				
71	9000			
72				
73	3500			
74				
75	2500			
76				
77	16900			
78				
79	11300			
80				
81	2450			
82				
83	12000			
84				
85	12000			
86				
87	13300			
88				
89	14300			
90				
91	38000			

Odd-year returns only.

ESCAPE
TREND



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution, Timing

STOCK STATUS
Healthy

SCREENING CRITERIA

HOOD CANAL -- DUCKABUSH PINK

STOCK DEFINITION AND ORIGIN

Duckabush River pink salmon are odd-year, single age-class fish geographically separated from other Puget Sound pink stocks. Spawning takes place primarily in the mainstem reaches of the Duckabush River and its side channels. There may be limited spawning in some of the tributaries as well.

Pink salmon enter the river beginning in early August, with the peak usually in early October, and hold briefly in the larger pools in the lower river until they are ready to spawn. Spawning begins in September and continues through October with the peak generally occurring in mid-October.

Genetic analysis has shown that the stock in the Duckabush River is not significantly different from stocks in the Dosewallips and Hamma Hamma rivers. However, when these three Hood Canal tributaries are pooled, the aggregate is significantly different from other recognized pink salmon stocks.

These fish are believed to be of native origin with no hatchery influence.

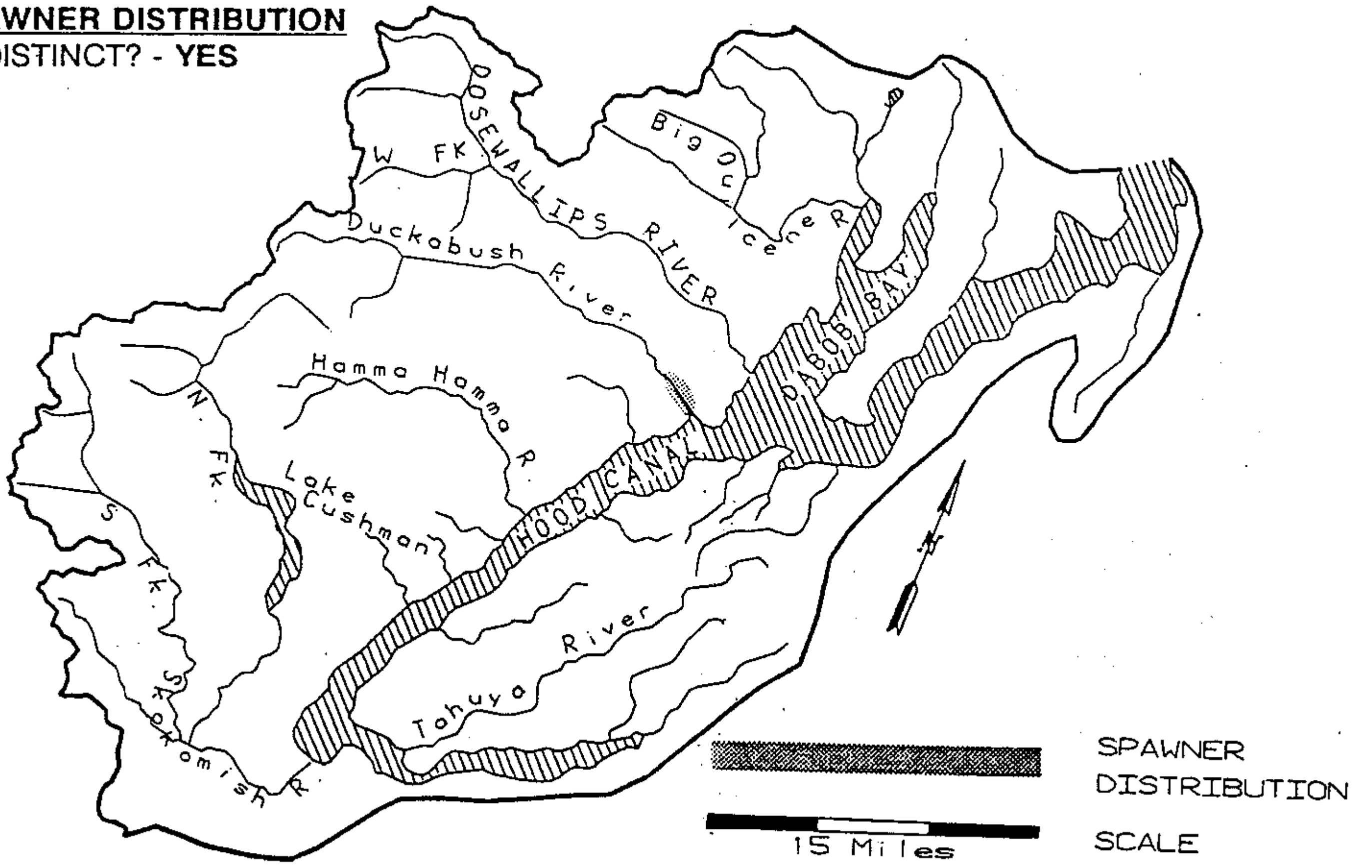
STOCK STATUS

The status of the Duckabush pink stock is Healthy.

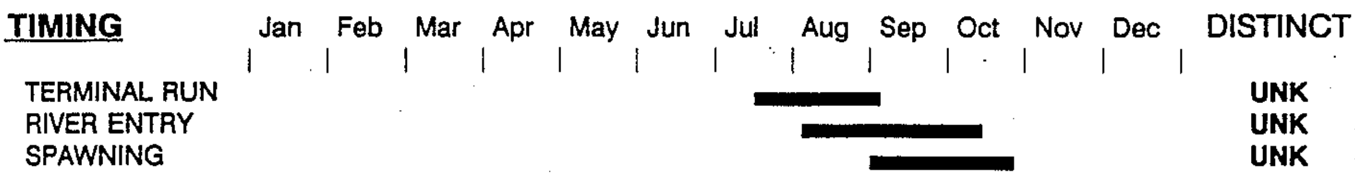
The estimated number of pink salmon returning to the Duckabush River during the past 25 years has ranged from 2,300 to 72,000. Escapement estimates are generated from spawning ground counts and index escapement methodology. The accuracy of these estimates is felt to be very good because of spawner distribution and survey methodology. Escapement levels of this stock have been stable over the last several cycles.

STOCK DEFINITION PROFILE for Duckabush Pink

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

GENETICS - This stock is not significantly different from the two other stocks recognized in Hood Canal [two collections from Duckabush River (N=150); 28-locus G-tests: $\mathbf{p}>0.5$]

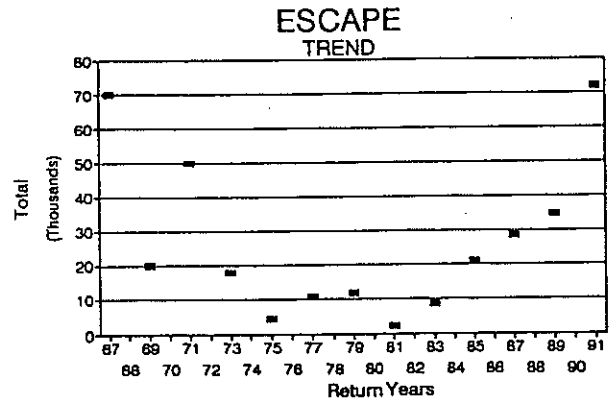
STOCK STATUS PROFILE for Duckabush Pink

STOCK ASSESSMENT

DATA QUALITY-----> Good

Return Years	ESCAPE Total			
67	70000			
68				
69	20000			
70				
71	50000			
72				
73	18000			
74				
75	4500			
76				
77	10800			
78				
79	11900			
80				
81	2300			
82				
83	8700			
84				
85	21000			
86				
87	28500			
88				
89	34600			
90				
91	72000			

Odd-year returns only.



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution, Timing

STOCK STATUS
Healthy

SCREENING CRITERIA

HOOD CANAL -- DOSEWALLIPS PINK

STOCK DEFINITION AND ORIGIN

Dosewallips River pink salmon are odd-year, single age-class fish geographically separated from other Puget Sound pink stocks. Spawning takes place primarily in the mainstem reaches of the river as well as in some major side channels. Pink salmon also utilize Rocky Brook Creek which is the main tributary in the lower four miles of the river.

Pink salmon enter the river beginning in late July with the peak in early October, and hold briefly in the larger pools until they are ready to spawn. Spawning begins in September and continues through October with the peak generally occurring in mid-October.

Genetic analysis has shown that the pink stock in the Dosewallips River is not significantly different from the stocks in the Duckabush and Hamma Hamma rivers. However, when these three Hood Canal tributaries are pooled, the aggregate is significantly different from other recognized pink salmon stocks.

These fish are believed to be of native origin with no hatchery influence.

STOCK STATUS

The status of the Dosewallips pink stock is Depressed.

The estimated number of pink salmon returning to the Dosewallips River during the past 25 years has ranged from 1,700 to 190,000. Escapement estimates are generated from spawning ground counts.

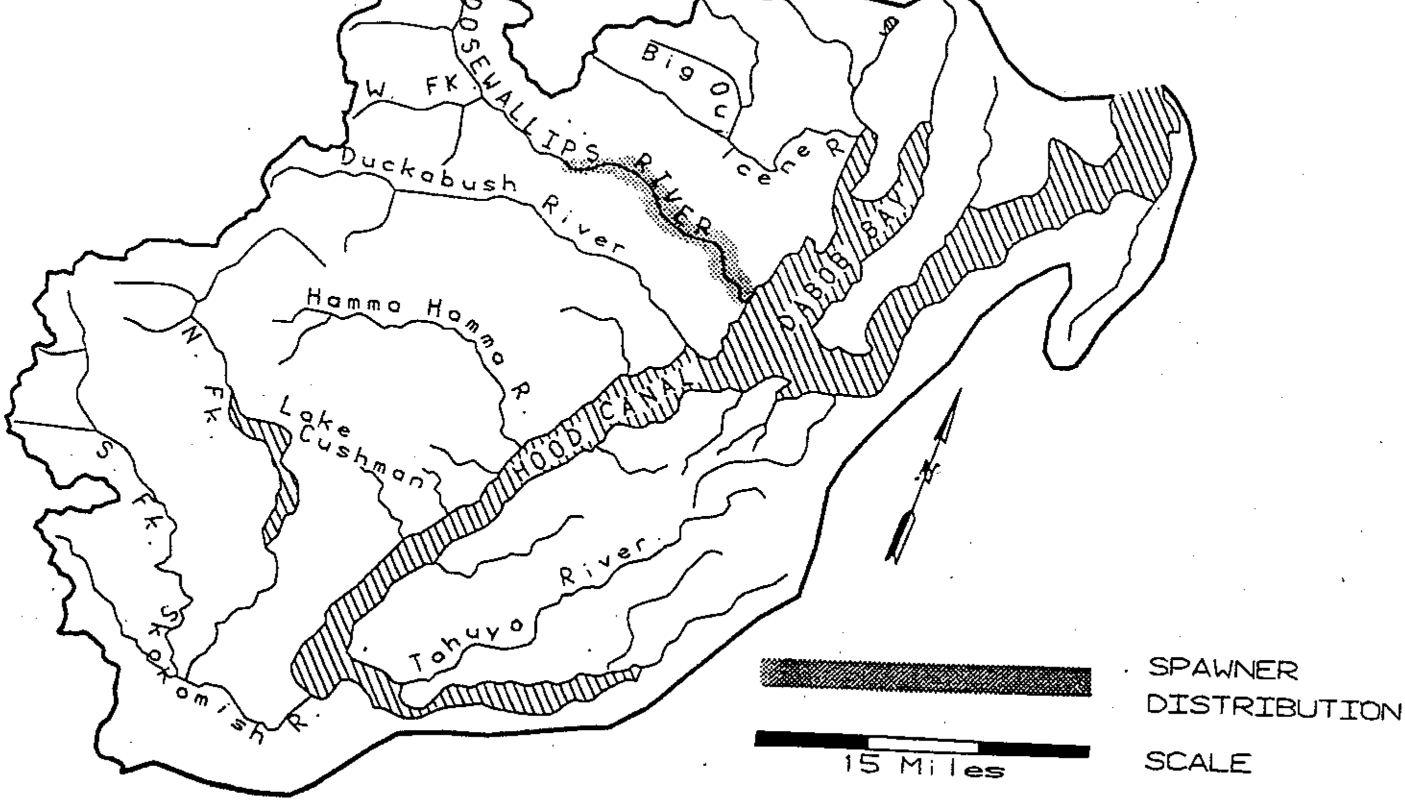
The accuracy of these estimates is felt to be very good because of spawner distribution and survey methodology. Escapement levels for this stock have been stable over the last several cycles but have not approached the expected production based on available habitat. Escapement estimates which pre-date the current data base and the peak estimates within the current data base indicate that the pink salmon production potential of the Dosewallips River system could be hundreds of thousands of fish. Accordingly, this stock has been classified as a Depressed stock based on chronically low escapement levels.

FACTORS AFFECTING PRODUCTION

Habitat -- Habitat conditions in the upper half of the watershed, located within the Olympic National Park, are very good. Logging and road building on steep, unstable soils further down the watershed have led to culvert blow-outs and debris torrents which

STOCK DEFINITION PROFILE for Dosewallips Pink

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**UNK**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

GENETICS - This stock is not significantly different from the two other stocks recognized in Hood Canal [four collections from Dosewallips River (N=342); 28-locus G-tests: **p**>0.05].

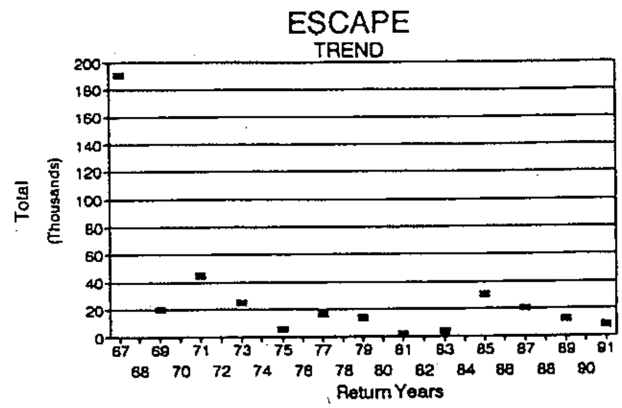
STOCK STATUS PROFILE for Dosewallips Pink

STOCK ASSESSMENT

DATA QUALITY——> Good

Return Years	ESCAPE Total			
67	190000			
68				
69	20000			
70				
71	45000			
72				
73	25000			
74				
75	5500			
76				
77	16300			
78				
79	13900			
80				
81	1700			
82				
83	4300			
84				
85	30800			
86				
87	20300			
88				
89	11900			
90				
91	8200			

Odd-year returns only.



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution, Timing

STOCK STATUS
Depressed

SCREENING CRITERIA
Chronically Low

have increased sediment loads in the streams and scoured streambeds. The most significant habitat impacts have come from the conversion of the once-forested flood plain along the lower river to agriculture land near the turn of the last century. At that time, the land was cleared and the river was diked to channel the flow to the south side of the river valley. This activity led to loss of side channels which provided spawning habitat and of large woody debris in the lower river. More recently, residential development near the mouth of the river has resulted in further destruction or channelization of formerly very productive side channels.

Harvest Management -- Dosewallips Pink salmon may be caught in commercial and sport fisheries in Alaska and Canada and in fisheries in the Strait of Juan de Fuca, however stock-specific harvest information is not available. Although no terminal-area commercial or sport fisheries are directed on this stock, Dosewallips pinks are likely to be caught in commercial chinook and coho fisheries in Hood Canal. Yearly catches of pink salmon in all Puget Sound commercial fisheries ranged from 143 to 22,180 from 1981 through 1991 and averaged 4,780. The yearly pink net catch in Hood Canal marine areas ranged from zero to 6,657 (average 1,323) from 1981 through 1991. The sport fishery in marine waters of Hood Canal is open all year. Yearly sport catches in the Dosewallips River during the same time period ranged from zero to 835 with catches under ten fish in most years. After 1991, the river was closed to sport fishing until November, after the peak of pink salmon spawning.

Hatchery -- Hood Canal-area hatcheries rear and release large numbers of chinook, coho and chum salmon. The Hood Canal Hatchery in Hoodsport has a relatively small pink salmon program. The effect of these hatchery programs on the Dosewallips pink stock is unknown.

Last ten years salmon releases into the Skokomish-Dosewallips Basin

Release Year	Spring Chinook	Summer Chinook	Fall Chinook	Chum	Coho	Pink
1982	25,906	0	6,553,671	21,928,520	620,011	916,675
1983	0	19,724	7,159,353	38,931,555	529,474	0
1984	0	0	6,286,887	30,365,182	749,000	254,800
1985	0	0	7,032,376	55,225,215	699,900	0
1986	0	0	9,197,536	38,594,000	1,289,100	974,700
1987	0	0	6,339,416	41,844,500	403,800	0
1988	0	0	7,910,510	40,589,500	606,400	5,002,800
1989	0	0	12,897,987	38,221,100	1,077,886	0
1990	183,100	0	12,478,127	34,744,100	373,400	827,900
1991	193,377	0	5,984,598	20,907,988	1,214,100	0
MEAN	134,128		8,184,046	36,135,166	756,307	1,595,375

OVERVIEW -- HOOD CANAL SUMMER AND WINTER STEELHEAD STOCKS

SUMMER:	WINTER:	
SKOKOMISH	DEWATTO	HAMMA HAMMA
DUCKABUSH	TAHUYA	DUCKABUSH
DOSEWALLIPS	UNION	DOSEWALLIPS
	SKOKOMISH	QUILCENE/DABOB BAY

STOCK DEFINITION AND ORIGIN

In Hood Canal, three wild summer steelhead stocks and eight wild winter steelhead stocks have been identified. Wild summer steelhead in the Skokomish, Duckabush, and Dosewallips rivers and wild winter steelhead in the Dewatto, Tahuya, Union, Skokomish, Hamma Hamma, Duckabush and Dosewallips rivers and Quilcene/Dabob bays tributaries are identified as wild stocks.

There is little or no information available to indicate that these are genetically distinct stocks. The stocks are treated separately due to the geographic isolation of the spawning populations. There may be more or fewer stocks identified once more comprehensive genetic, life history, and ecological information is available.

The run timing of the summer steelhead stocks (May through October) is distinct from the run timing of the winter steelhead stocks (December through May) in Hood Canal.

Hatchery steelhead stocks will be discussed in a separate inventory. Hatchery steelhead will be mentioned here only in the context of how they may impact the origin, productivity or production of the wild stock. Hatchery steelhead smolts are stocked in many streams to provide recreational and tribal fishing opportunities, but not all hatchery fish are harvested and some may spawn in the wild. The WDFW Bogachiel/Chambers Creek hatchery winter steelhead stock or Bogachiel hatchery summer steelhead stock is used in most streams where hatchery steelhead are released.

STOCK STATUS

Where possible, the trend in wild steelhead spawning escapement and its relationship to potential steelhead production in available habitat or to established spawning escapement objectives was used to determine the status of wild steelhead stocks. If spawning escapement information was not available for a stock then trends in sport harvest or other indices were used.

To estimate spawning escapement, standardized methods were used. Redd counts were conducted on foot, by boat, and/or by air every two or three weeks (or as water conditions allowed) from March through June or the end of the spawning season, whichever occurs first. Spawner escapements were calculated as: (Number of redds) x (0.81 females per redd) x (an adjustment for sex ratio; typically one male per female unless system-specific information is available).

For most streams, the Washington Department of Fish and Wildlife estimates steelhead sport harvest based on projections of the number of steelhead reported on permit cards that are returned by anglers for each stream. The projection is necessary because not all permit cards are returned. Harvest estimates are also derived from angler surveys ("creel surveys") on several river systems; these harvest estimates are more accurate and are compared with the number of steelhead reported on permit cards for those same systems to calculate the projection factor. In western Washington, winter-run steelhead are those caught between November 1 and April 30; summer-run steelhead are those caught between May 1 and October 31. Most hatchery steelhead are marked with an adipose fin-clip and marked and unmarked steelhead have been reported separately by anglers on the permit cards since the 1986 summer steelhead season and since the 1986-87 winter steelhead season.

The non-treaty sport fishery for summer steelhead occurs from June through February; wild steelhead release regulations have been in effect in all freshwater areas since 1992 to protect wild summer steelhead from sport harvest. For winter steelhead, non-treaty sport fisheries in all Hood Canal rivers are directed at hatchery winter steelhead from December through February; in addition, wild steelhead release regulations have been in effect in the Dewatto, Tahuya, and Skokomish rivers since 1987 and will begin with the 1994-95 season in all other rivers to protect the wild winter steelhead from sport harvest. Wild steelhead release regulations have been in effect in all marine areas since 1993 to protect wild summer and winter steelhead from sport harvest.

Treaty net fisheries and hook-and-line subsistence fisheries occur in some marine and freshwater areas in Hood Canal. Treaty net fisheries occur only in areas where the streams are stocked with hatchery steelhead smolts. If no hatchery steelhead smolts are stocked, limited tribal hook-and-line subsistence fisheries may still take place. Treaty net fisheries only occur in marine areas of north Hood Canal (Area 9A) from December through January. Treaty net fisheries occur in freshwater areas from December through February or the first week in March in the Union, Skokomish, Duckabush, Dosewallips, and Big Quilcene rivers, from January through February or the first week in March in the Hamma Hamma River, and from December through January in the Dewatto and Tahuya rivers. Hook-and-line subsistence fisheries occur from December through the first week in April in all of the above named Hood Canal streams; hook-and-line subsistence fisheries are operated with a bag limit when and where treaty net fisheries are closed and with no bag limit when treaty net fisheries are open.

A recent Washington Department of Wildlife study (Cooper and Johnson 1992) concluded that there have been long-term fluctuations and recent declines in winter, summer, hatchery and wild steelhead abundance and survival in the Puget Sound, Strait of Juan de Fuca, Pacific coast, and Columbia River areas in Washington. There were also similarities in the overall trends and year-to-year trends of steelhead abundance in Washington, British Columbia and Oregon. Similarities in survival trends over widespread geographic areas indicate that common factor(s) to each of these areas are partially responsible for recent changes in steelhead survival. A combination of factors contributed to the recent decline in steelhead abundance including low ocean productivity, competition for food in the ocean, and catch of steelhead in authorized and unauthorized high seas drift net fisheries.

More information on each stock is presented in separate Stock Reports.

HOOD CANAL -- SKOKOMISH SUMMER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild summer steelhead in the Skokomish and South Fork Skokomish rivers and their tributaries have been classified as a distinct stock based on the geographic isolation of the spawning population. The specific spawning distribution is unknown, but spawning is generally believed to take place in the upper reaches of the river. Summer steelhead are distinct from wild winter steelhead in the Skokomish River based on run timing. Similar to other wild summer steelhead stocks, run timing is generally from May through October and spawn timing is unknown but probably occurs from February through April.

There is no information regarding the genetic composition of the stock.

STOCK STATUS

The status of the stock is Unknown. This stock is comprised of a historically small number of summer steelhead, but there is insufficient information to classify its status as either Healthy, Depressed, or Critical.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified.

Sport harvest data are available since the early 1960s, but wild summer steelhead catches were not reported separately on steelhead permit cards until the 1986 summer steelhead season. An estimated 19, 9, 6, 11, 2, and 0 wild summer steelhead were harvested in the sport fishery during the 1986, 1987, 1988, 1989, 1990, and 1991 summer steelhead seasons, respectively. Information on sport harvest of wild summer steelhead is available over the entire run, but wild sport harvest is too low to be used to assess the status of the wild stock.

More information needs to be collected on this stock so that stock status can be determined. As a small stock, it could be especially vulnerable to any negative impacts.

FACTORS AFFECTING PRODUCTION

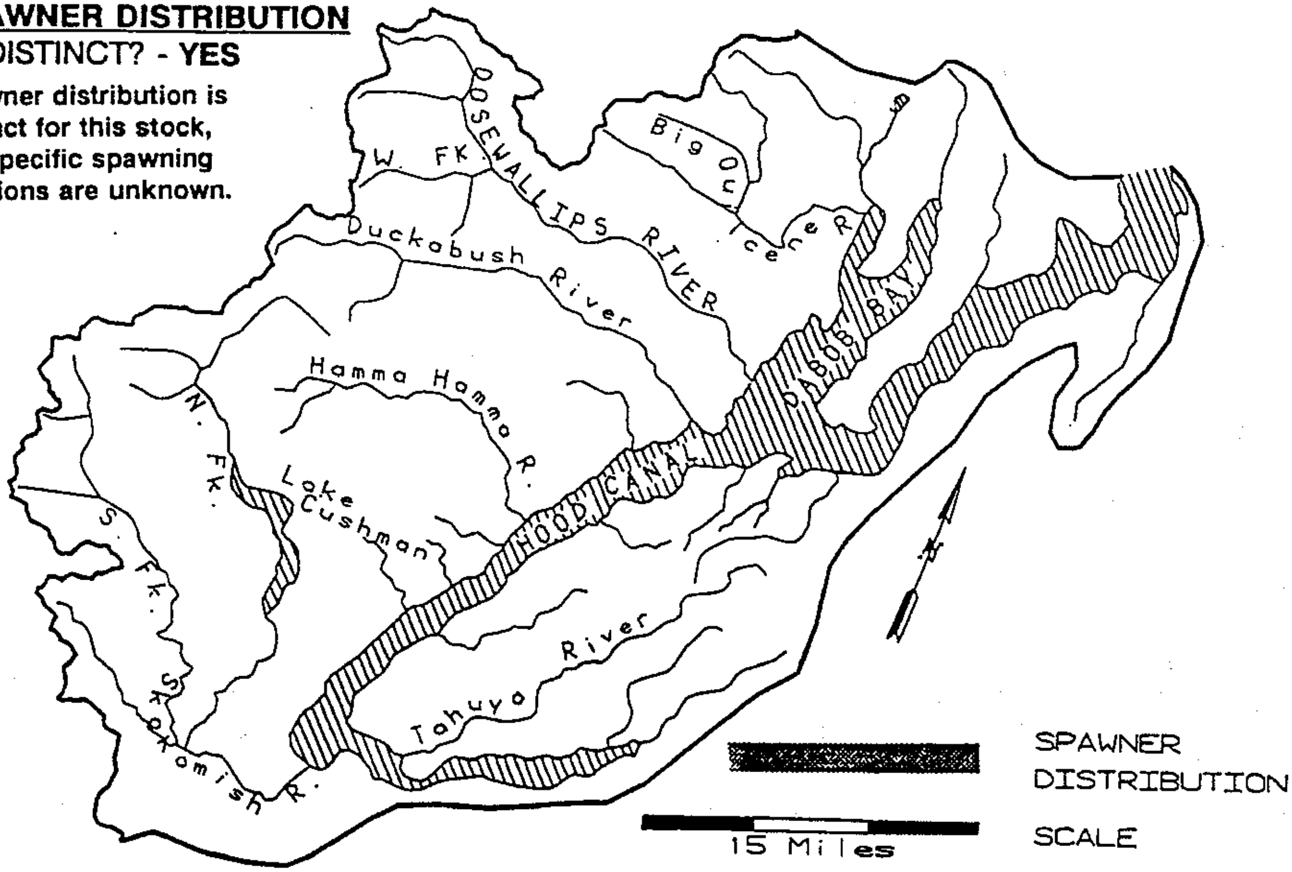
Habitat -- Freshwater habitat has been impacted by land-use (forest management) activities in the Skokomish River. The upper watershed has been extensively logged. Cushman Dam blocks access to habitat in the upper North Fork Skokomish. Marine mammal predation on migrating wild steelhead smolts and returning wild adults may also affect production.

STOCK DEFINITION PROFILE for Skokomish Summer Steelhead

SPAWNER DISTRIBUTION

DISTINCT? - **YES**

Spawner distribution is distinct for this stock, but specific spawning locations are unknown.



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													
RIVER ENTRY					—	—	—	—	—	—			**NO**
SPAWNING													**UNK**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Skokomish Summer Steelhead

STOCK ASSESSMENT

DATA QUALITY------> No Data

Return Years	NO DATA			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

Harvest Management -- There is no directed net fishery on this stock. The non-treaty sport fishery occurs from June through February and has been managed with wild steelhead release regulations in the Skokomish River since 1992 and in all marine areas since 1993 to protect the wild stock from sport harvest, although some hook-and-release mortality of wild summer steelhead may occur.

Hatchery -- While hatchery steelhead smolts have been stocked in this and nearby streams, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

HOOD CANAL -- DUCKABUSH SUMMER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild summer steelhead in the Duckabush River have been classified as a distinct stock based on the geographic isolation of the spawning population. The specific spawning distribution is unknown, but spawning is generally believed to take place in the upper reaches of the river. Summer steelhead are distinct from wild winter steelhead in the Duckabush River based on run timing. Similar to other wild summer steelhead stocks, run timing is generally from May through October and spawn timing is unknown but probably occurs from February through April.

There is no information regarding the genetic composition of the stock.

STOCK STATUS

The status of the stock is Unknown. This stock is comprised of a historically small number of summer steelhead, but there is insufficient information to classify its status as either Healthy, Depressed, or Critical.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified.

Sport harvest information is available since the early 1960s, but wild summer steelhead catches were not reported separately on steelhead permit cards until the 1986 summer steelhead season. An estimated 14, 32, 6, 2, 10, and 4 wild summer steelhead were harvested in the sport fishery during the 1986, 1987, 1988, 1989, 1990, and 1991 summer steelhead seasons, respectively. information on sport harvest of wild summer steelhead is available over the entire run, but wild sport harvest is too low to be used to assess the status of the wild stock.

More information needs to be collected on this stock so that stock status can be determined. As a small stock, it could be especially vulnerable to any negative impacts.

FACTORS AFFECTING PRODUCTION

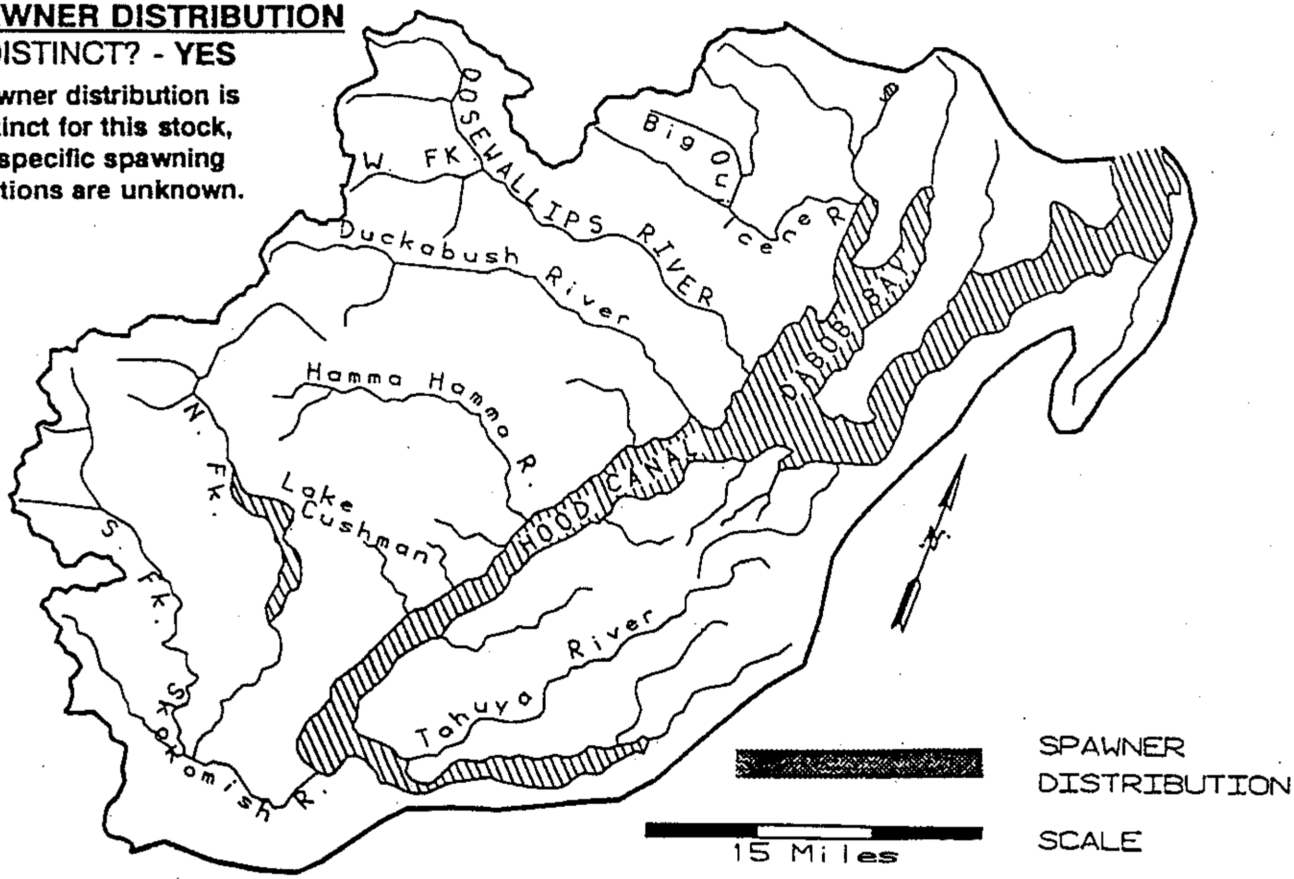
Habitat -- The anadromous portion of the mainstem Duckabush River available to steelhead is rather short, approximately seven miles long. From RM 3.5 to 7.0 the stream gradient is moderate with numerous cascades. The stream flows through a moderately to tightly confined valley with limited rearing capacity. Spawning gravel in this area consists mainly of patch gravel. The lower three-mile portion of the mainstem flows through a loosely confined valley with a relatively low gradient where there are some excellent riffles and side channels for spawning.

STOCK DEFINITION PROFILE for Duckabush Summer Steelhead

SPAWNER DISTRIBUTION

DISTINCT? - **YES**

Spawner distribution is distinct for this stock, but specific spawning locations are unknown.



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													
RIVER ENTRY					▬	▬	▬	▬	▬	▬			**NO**
SPAWNING													**UNK**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Duckabush Summer Steelhead

STOCK ASSESSMENT

DATA QUALITY------> No Data

Return Years	NO DATA			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

Residential development along the lower two miles of the mainstem has resulted in loss of riparian vegetation and in dike construction to alleviate flooding. Diking in the lower mile of the mainstem has probably led to the loss of rearing habitat and may promote scouring of spawning habitat.

Steelhead utilize the mainstem and the few tributaries available for spawning and rearing, however the tributaries are short, and both the mainstem and tributaries have been impacted by past logging practices and residential development.

Summer low flows may restrict steelhead production, and because the amount of winter rearing habitat in the basin is low, winter floods may also limit production.

Harvest Management -- There is no directed net fishery on this stock. The non-treaty sport fishery occurs from June through February and has been managed with wild steelhead release regulations in the Duckabush River since 1992 and in all marine areas since 1993 to protect the wild stock from sport harvest, although some hook-and-release mortality of wild summer steelhead may occur.

Hatchery -- While hatchery steelhead smolts have been stocked in this and nearby streams, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

HOOD CANAL -- DOSEWALLIPS SUMMER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild summer steelhead in the Dosewallips River and tributaries have been classified as a distinct stock based on the geographic isolation of the spawning population. The specific spawning distribution is unknown, but spawning is generally believed to take place in the upper reaches of the river. Summer steelhead are distinct from wild winter steelhead in the Dosewallips River based on run timing. Similar to other wild summer steelhead stocks, run timing is generally from May through October and spawn timing is unknown but probably occurs from February through April.

There is no information regarding the genetic composition of the stock.

STOCK STATUS

The status of the stock is Unknown. This stock is comprised of a historically small number of summer steelhead, but there is insufficient information to classify its status as either Healthy, Depressed, or Critical.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified.

Sport harvest information is available since the early 1960s, but wild summer steelhead catches were not reported separately on steelhead permit cards until the 1986 summer steelhead season. An estimated 11, 2, 4, 5, 9, and 2 wild summer steelhead were harvested in the sport fishery during the 1986, 1987, 1988, 1989, 1990, and 1991 summer steelhead seasons, respectively. Information on sport harvest of wild summer steelhead is available over the entire run, but wild sport harvest is too low to be used to assess the status of the wild stock.

More information needs to be collected on this stock so that stock status can be determined. As a small stock, it could be especially vulnerable to any negative impacts.

FACTORS AFFECTING PRODUCTION

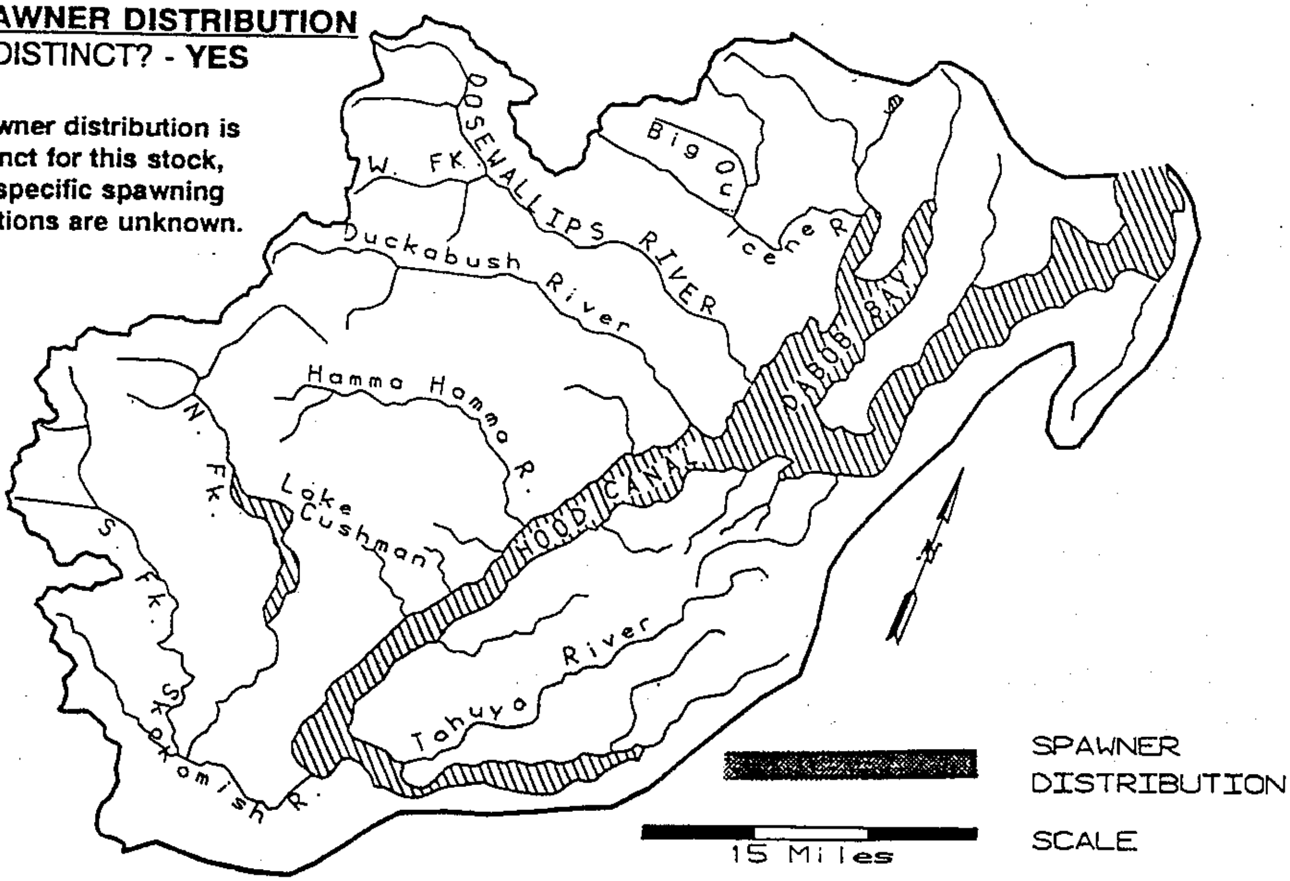
Habitat -- Habitat conditions in the upper half of the watershed, located within the Olympic National Park, are very good. Logging and road-building on steep, unstable soils further down the watershed have led to culvert blow-outs and debris torrents which have further increased sediment loads in the streams and scoured streambeds.

The most significant habitat impacts have come from the conversion of the once-forested flood plain along the lower river to agricultural land at the turn of the century. At that time, the land was cleared, and the river was diked to channel the flow to the

STOCK DEFINITION PROFILE for Dosewallips Summer Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**

Spawner distribution is distinct for this stock, but specific spawning locations are unknown.



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													
RIVER ENTRY					▬	▬	▬	▬	▬	▬			NO
SPAWNING													UNK

BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Dosewallips Summer Steelhead

STOCK ASSESSMENT

DATA QUALITY------> No Data

Return Years	NO DATA			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

south side of the river valley. This activity led to loss of side channels which provide spawning habitat and to the loss of large woody debris in the lower river. More recently, residential development near the mouth of the river has resulted in further destruction or channelization of formerly very productive side channels.

Harvest Management -- There is no tribal net fishery on this stock. The non-treaty sport fishery occurs from June through February and has been managed with wild steelhead release regulations in the Dosewallips River since 1992 and in all marine areas since 1993 to protect the wild stock from sport harvest, although some hook-and-release mortality of wild summer steelhead may occur.

Hatchery -- While hatchery steelhead smolts have been stocked, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

HOOD CANAL -- DEWATTO WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Dewatto River have been classified as a distinct stock based on the geographic isolation of the spawning population. Run timing (December through May) and spawn timing (mid-February to early June) are similar to those of some other wild winter steelhead stocks in Hood Canal.

There is no information regarding the genetic composition of the stock.

STOCK STATUS

The status of the stock has been designated as Depressed based on wild steelhead spawner escapement.

Spawner escapement ranged from 3 to 102 wild winter steelhead from 1985 through 1989. No spawner surveys were done during 1990, 1991 or 1992. In most years surveyed, this is lower than potential steelhead production based on available habitat. For example, using the WDFW methodology (Gibbons et al. 1985) a maximum sustained harvest (MSH) escapement objective for this stock would be 138 wild winter steelhead. This escapement objective and the method used to derive it have not been jointly agreed to between the WDFW and the treaty tribes.

Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 0, 2, 0, 2, and 0 wild winter steelhead were harvested in the sport fishery during the 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 winter steelhead seasons, respectively. Information on sport harvest of wild winter steelhead is available for only the early portion of the run (because the sport steelhead season closes on February 28) and cannot be used to assess the status of the wild stock. The low sport harvests during the last five years are partly the result of regulation changes made in 1987 to limit the take of wild steelhead.

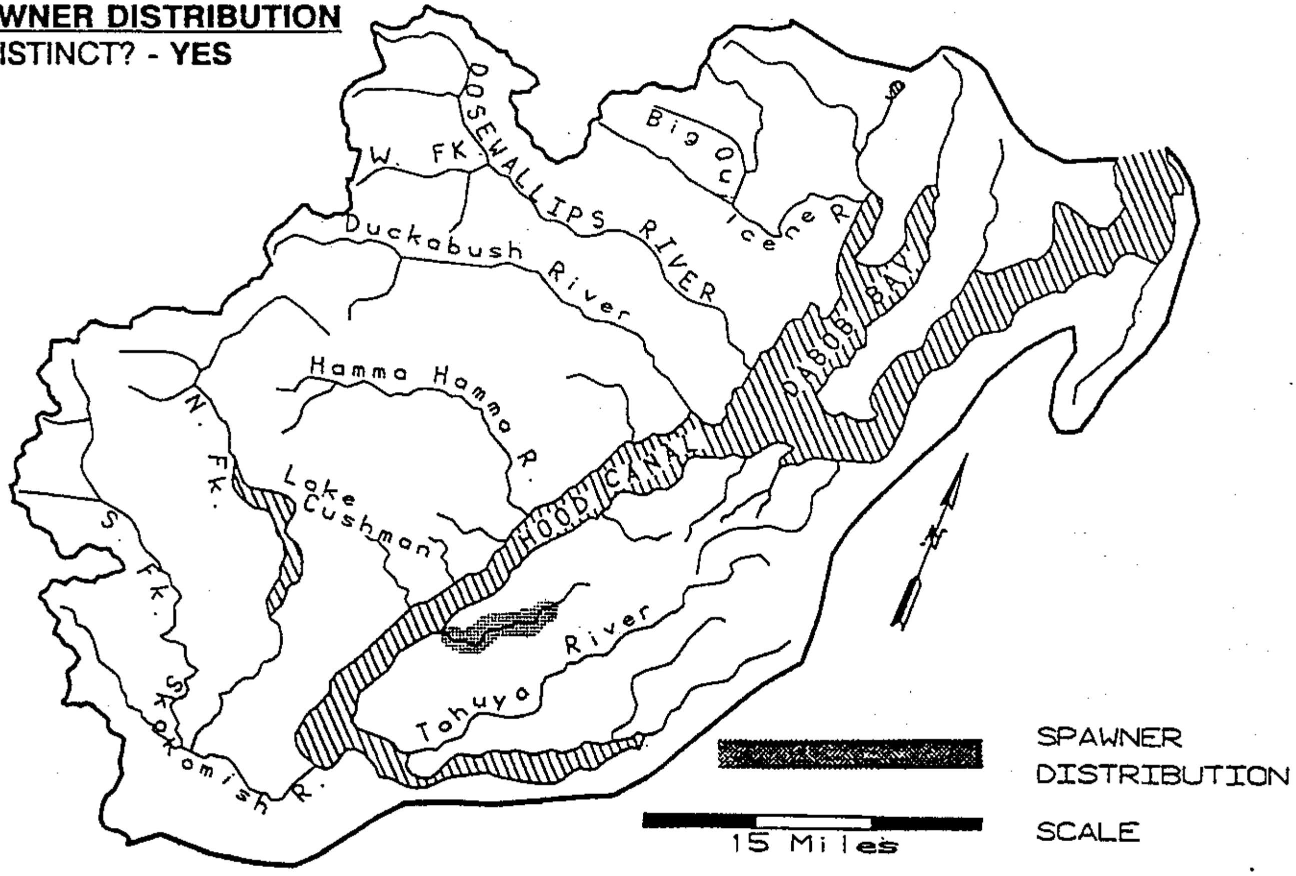
FACTORS AFFECTING PRODUCTION

Habitat -- The principal limiting factor for steelhead in the Dewatto watershed is summer low flow which reduces or, in extreme cases, dries up juvenile rearing habitat. In addition, beaver dams, though generally beneficial to steelhead, may be flooding spawning areas in the stream.

The Dewatto watershed has not been heavily impacted by human activity, and the freshwater habitat for steelhead is in relatively good condition. The primary human activities affecting fish habitat include rural development (houses and hobby farms),

STOCK DEFINITION PROFILE for Dewatto Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**DISTINCT**
TERMINAL RUN													
RIVER ENTRY													**NO**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

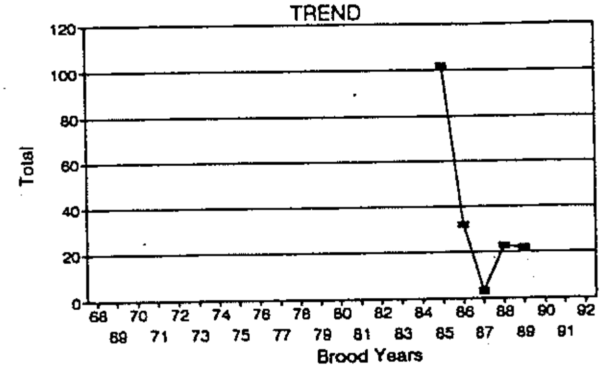
STOCK STATUS PROFILE for Dewatto Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY-----> Good

Brood Years	ESCAPE Total			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85	102			
86	32			
87	3			
88	23			
89	22			
90				
91				
92				

ESCAPE
TREND



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Chronically Low

road building and logging. All of these activities have resulted in reduction of riparian areas leading to loss of streamside shade and reduced in-stream sources of large woody debris. Bank protection activities associated with rural development have channelized parts of the stream, resulting in reduction of cover and hiding habitat. In addition to contributing to loss of riparian areas, logging in the watershed has resulted in increased sediment load in the stream. Several culverts block access to spawning and juvenile-rearing habitat. Four-wheel drive vehicles driving in the stream bed in the lower one and one-half miles of the mainstem Dewatto may be damaging redds and at least temporarily destroying gravel structure. The effects of these activities on fish habitat are expected to worsen with increased development in the watershed.

Harvest Management -- Treaty commercial net fisheries directed at steelhead occur from December through January in marine areas of north Hood Canal (Area 9A) and occasionally in the river, a limited tribal hook-and-line fishery occurs from early December through early April, and incidental harvest of wild winter steelhead may occur in some years. The non-treaty sport fishery is directed at hatchery winter steelhead from December through February, but some harvest of wild winter steelhead may occur. The sport fishery has been managed with wild steelhead release regulations in the Dewatto River since 1987 and in all marine areas since 1993, but some hook-and-release mortality of wild winter steelhead may occur.

Hatchery -- While hatchery winter steelhead smolts have been stocked in this and nearby streams, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

HOOD CANAL -- TAHUYA WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Tahuya River have been classified as a distinct stock based on the geographic isolation of the spawning population. Similar to other wild winter steelhead stocks in the Hood Canal area, run timing is generally from December through May and spawn timing is generally from mid-February to early June.

There is no information regarding the genetic composition of the stock.

STOCK STATUS

The status of the stock is designated as Depressed based on wild steelhead spawner escapement.

Spawner escapement ranged from 73 to 185 wild winter steelhead from 1985 through 1992. In most years surveyed, this is lower than potential steelhead production based on available habitat. For example, using the WDFW methodology (Gibbons et al. 1985) a maximum sustained harvest (MSH) escapement objective for this stock would be 236 wild winter steelhead. This escapement objective and the method used to derive it have not been jointly agreed to between the WDFW and the treaty tribes.

Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 7, 4, 3, 7, and 2 wild winter steelhead were harvested in the sport fishery during the 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 winter steelhead seasons, respectively. Information on sport harvest of wild winter steelhead is available for only the early portion of the run (because the sport steelhead season closes on February 28) and cannot be used to assess the status of the wild stock. Low sport harvests during the last five years are partly a result of regulation changes made in 1987 to limit the take of wild steelhead.

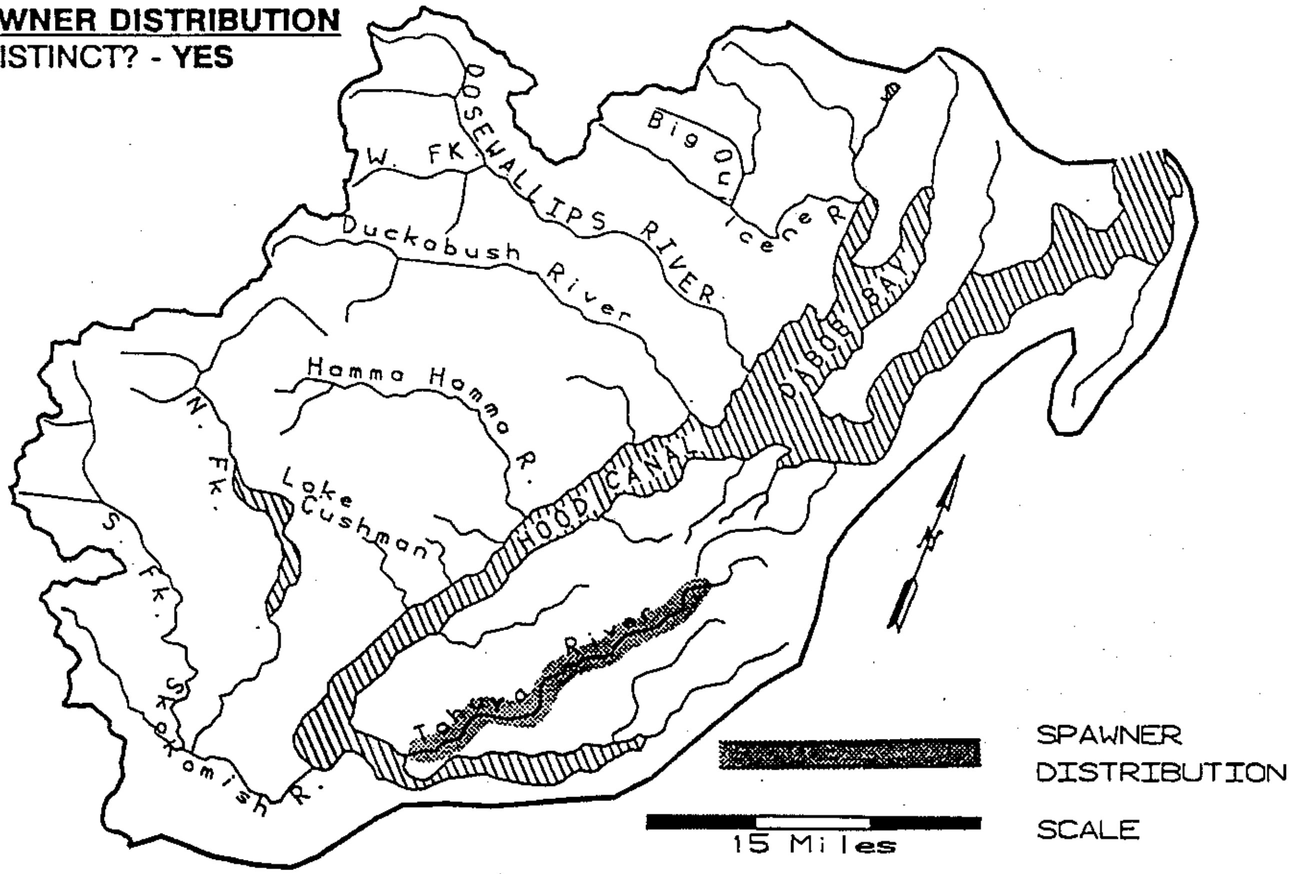
FACTORS AFFECTING PRODUCTION

Habitat -- Freshwater habitat has been impacted by land-use (forest management) activities, although quantitative data are unavailable. Summer low flows significantly limit the survival of juvenile winter steelhead.

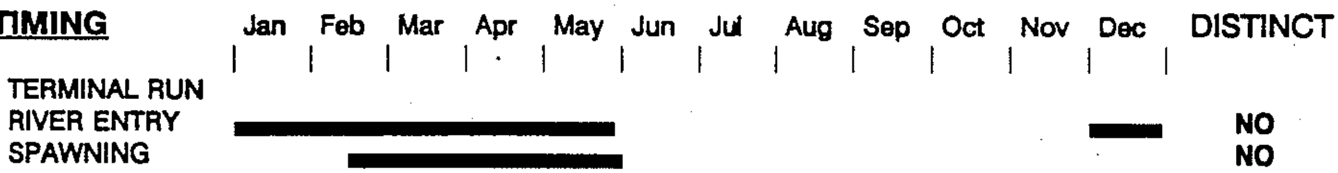
Harvest Management -- Treaty commercial net fisheries directed at steelhead occur from December through January in marine areas of north Hood Canal (Area 9A) and occasionally in the river, a limited tribal hook-and-line fishery occurs from early December through early April, and incidental harvest of wild winter steelhead may occur in some years. The non-treaty sport fishery is directed at hatchery winter

STOCK DEFINITION PROFILE for Tahuya Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING



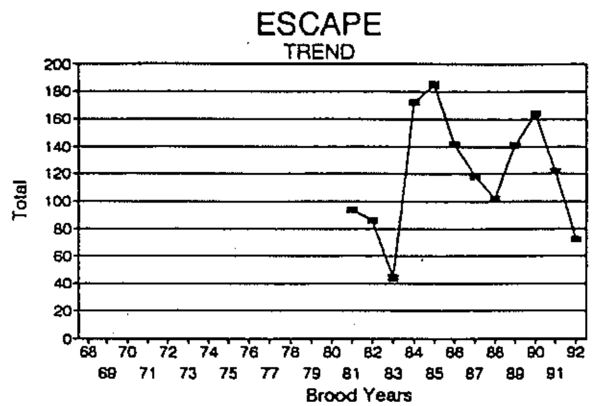
BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Tahuya Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY------> Good

Brood Years	ESCAPE Total			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81	94			
82	86			
83	44			
84	172			
85	185			
86	142			
87	119			
88	102			
89	141			
90	164			
91	122			
92	73			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Chronically Low

steelhead from December through February, but some harvest of wild winter steelhead may occur. The sport fishery has been managed with wild steelhead release regulations in the Tahuya River since 1987 and in all marine areas since 1993, but some hook-and-release mortality of wild winter steelhead may occur.

Hatchery -- While hatchery winter steelhead smolts have been planted in this and nearby streams, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

HOOD CANAL -- UNION WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Union River have been classified as a distinct stock based on the geographic isolation of the spawning population.

There is no information regarding the genetic composition of the stock.

Run timing (December through May) and spawn timing (mid-February to early June) are similar to those of some other wild winter steelhead stocks in Hood Canal.

STOCK STATUS

The status of the stock is Unknown. This stock is comprised of a historically small number of winter steelhead, but there is insufficient information to classify its status as either Healthy, Depressed, or Critical.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified.

Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 2, 6, 2, 6, and 2 wild winter steelhead were harvested in the sport fishery during the 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 winter steelhead seasons, respectively. Sport harvest data for wild winter steelhead are available over the majority of the run (because the sport steelhead season is open through March 31), but sport harvest is too low to be used to assess the status of the stock.

More information needs to be collected on this stock so that stock status can be determined. As a small stock, it could be especially vulnerable to any negative impacts.

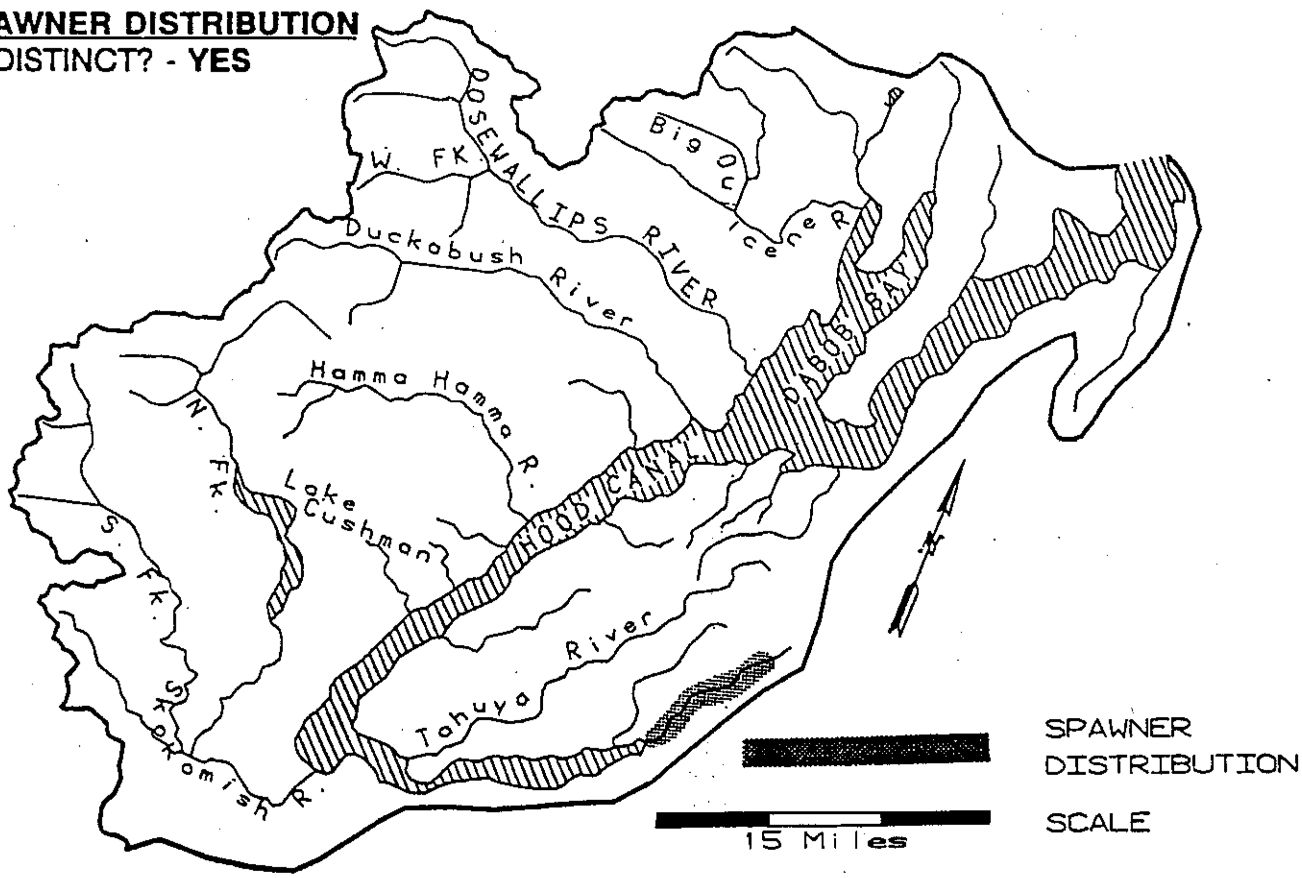
FACTORS AFFECTING PRODUCTION

Habitat -- Freshwater habitat has been impacted by land-use (forest management, water withdrawal) activities in the Union River, although quantitative data are unavailable.

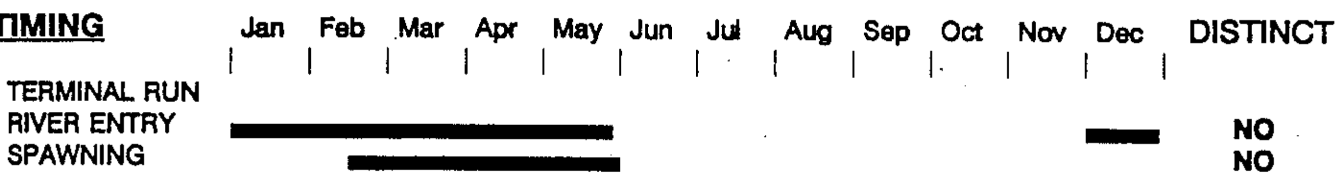
Harvest Management -- Treaty commercial net fisheries directed at steelhead occur from December through January in marine areas of north Hood Canal (Area 9A) and occasionally in the river from December through February or the first week in March. A limited tribal hook-and-line subsistence fishery occurs from early December through

STOCK DEFINITION PROFILE for Union Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Union Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY-----> No Data

Brood Years	NO DATA			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

early April. Incidental harvest of wild winter steelhead may occur in these treaty fisheries in some years. The sport fishery has closed on March 31, and sport harvest of wild winter steelhead has been low. Beginning with the 1994-95 season, the sport fishery closes on February 28 and wild steelhead release regulations are in effect to protect wild steelhead from sport harvest.

Hatchery -- While hatchery winter steelhead smolts have been stocked in this and nearby streams, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

HOOD CANAL -- SKOKOMISH WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Skokomish and South Fork Skokomish rivers and their tributaries have been classified as a distinct stock based on the geographic isolation of the spawning population.

There is no information regarding the genetic composition of the stock.

Similar to other wild winter steelhead stocks in the Hood Canal area, run timing is generally from December through May and spawn timing is generally from mid-February to mid-June.

STOCK STATUS

The status of the stock has been classified as Depressed.

Spawner escapement ranged from 172 to 1,444 wild winter steelhead from 1982 through 1992. In most years surveyed, this is lower than potential steelhead production based on available habitat. For example, using the WDFW methodology (Gibbons et al. 1985) a maximum sustained harvest (MSH) escapement objective for this stock would be 1,400 wild winter steelhead. This escapement objective and the method used to derive it have not been jointly agreed to by the WDFW and the treaty tribes.

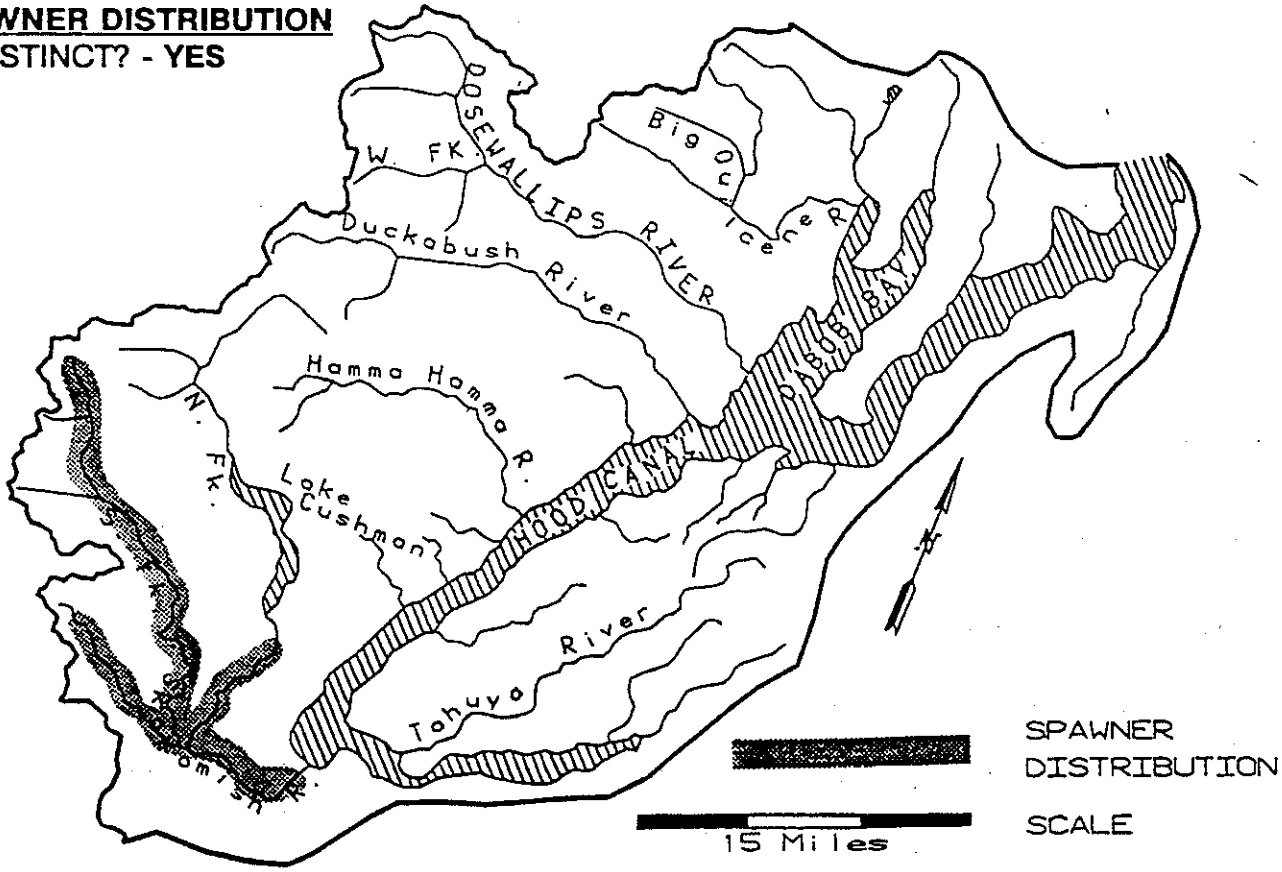
Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 15, 13, 2, 2, and 2 wild winter steelhead were harvested in the sport fishery during the 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 winter steelhead seasons, respectively. Sport harvest information of wild winter steelhead is available for only the early portion of the run (because the sport steelhead season closes on February 28) and cannot be used to assess the status of the wild stock. Recent low sport harvests are partly a result of regulation changes made in 1987 to limit the take of wild steelhead.

FACTORS AFFECTING PRODUCTION

Habitat -- Freshwater habitat has been impacted by land-use (forest management) activities in the Skokomish River, although quantitative data are unavailable. The upper watershed has been extensively logged. Cushman Dam blocks access to habitat in the upper North Fork Skokomish.

STOCK DEFINITION PROFILE for Skokomish Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													
RIVER ENTRY	■	■	■	■	■							■	**NO**
SPAWNING		■	■	■	■	■							**NO**

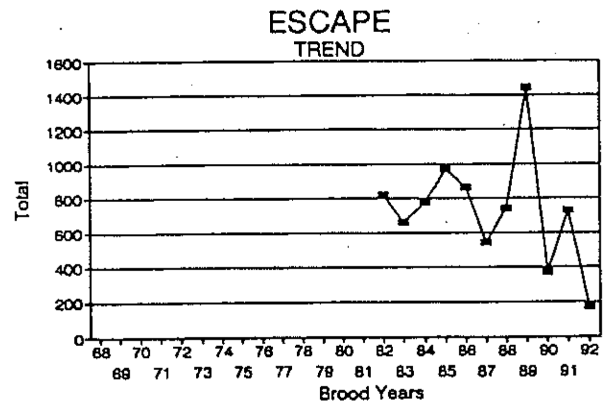
BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Skokomish Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY------> Good

Brood Years	ESCAPE Total			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82	822			
83	659			
84	777			
85	968			
86	866			
87	546			
88	742			
89	1444			
90	370			
91	729			
92	172			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Chronically Low

A short-term decline in abundance may additionally be due, in part, to changes in ocean survival of steelhead which has occurred over widespread areas in Washington, Oregon, and British Columbia (Cooper and Johnson 1992).

Marine mammal predation on migrating wild steelhead smolts and returning wild adults may also be partly responsible for the recent decline in stock status.

Harvest Management -- Treaty commercial net fisheries directed at steelhead occur from December through January in marine areas of north Hood Canal (Area 9A) and occur occasionally in the river from December through February or the first week in March. A limited tribal hook-and-line subsistence fishery occurs from early December through early April. Incidental harvest of wild winter steelhead in these treaty fisheries may occur in some years. The non-treaty sport fishery is directed at hatchery winter steelhead from December through February, but some harvest of wild winter steelhead may occur. The sport fishery has been managed with wild steelhead release regulations in the Skokomish River since 1987 and in all marine areas since 1993, but some hook-and-release mortality of wild winter steelhead may occur.

Hatchery -- While hatchery winter steelhead smolts have been stocked in this and nearby streams, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

HOOD CANAL -- HAMMA HAMMA WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Hamma Hamma River are native and have been classified as a distinct stock based on the geographic isolation of the spawning population. There is no information regarding the genetic composition of the stock.

Run timing (December through May) and spawn timing (mid-February to early June) are similar to those of some other wild winter steelhead stocks in Hood Canal.

STOCK STATUS

The status of the stock is Unknown. This stock is comprised of a historically small number of winter steelhead, but there is insufficient information to classify its status as either Healthy, Depressed, or Critical.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified.

Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 44, 11, 8, 4, 0, and 0 wild winter steelhead were harvested in the sport fishery during the 1986-87, 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 winter steelhead seasons, respectively. Information on sport harvest of wild winter steelhead is available for only the early portion of the run (because the sport steelhead season closes on February 28) and cannot be used to assess the status of the wild stock.

More information needs to be collected on this stock so that stock status can be determined. As a small stock, it could be especially vulnerable to any negative impacts.

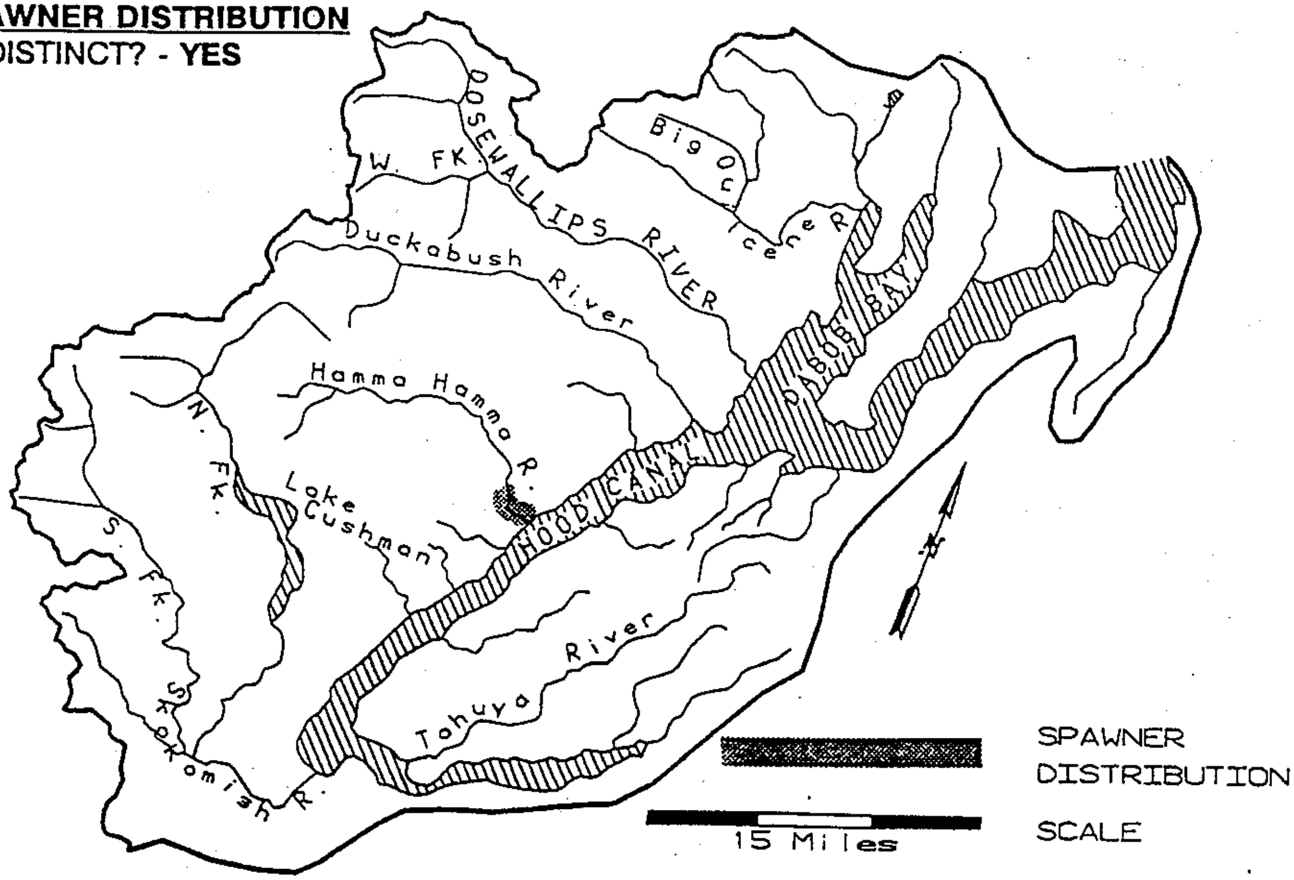
FACTORS AFFECTING PRODUCTION

Habitat -- The Hamma Hamma River has a very limited anadromous rearing and spawning area (approximately 2 miles) and portions of the watershed have been extensively logged. Marine mammal predation on migrating wild steelhead smolts and returning wild adults may also affect production.

Harvest Management -- Treaty commercial net fisheries directed at steelhead occur from December through January in marine areas of north Hood Canal (Area 9A) and occur occasionally in the river from January through February or the first week in March. A limited tribal hook-and-line subsistence fishery occurs from early December through early April. Incidental harvest of wild winter steelhead in these treaty fisheries

STOCK DEFINITION PROFILE for Hamma Hamma Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													
RIVER ENTRY													NO
SPAWNING													NO

BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Hamma Hamma Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY------> No Data

Brood Years	NO DATA			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

may occur in some years. The non-treaty sport fishery is directed at hatchery winter steelhead from December through February, but some harvest of wild winter steelhead may occur. Beginning with the 1994-95 season, wild steelhead release regulations are in effect to protect the wild stock from sport harvest.

Hatchery -- No hatchery steelhead smolts have been stocked in the Hamma Hamma River. Hatchery steelhead smolts have been stocked in nearby streams and some straying of hatchery steelhead adults may occur, but the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

HOOD CANAL -- DUCKABUSH WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Duckabush River have been classified as a distinct stock based on the geographic isolation of the spawning population. Winter steelhead are distinct from summer steelhead in the Duckabush River based on run timing. Run timing (December through May) and spawn timing (mid-February to early June) are similar to those of some other wild winter steelhead stocks in Hood Canal. There is no information regarding the genetic composition of the stock.

STOCK STATUS

The status of the stock has been designated as Depressed based on sport harvest of wild winter steelhead. The harvest is exhibiting a short-term severe decline.

Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 42, 30, 30, 10, and 22 wild winter steelhead were harvested in the sport fishery during the 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 winter steelhead seasons, respectively. Sport harvest information for wild winter steelhead is available over the majority of the run because the sport steelhead season has been open through March 31. As a result, sport harvest can be used to rate the status of the wild stock as Depressed.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified.

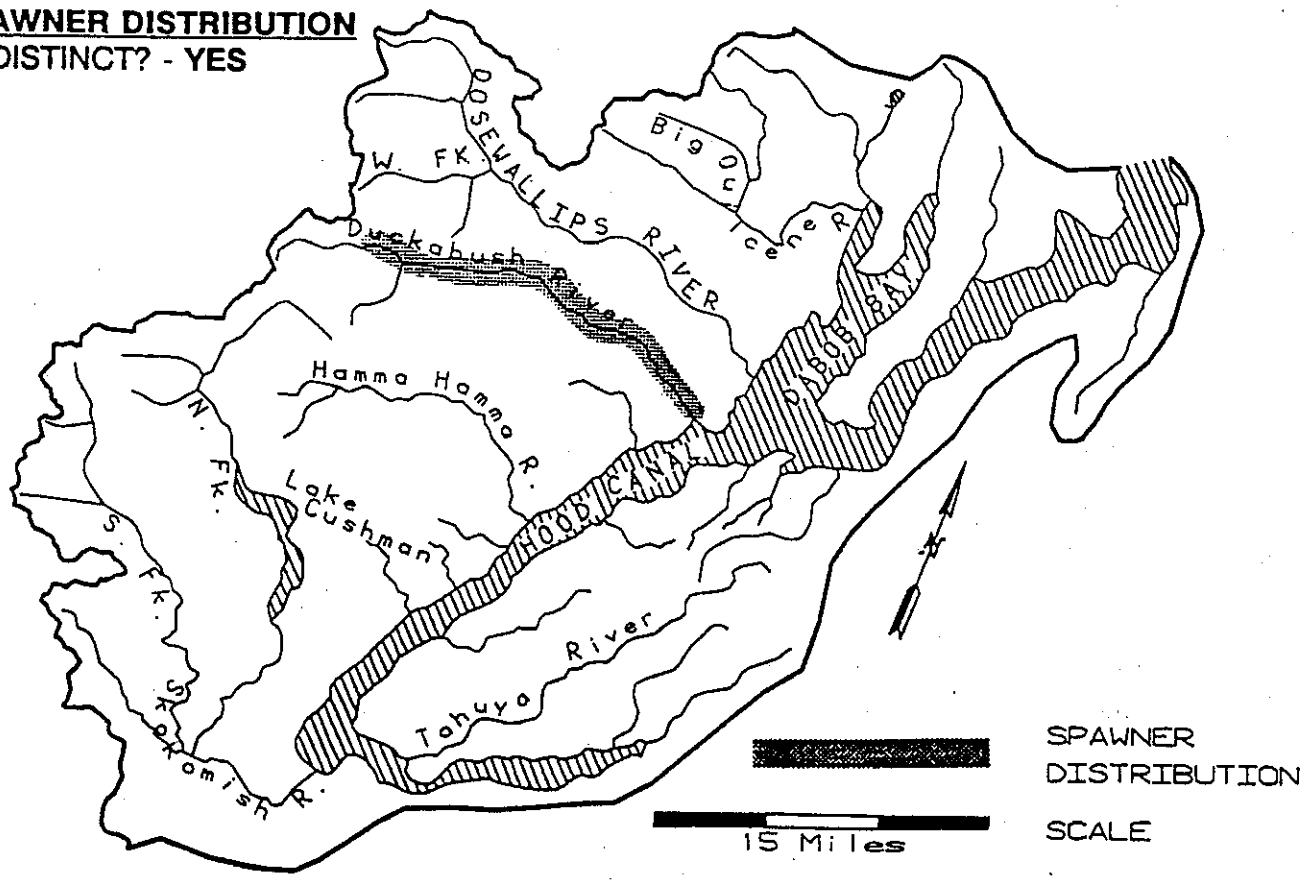
FACTORS AFFECTING PRODUCTION

Habitat -- Freshwater habitat has been impacted by land-use (forest management) activities in the Duckabush River, although quantitative data are unavailable. A short-term decline in abundance may additionally be due, in part, to changes in ocean survival of steelhead which has occurred over widespread areas in Washington, Oregon, and British Columbia (Cooper and Johnson 1992). Marine mammal predation on migrating wild steelhead smolts and returning wild adults may be partly responsible for the recent decline in the stock.

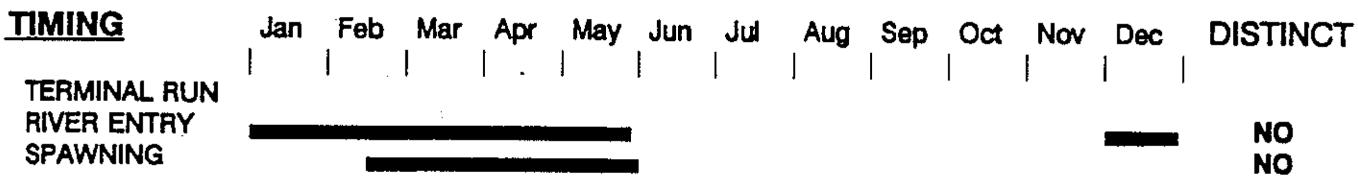
Harvest Management -- Treaty commercial net fisheries directed at steelhead occur from December through January in marine areas of north Hood Canal (Area 9A) and occur occasionally in the river from December through February or the first week in March. A limited tribal hook-and-line subsistence fishery occurs from early December through early April. Incidental harvest of wild winter steelhead in these treaty fisheries may occur in some years. The non-treaty sport fishery is directed at hatchery winter

STOCK DEFINITION PROFILE for Duckabush Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - YES



TIMING



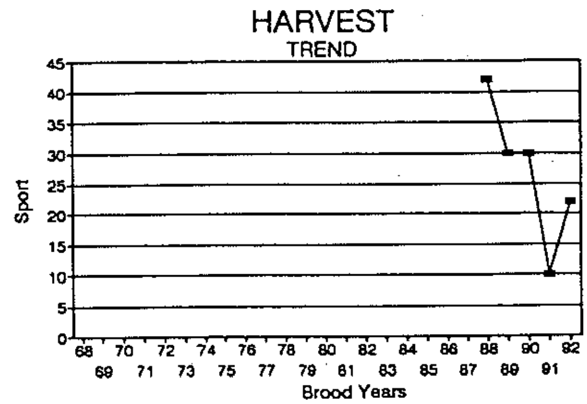
BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Duckabush Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY------> Fair

Brood Years	HARVEST Sport			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88	42			
89	30			
90	30			
91	10			
92	22			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Unresolved

PRODUCTION TYPE

Unresolved

STOCK DISTINCTION

Spawning Distribution

STOCK STATUS

Depressed

SCREENING CRITERIA

Short-Term Severe Decline

steelhead from December through February, but some harvest of wild winter steelhead may occur. The sport fishery has been open through the end of March. Beginning with the 1994-95 season, the sport fishery closes on February 28 and wild steelhead release regulations are in effect.

Hatchery -- While hatchery winter steelhead smolts have been stocked in this and nearby streams, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

HOOD CANAL -- DOSEWALLIPS WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Dosewallips River have been classified as a distinct stock based on the geographic isolation of the spawning population. Winter steelhead are distinct from summer steelhead in the Dosewallips River based on run timing. Run timing (December through May) and spawn timing (mid-February to early June) are similar to those of some other wild winter steelhead stocks in Hood Canal. There is no information regarding the genetic composition of the stock.

STOCK STATUS

The status of the stock is designated as Depressed based on sport harvest of wild winter steelhead. The harvest is exhibiting a short-term decline.

Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 41, 10, 14, 8, and 2 wild winter steelhead were harvested in the sport fishery during the 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 winter steelhead seasons, respectively. Sport harvest information for wild winter steelhead is available over the majority of the run because the sport steelhead season has been open through March 31. As a result, sport harvest can be used to rate the status of the wild stock as Depressed.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified.

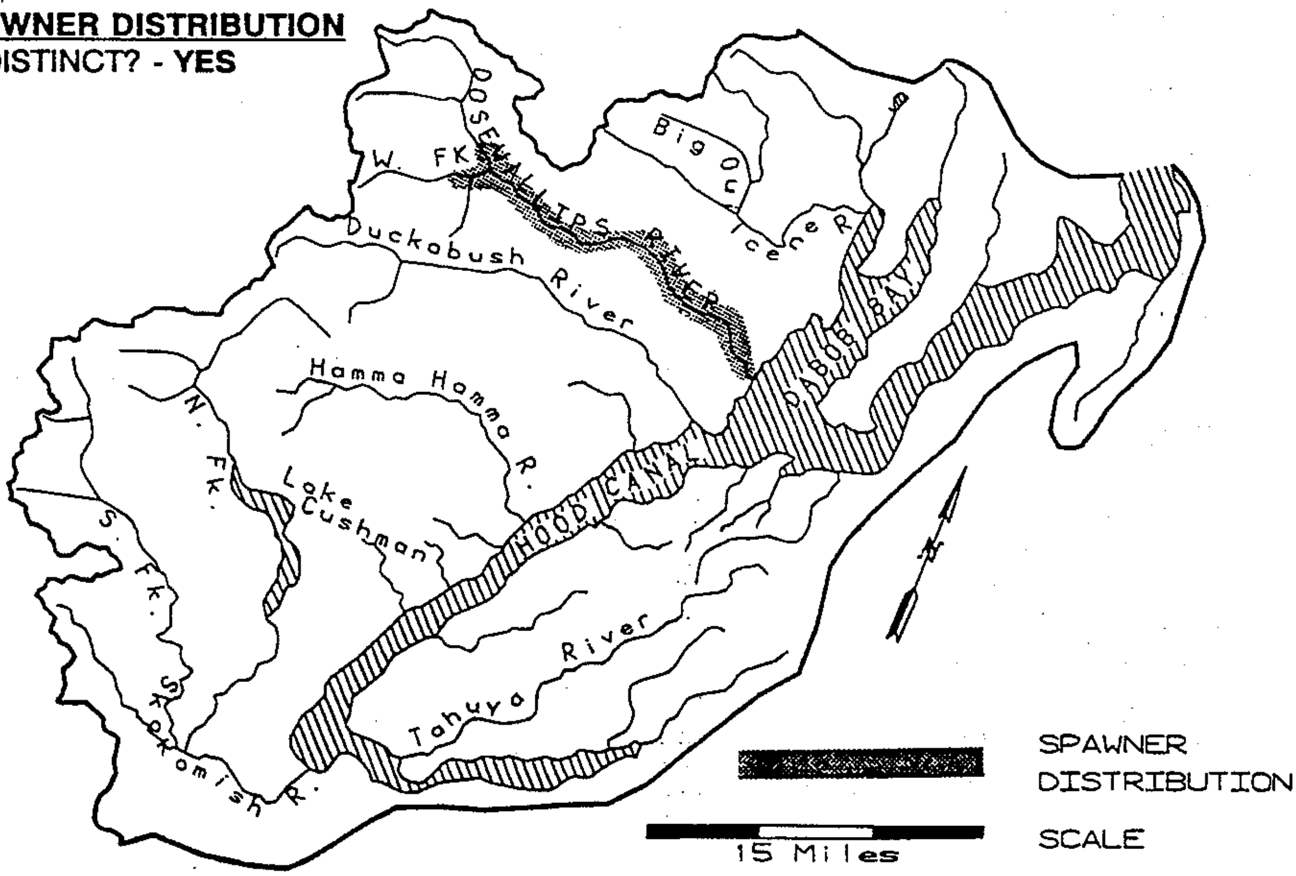
FACTORS AFFECTING PRODUCTION

Habitat -- Freshwater habitat has been impacted by land-use (forest management) activities in the Dosewallips River, although quantitative data are unavailable. A short-term decline in abundance may additionally be due, in part, to changes in ocean survival of steelhead which have occurred over widespread areas in Washington, Oregon, and British Columbia (Cooper and Johnson 1992). Marine mammal predation on migrating wild steelhead smolts and returning wild adults may be partly responsible for the recent decline in the stock.

Harvest Management -- Treaty commercial net fisheries directed at steelhead occur from December through January in marine areas of north Hood Canal (Area 9A) and occur occasionally in the river from December through February or the first week in March. A limited tribal hook-and-line subsistence fishery occurs from early December through early April. Incidental harvest of wild winter steelhead in these treaty fisheries may occur in some years. The non-treaty sport fishery is directed at hatchery winter

STOCK DEFINITION PROFILE for Dosewallips Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													
RIVER ENTRY													**NO**
SPAWNING													**NO**

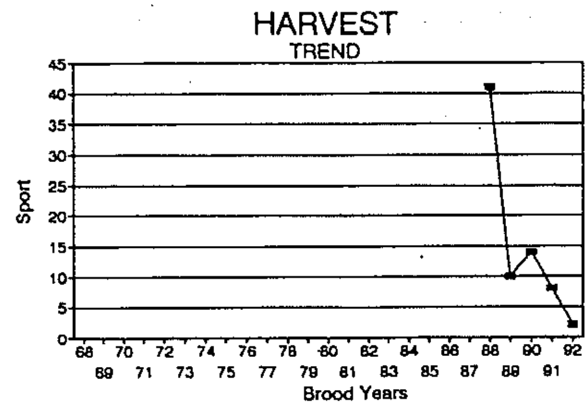
BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Dosewallips Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY------> Fair

Brood Years	HARVEST Sport			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88	41			
89	10			
90	14			
91	8			
92	2			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Short-Term Severe Decline

steelhead from December through February, but some harvest of wild winter steelhead may occur. The sport fishery has been open through the end of March. Beginning with the 1994-95 season, the sport fishery closes on February 28 and wild steelhead release regulations are in effect.

Hatchery -- While hatchery winter steelhead smolts have been stocked, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

HOOD CANAL -- QUILCENE / DABOB BAYS WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead have been classified as a distinct stock based on the geographic isolation of the spawning population in the Quilcene/Dabob Bay tributaries, including Big Quilcene River, Little Quilcene River, and Tarboo Creek. Run timing (December through May) and spawn timing (mid-February to early June) are similar to those of some other wild winter steelhead stocks in Hood Canal.

There is no information regarding the genetic composition of the stock.

STOCK STATUS

The status of the stock is Unknown. This stock is comprised of a historically small number of winter steelhead, but there is insufficient information to classify its status as either Healthy, Depressed, or Critical.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified.

Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 11, 2, 4, 10, 2, and 0 wild winter steelhead were harvested in the sport fishery during the 1986-87, 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 winter steelhead seasons, respectively. Sport harvest information for wild winter steelhead has been available over the majority of the run (because the sport steelhead season has been open through March 31), but sport harvest is too low to be used to assess the status of the stock.

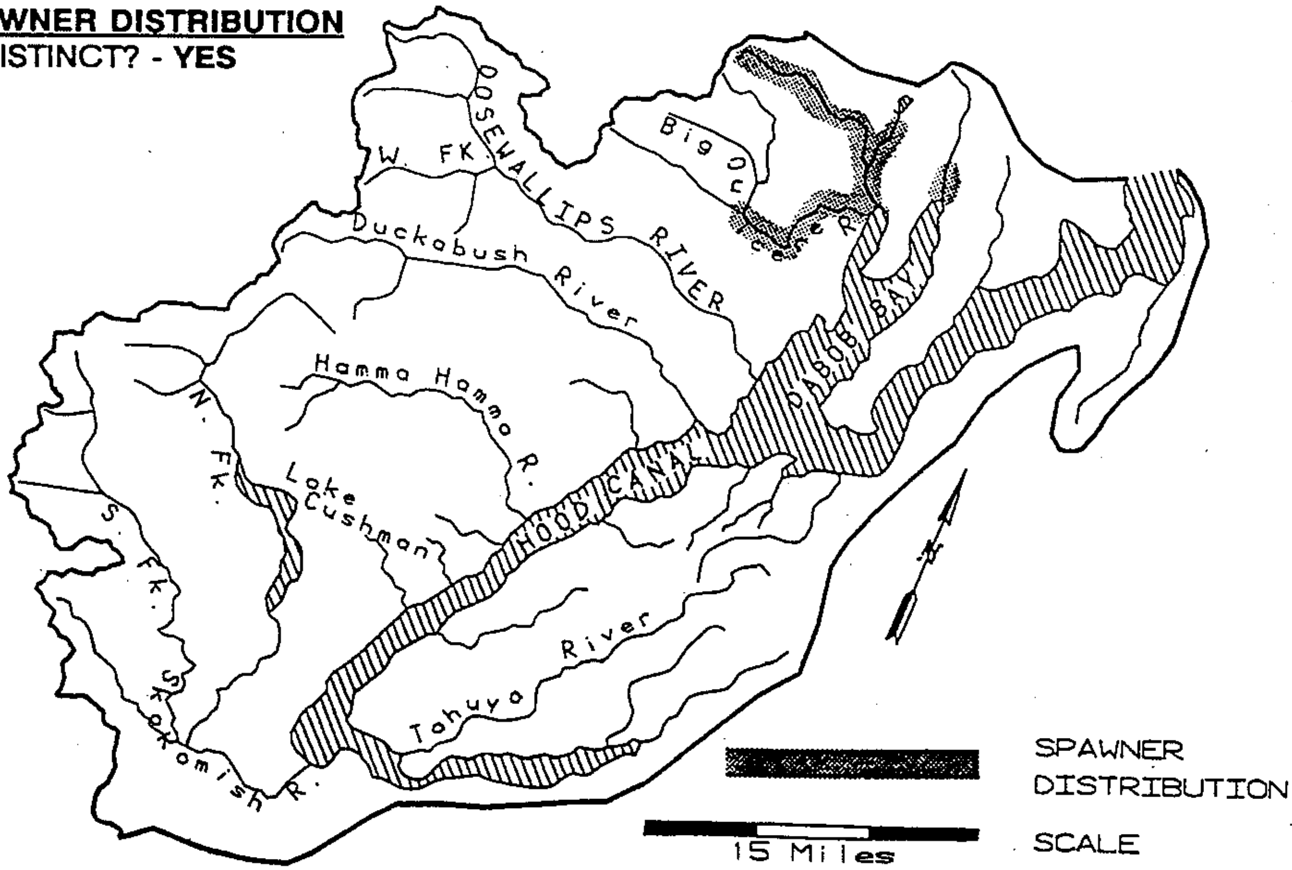
FACTORS AFFECTING PRODUCTION

Habitat -- Water withdrawal limits the production of juvenile steelhead especially during summer and fall low-flow periods. The Big Quilcene River also has very limited anadromous fish rearing and spawning area (approximately 4 miles). The dam at the mouth of Tunnel Creek, a Big Quilcene tributary, may also reduce the normal amount of natural gravel recruitment from Tunnel Creek to the lower watershed. Marine mammal predation on migrating wild steelhead smolts and returning wild adults may be partly responsible for the recent decline in the stock. As noted in the Stock Report for Hood Canal summer chum salmon, gravel aggradation and shifting of the stream channel are problems near the mouth of the Quilcene River.

STOCK DEFINITION PROFILE for Quilcene/Dabob Bays Winter Steelhead

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													
RIVER ENTRY	▬	▬	▬	▬	▬							▬	**NO**
SPAWNING		▬	▬	▬	▬								**NO**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Quilcene/Dabob Bays Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY------> No Data

Brood Years	NO DATA			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

Harvest Management -- Treaty commercial net fisheries directed at steelhead occur from December through January in marine areas of north Hood Canal (Area 9A) and occur occasionally in the river from December through February or the first week in March. A limited tribal hook-and-line subsistence fishery occurs from early December through early April. Incidental harvest of wild winter steelhead in these treaty fisheries may occur in some years. The non-treaty sport fishery is directed at hatchery winter steelhead from December through February, but some harvest of wild winter steelhead may occur. The sport fishery has been open through the end of March. Beginning with the 1994-95 season, the sport fishery closes on February 28 and wild steelhead release regulations are in effect.

Hatchery -- While hatchery winter steelhead smolts have been stocked in these and nearby streams, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

OVERVIEW -- STRAIT OF JUAN DE FUCA CHINOOK STOCKS

DUNGENESS SPRING / SUMMER
ELWHA / MORSE CREEK SUMMER/FALL
HOKO FALL

STOCK DEFINITION AND ORIGIN

Chinook salmon populations in the Dungeness, Elwha, Hoko rivers, and other streams in the western Strait of Juan de Fuca are spring, summer or fall runs. River entry begins in June and continues through early October in the Elwha River. The Hoko River run is somewhat later; river entry begins in mid-September and continues through October. River entry timing is unknown in the Dungeness. Spawning in the Dungeness and Elwha begins in mid-August and continues through mid-October in the Dungeness and throughout October in the Elwha. In the Hoko River spawning occurs from late September through mid-November.

Elwha River chinook, which are supported by hatchery programs, have been limited to spawning in the lower 4.5 miles of the river since the construction of Lower Elwha Dam in 1914. Chinook spawn in the Dungeness River mainstem, from RM 0.0 to RM 19.0, and in the lower five miles of the Gray Wolf River. Natural spawning occurs primarily in the lower ten miles of the Hoko River, but chinook also utilize the mainstem up to RM 20.5 and Brownes Creek. During recent years minor spawning has also been observed in the Little Hoko River and in Herman Creek. Spawning in other Strait streams has not been consistently documented in recent years, though small numbers of chinook are sometimes seen in the Sekiu, Pysht and Lyre rivers and in Morse Creek.

Genetic stock identification of Strait chinook stocks has been limited to samples collected from the Elwha River. These enzyme electrophoresis studies suggest that the Elwha stock, at least, is distinguishable from other Puget Sound stocks and from adjacent stocks on the Washington coast and the west coast of Vancouver Island. For this reason, the Elwha River chinook stock is believed to be primarily of native origin. However, non-native stocks were introduced into the Dungeness and Elwha rivers in the 1970s. The influence of these plants on the genetic integrity of these native stocks is unknown. Samples of Dungeness chinook will be obtained for genetic stock identification from a current brood stock collection program.

The genetic composition of the Hoko River stock has not been studied, but collections of Hoko chinook have been initiated recently. Several non-native stocks were introduced into the system from the 1950s into the mid-1970s. The existence of unique wild chinook stocks in other stream systems in the western Strait is in question. Comprehensive escapement surveys documenting returns to the Lyre, Pysht, Clallam, Sekiu, and Sail rivers have not been done in recent years. The few chinook that are observed in these streams may be strays from the Hoko and Elwha stocks.

STOCK STATUS

Recoveries of coded-wire tagged chinook released from the Lower Elwha Hatchery, Elwha Channel, and the Hoko River Hatchery indicate that these stocks are far-north migrating and are caught primarily in the West Vancouver Island (38 percent to 56 percent) and Alaskan (14 percent to 20 percent) troll fisheries and in recreational and commercial fisheries in Puget Sound (24 percent to 27 percent). Less than 1 percent of the coded-wire tag recoveries have occurred in Washington coastal troll and recreational fisheries. At present, recreational and commercial chinook harvest in terminal and freshwater areas in the Strait is not allowed, with the exception of a treaty Indian commercial fishery conducted occasionally in the Elwha River and a recreational fishery in Dungeness Bay (chinook must be released).

The Dungeness River chinook stock has been classified as Critical, because escapement has declined to an annual average of 200 spawners in recent years. Degraded spawning and rearing habitat, extensive river water withdrawals during low water flows leading to passage problems, reduced spawning habitat, and suspected overfishing are probable contributors to the decline in the Dungeness system. A rebuilding program for Dungeness River chinook was initiated in 1992. The program has been designed and implemented by state, tribal, and federal agencies, as well as private citizens. Captive brood stock techniques will be utilized to rear collected chinook fry to spawning adults and their progeny will be released into the Dungeness River. Habitat improvement projects will be implemented concurrently with the captive brood stock program. The rebuilding program is intended to operate for eight to twelve years, including the evaluation period.

The number of chinook spawning naturally in the limited habitat below the Elwha Dam has been relatively stable in recent years, though the hatchery programs may produce most of the returning adults. Returns to the Elwha are managed to achieve hatchery production goals. Classification of this stock as Healthy should not obscure the potential for much higher chinook production in the Elwha system, should spawner access to the upstream habitat be restored.

Chinook production in the Hoko River has been supplemented by the annual release of 100,000 to 250,000 hatchery smolts raised from Hoko brood stock, and appears to be stable at the current low numbers. Low escapements in the last five years have led managers to classify this stock as Depressed. A limited number of recent surveys of the Sekiu River have documented that a few chinook continue to spawn in that system. Wild chinook escapement and production are not currently assessed in other streams in the Strait region and are thought to be virtually non-existent.

Escapement goals for chinook stocks originating in the Strait of Juan de Fuca are as follows: Dungeness, 850 spawners; Hoko, 850; and Elwha 2,400 hatchery spawners and 500 natural spawners (Ames and Phinney 1977.).

STRAIT OF JUAN DE FUCA CHINOOK ESCAPEMENTS

Return Year	Dungeness River Natural *	Elwha River Natural & Hatchery	Hoko, Sekiu Rivers Natural & Hatchery
1980		1,664	
1981		849	
1982		2,661	
1983		1,771	
1984		2,197	
1985		1,820	
1986	238	3,127	847
1987	100	5,893	581
1988	335	7,873	784
1989	88	5,488	845
1990	310	3,180	493
1991	163	3,469	1,008

* Spring chinook were passed above the hatchery weir until its removal in 1982. However, counts of these fish are too sporadic and inconsistent to be included as escapement estimates.

Information on individual chinook salmon stocks is presented in the Stock Reports which follow.

STRAIT OF JUAN DE FUCA -- DUNGENESS SPRING / SUMMER CHINOOK

STOCK DEFINITION AND ORIGIN

Dungeness spring/summer chinook salmon have been classified as distinct based upon their geographic distribution and spawn timing. Spawning begins in August and continues until mid-October. Genetic composition analysis of the stock is currently unavailable. Biological samples will be collected over the next four brood years to develop baseline genetic information on the stock.

Stock origin is believed to be native. However, since 1965, there have been five releases of non-native chinook in the Dungeness River. These releases were: 1) 811,680 Green River fingerlings in 1966; 2) 416,892 Issaquah Creek fall chinook releases in 1967; 3) 128,500 Hood Canal fall chinook releases in 1969; 4) 629,694 Minter Creek fingerlings in 1970; 5) 167,207 Hood Canal yearlings in 1972. What influence these stockings may have had on the genetic composition of the native chinook stock is unknown.

STOCK STATUS

Stock status has been designated as Critical based upon depressed escapement estimates from 1986 through 1991. These escapement estimates were derived from redd counts during foot surveys and are considered to be fairly accurate and good measures of relative abundance for those years. The range of escapement has been from 88-335 with an average of 200 per year. WDFW and tribal biologists have determined that the Dungeness River system has sufficient habitat to support over 900 adult spawners per year. Therefore, the average of 200 spawners per year represents chronically low production.

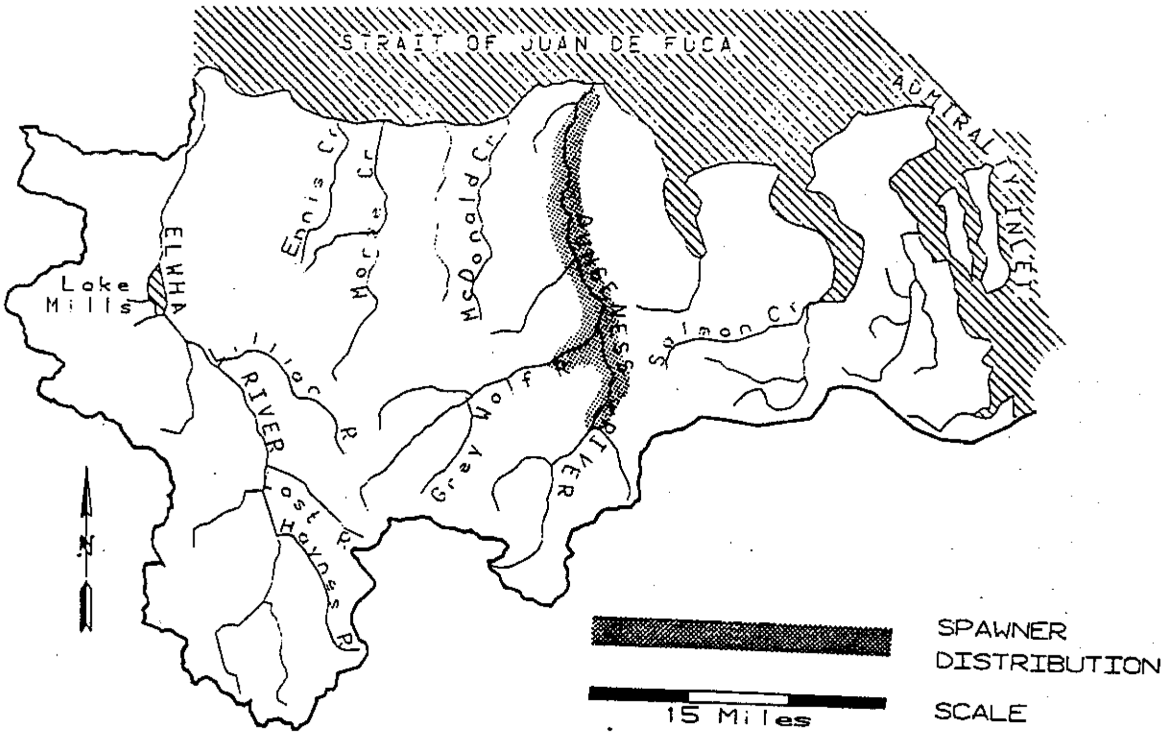
The low levels of escapement have resulted in the formation of a cooperative Dungeness chinook rebuilding group, including representatives from the Tribes, WDFW, U.S. Fish and Wildlife Service, National Marine Fisheries Service and the private sector. Stock rehabilitation activities were initiated in 1992.

FACTORS AFFECTING PRODUCTION

Habitat -- Dungeness chinook spawn from the mouth to river mile 18.9 in the mainstem and in the lower 5.1 miles of the Gray Wolf River, a main tributary of the Dungeness River. The initiation of spawning in the upper river (RM 13.8 to 18.7) is two weeks earlier than the start of spawning in the lower river (RM 3.0 to 6.0). The date of peak spawning in the upper river and the date of first appearance historically observed at

STOCK DEFINITION PROFILE for Dungeness Spring/Summer Chinook

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**UNK**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **UNKNOWN**

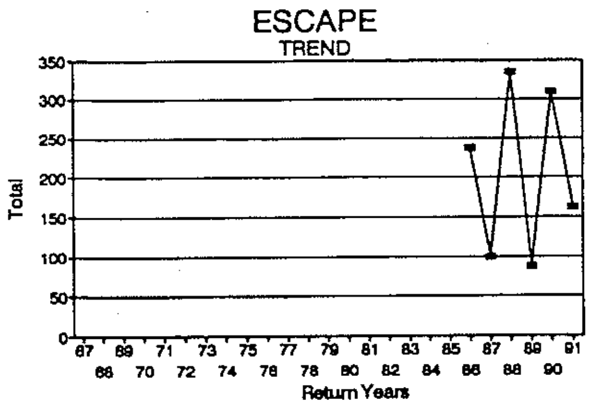
GENETICS - No data available.

STOCK STATUS PROFILE for Dungeness Spring/Summer Chinook

STOCK ASSESSMENT

DATA QUALITY-----> Excellent

Return Years	ESCAPE Total			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86	238			
87	100			
88	335			
89	88			
90	310			
91	163			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Native

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution, Timing

STOCK STATUS

Critical

SCREENING CRITERIA

Chronically Low

the hatchery rack suggests that chinook salmon hold in the river below the hatchery until just prior to spawning, then move into the upper river to spawn. This movement may be triggered by the normal pattern of declining flows in the Dungeness River in August.

The Dungeness watershed is located in a rain shadow, and receives little annual precipitation (less than 20 inches per year). A significant portion of the water flow in the Dungeness River is provided by melting snow from the surrounding mountains, which varies from year to year. As a result, the amount of water available for fish production is somewhat limited compared to neighboring watersheds.

In general, chinook salmon production in the Dungeness River has been affected by human activities, including removal of riparian vegetation for urban and agricultural development, forest practices in the upper watershed, flood control, water withdrawals for irrigation, pollution of the river and estuary by urban and agricultural run-off and possibly by overfishing.

Five irrigation withdrawals occur between river miles 6.8 and 11.0 and remove as much as 60 percent of the natural flow during the critical low-flow period (August through October), which coincides with chinook salmon spawning in the river. Erosion resulting from agriculture, urban development and forest practices has caused extensive gravel aggradation and channel braiding in the river. These factors reduce the water depth, increase water temperature and velocity, and destabilize the river bedload. In addition, fine sediments reduce the quality of spawning habitat by smothering incubating salmon eggs. Low water flows through braided channels create barriers to migrating adults, increase the water temperature to marginal levels and reduce the available spawning habitat. Flood control measures, such as dikes, confine the river during high water events, exacerbating bedload instability and subjecting rearing fish to extreme conditions. In combination, these production bottlenecks adversely impact fish production by impeding upstream and downstream migration of anadromous salmonids, reducing the quality and quantity of spawning and rearing habitat, and killing incubating eggs in the unstable bedload during high water flows.

Harvest Management -- Dungeness River chinook salmon are managed for natural escapement and production needs in terminal and extreme terminal areas. The current escapement goal for Dungeness chinook is 850. Given the observed low abundance of chinook spawners in the Dungeness River in recent years, all returning native chinook have been required for spawning.

Harvest of Dungeness chinook has historically occurred in preterminal, terminal, and extreme terminal areas by commercial, recreational, and tribal ceremonial and subsistence fishers. No directed commercial fisheries have occurred on Dungeness chinook in the terminal and extreme terminal areas. In recent years, mixed-stock preterminal fisheries in Puget Sound have been subject to closures and size restrictions to pass spawning adult spring chinook to their respective spawning areas.

Quantitative information is unavailable to determine stock distribution and harvest contribution rates.

Incidental harvests of Dungeness chinook salmon have also occurred in terminal commercial net fisheries in Dungeness Bay (Area 6D) targeting on coho salmon. From 1979 to 1992, these incidental chinook harvests in Area 6D have ranged from 0 to 74 per year, averaging 19 per year. State-tribal management recommendations for the terminal area have included conducting spawning surveys to document clearance of chinook salmon from anticipated fishing areas for coho salmon. Dungeness chinook are also caught in the terminal area in the Dungeness Bay sport fishery. This sport fishery is currently closed from April 16 to October 31 to protect returning chinook spawners.

From 1978 to 1988, the average sport catch in the Dungeness River was 34 chinook. Since tribal harvest statistics have been recorded there has been no tribal ceremonial and subsistence (C&S) chinook harvest in the Dungeness River. There has been no directed chinook fishery of any type in the extreme terminal area since 1988.

Hatchery -- This stock of spring/summer chinook has been periodically raised in captivity within the Dungeness basin and at other locations. Chinook salmon were raised at the Dungeness Hatchery from the early 1900s until 1981. A small rearing and release program utilizing chinook brood stock that originated from the Dungeness River is currently operating at the Hood Canal (Hoodsport) Hatchery.

Specific hatchery operation impacts on the native Dungeness chinook stock have not been quantified. A weir was operated in the river from 1938 until 1982 to capture chinook brood stock for the Dungeness Hatchery. The number of brood stock collected each year ranged from 5 in 1980 to 1,305 in 1959. The chinook program ended in 1983, when the Dungeness Hatchery was temporarily closed. There are insufficient data to determine what percentage of the total chinook escapement each year was captured for hatchery brood stock, though it would be reasonable to assume it was significant in certain years.

In addition, the Dungeness Hatchery produces coho yearlings for release into the Dungeness River and supports small cooperative projects in the immediate area. What impact large hatchery releases of coho salmon yearlings into the river have had on naturally rearing chinook salmon juveniles is unknown, though increased predation may be a significant factor.

A cooperative chinook salmon rebuilding project was initiated in the Dungeness River in 1992. A captive brood stock program at the Hurd Creek Hatchery, located on a tributary of the Dungeness River, was implemented to artificially increase fish numbers while factors limiting production are addressed, including habitat improvements. The intent is to provide short-term assistance through a genetic bottleneck that places the stock at risk of extinction.

Last ten years salmon releases into the Dungeness basin.

Release Year	Spring Chinook	Fall Chinook	Coho	Pink
1982	26,600	0	4,661,652	0
1983	0	0	0	0
1984	0	0	721,000	0
1985	0	0	669,100	0
1986	0	0	499,400	0
1987	0	0	1,400,200	0
1988	0	0	336,700	27,200
1989	0	1,981,000	815,206	0
1990	0	0	423,414	0
1991	0	0	361,829	0
MEAN			1,098,722	

STRAIT OF JUAN DE FUCA -- ELWHA / MORSE CREEK SUMMER / FALL CHINOOK

STOCK DEFINITION AND ORIGIN

Elwha/Morse Creek summer/fall chinook salmon were classified as distinct based upon their geographical distribution and run timing. River entry begins in early June, and spawning begins in late August and peaks in late September to early October. Genetic analysis has been done for the Elwha hatchery fall chinook samples collected in 1981 and 1988, and the resulting genetic profile is significantly different from that of all other Puget Sound chinook stocks.

Stock origin is native. Two hatcheries contribute to the production of this stock, the WDFW Elwha rearing channel and the Lower Elwha Tribal hatchery. The eggtake for the hatcheries is augmented by collections from the natural spawning population. Also, hatchery strays contribute to the naturally-spawning population. For these reasons, the hatchery and natural spawning populations are not distinct from each other.

STOCK STATUS

The stock status for Elwha/Morse Creek summer/fall chinook is Healthy, as escapement goals have been reached or exceeded since 1986. The stock status is based upon the combined escapement of hatchery and naturally spawning fish. The range of escapement has been 800 to 7,900 fish, with an average of 2,850 per year (1976 through 1991). There has been an increasing trend in escapement since 1986. However, the production from the 1992 brood year is expected to be exceptionally low due to high pre-spawning mortality resulting from a *Dermocystidium* infestation coupled with below-forecast returns. Also, the loss to viral hemorrhagic septicemia of Elwha-origin brood reared at the Soleduck Hatchery in 1989 severely diminished the number of hatchery fish released that year.

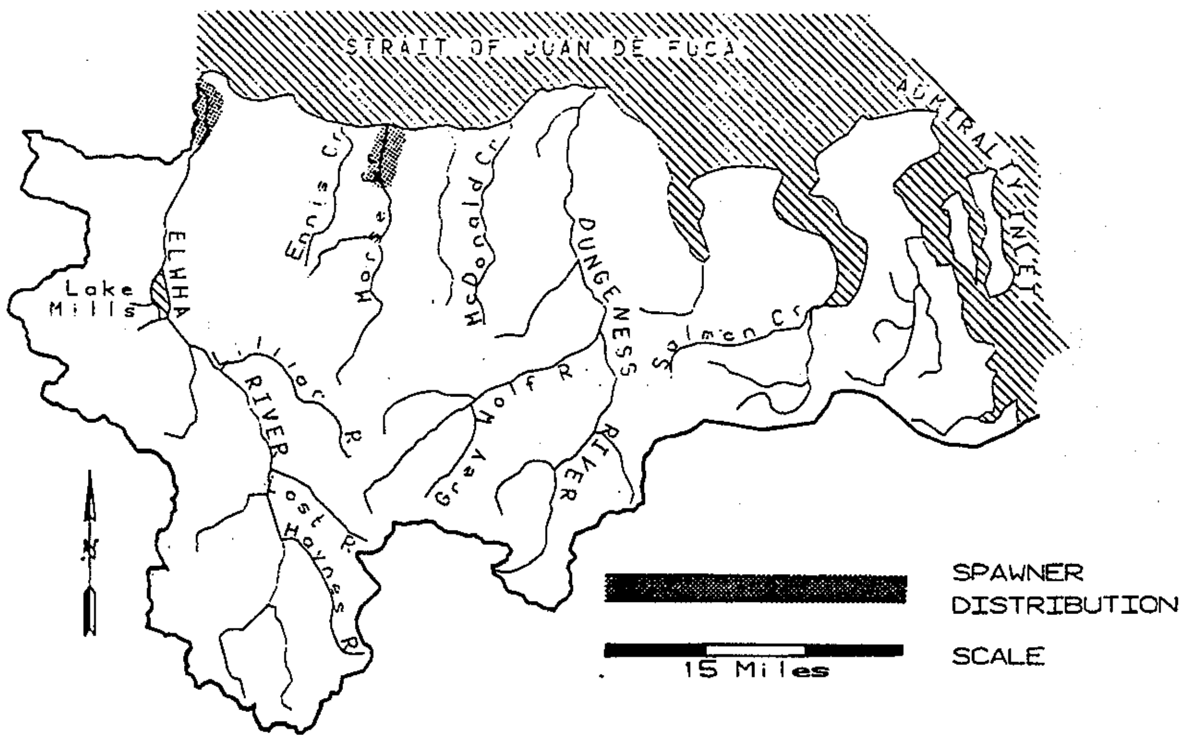
FACTORS AFFECTING PRODUCTION

Habitat -- Natural spawning of this stock is limited to the lower 4.9 miles of the river due to the presence of two impassible dams. What spawning habitat is available has been degraded by the loss of natural recruitment of gravel into the lower river due to the presence of the dams. This stock is exceptionally vulnerable to high pre-spawning mortality as the result of *Dermocystidium* outbreaks during drought conditions. These outbreaks are apparently tied to excessively high water temperatures (70+°F, documented by the Lower Elwha S'Klallam Tribe). Warm water is the result of thermal stratification in the reservoirs followed by spills from the warmer upper water layers. During drought years, prespawning mortality has been as high as 70 percent of the returning adults.

STOCK DEFINITION PROFILE for Elwha/Morse Creek Summer/Fall Chinook

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



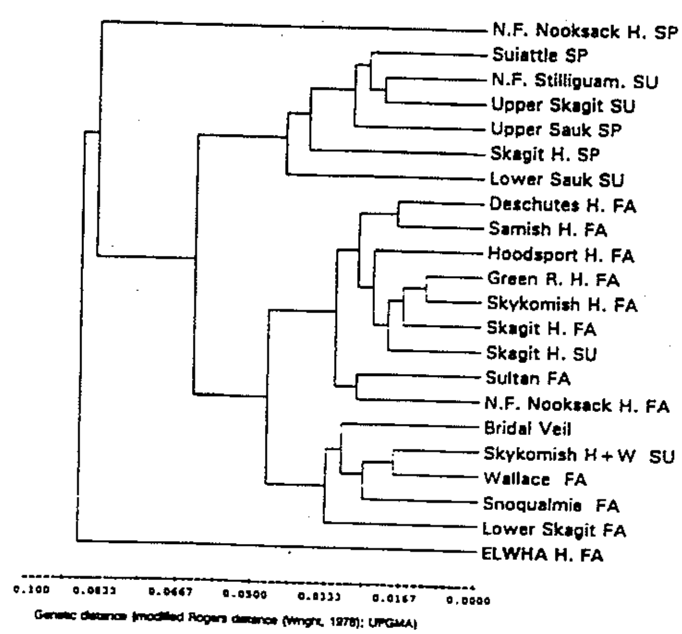
TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**UNK**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - **YES**

GENETICS - Samples of Elwha Hatchery chinook from 1981 and 1988 show them to be significantly different (**p**<0.05) in genetic characteristics from all other Puget Sound stocks examined.

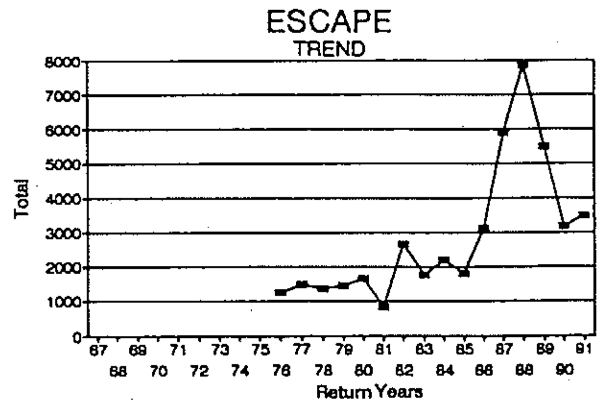


STOCK STATUS PROFILE for Elwha/Morse Creek Summer/Fall Chinook

STOCK ASSESSMENT

DATA QUALITY-----> Good

Return Years	ESCAPE Total			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76	1275			
77	1503			
78	1379			
79	1469			
80	1664			
81	849			
82	2661			
83	1771			
84	2197			
85	1820			
86	3127			
87	5893			
88	7873			
89	5487			
90	3180			
91	3469			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Composite

STOCK DISTINCTION
Distribution, Timing, Genetics

STOCK STATUS
Healthy

SCREENING CRITERIA

Harvest Management -- The Elwha River is primarily managed to meet the hatchery escapement goal of 2,400 fish and secondarily to meet a natural spawning escapement goal of 500 fish.

Harvest of Elwha chinook has historically occurred in preterminal recreational and commercial fisheries in Alaska, Canada, the Washington Coast, the Strait of Juan de Fuca and Puget Sound, as well as in terminal-area treaty commercial net fisheries in Freshwater Bay. Since 1988, a limited test fishery has been conducted in the river. Incidental in-river harvests of chinook also occur during the first weeks of the treaty coho net fishery.

Approximately 60 percent of the Elwha chinook run is harvested before it reaches the Strait of Juan de Fuca. An additional five percent is taken in the Strait and Puget Sound, primarily in the recreational fishery.

Hatchery -- The Elwha River chinook stock is a composite stock, being supported by both hatchery and natural production. Hatchery production of fingerling and yearling fish is high, with a targeted total release of nearly 4,000,000 fish combined from the state and tribal facilities.

Due to the nature of the facilities and the river, homing of returning adults back to the hatchery rack is limited, and the majority of the fish stray into the river. Therefore, natural spawners are annually gaffed from the river, and in most years comprise the majority of the brood stock. No attempt is made to differentiate between natural- and hatchery-origin fish during the gaffing operation.

With the exception of the limited imports of fish from the Green River, Issaquah and Hood Canal (Hoodsport) hatcheries during the late 1960s, all hatchery-reared chinook planted in the Elwha River have been of Elwha origin. Therefore, it is believed that the Elwha stock has maintained its unique genetic identity.

Last ten years salmon releases into the Elwha basin.

Release Year	Fall Chinook	Chum	Coho
1982	1,250,944	884,684	3,108,507
1983	3,735,409	233,000	602,080
1984	2,188,950	99,200	751,010
1985	2,732,735	622,400	890,314
1986	2,363,712	272,170	1,038,000
1987	2,265,871	0	880,100
1988	4,265,153	0	267,148
1989	4,094,690	0	415,557
1990	880,085	0	995,204
1991	2,622,153	0	892,185
MEAN	2,639,970	422,291	984,011

STRAIT OF JUAN DE FUCA -- HOKO FALL CHINOOK

STOCK DEFINITION AND ORIGIN

Hoko fall chinook salmon have been classified as distinct based upon their geographic distribution and spawn timing. Spawning begins in late September and extends through early November. Genetic composition analysis is not available.

Stock origin is native with primarily natural spawning. Recently, a brood stocking effort by the Makah Tribe has resulted in some hatchery assistance to augment this stock.

STOCK STATUS

Stock status is Depressed based upon escapement data from 1986 through 1991. The range of escapement is from 500 to 900 with an average of 700 per year. This level is below the natural escapement goal of 850 fish per year. There has been no trend in escapement levels during this time period. Escapement estimates are based upon redd counts and considered to be fairly accurate and good measures of relative abundance.

FACTORS AFFECTING PRODUCTION

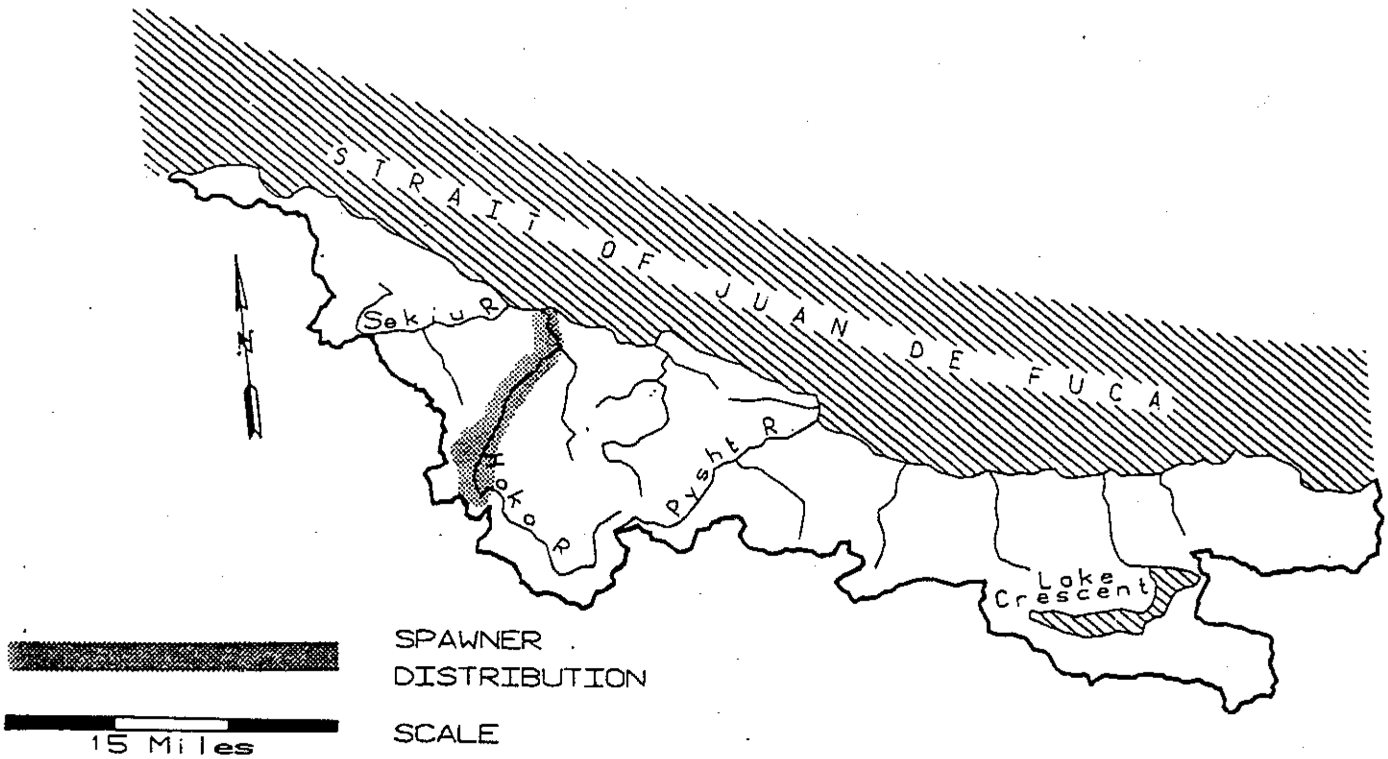
Habitat -- The Hoko River drainage is managed for timber production and has been impacted by past logging practices. The drainage has experienced over 300 mass-wasting events over the past 50 years as shown through the aerial photograph record (Hoko Watershed Analysis 1994). Most of these events originated either in harvested areas on Ellis, Stolzenberg or Sekiu mountains or from poorly constructed and maintained roads.

Virtually the entire drainage was originally harvested to the streambank and much of the drainage is currently being harvested for the second time. Although aerial photographs reveal that most riparian areas contained predominately large conifers prior to the first logging, 91 percent of the current riparian stands are now young red alder (Hoko Watershed Analysis 1994). Logjam removal and other instream wood removal was conducted throughout the drainage into the 1970s (Williams et al. 1975), including removal of all wood from the lower Little Hoko River during 1937 (John Cowan, long-time resident, personal communication). The lower Little Hoko River subsequently downcut one to two meters, and the channel is now entrenched within its floodplain. The wood removal from within and adjacent to streams has led to a shortage of in-channel wood throughout the Hoko drainage. On average, only 0.66 pieces of large woody debris per channel width presently exist and most of this is either small alder which rapidly decomposes or decaying residual old growth wood (Hoko Watershed Analysis 1994).

STOCK DEFINITION PROFILE for Hoko Fall Chinook

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**UNK**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - **UNKNOWN**

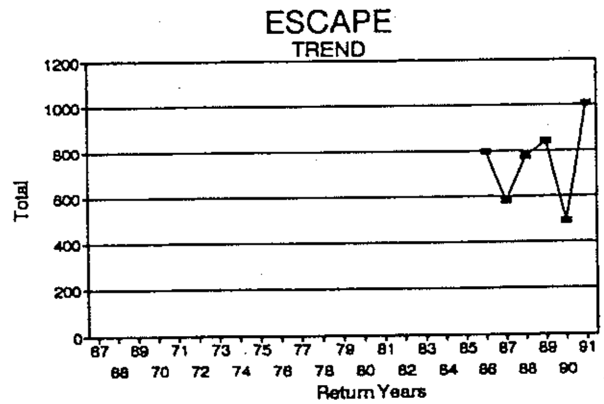
GENETICS - No data available.

STOCK STATUS PROFILE for Hoko Fall Chinook

STOCK ASSESSMENT

DATA QUALITY-----> Excellent

Return Years	ESCAPE Total			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86	793			
87	578			
88	774			
89	842			
90	493			
91	1005			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Composite

STOCK DISTINCTION
Distribution, Timing

STOCK STATUS
Depressed

SCREENING CRITERIA
Chronically Low

A substantial loss of coho and steelhead egg baskets in the 1990, 1991, and 1992 winters indicates that bedload scour and fill are significant and probably affect survival from egg deposition to fry emergence in many mainstem and tributary areas. Survival is also probably affected by the moderate to high level of fine sediments. A basin average of 14.27 percent fine sediments (<0.85 mm) in seventeen coho and steelhead spawning areas throughout the basin was determined through McNeil core sampling efforts during 1991 (McHenry et al. 1994).

Instream temperatures are also a problem. A thermograph placed at RM 16.6 in 1985 recorded temperatures as high as 73.4 °F (Blum and DiDomenico 1985) and thermographs recorded peak temperatures of 67 °F in the lower mainstem during 1992 and 69 °F in the lower Little Hoko River during 1991 (McHenry et al. 1994).

The drainage also appears to be deficient in steelhead and coho salmon rearing habitat, with pools comprising less than 25 percent of the measured habitat areas (Hoko Watershed Analysis 1994).

Harvest Management -- Hoko River chinook are likely to be caught in preterminal fisheries in Alaska, Canada and off the coast of Washington, as well as in Puget Sound sport fisheries. The river is closed to salmon sport fishing, and the only net fisheries which occur in the river are steelhead fisheries from December through February.

Fisheries in terminal and extreme terminal areas are managed to meet Hoko natural chinook escapement and production needs.

Hatchery -- Some hatchery introductions were made in the 1950s, but it is not known if these introductions were successful.

Last ten years salmon releases into the Lyre-Hoko Basin

Release Year	Spring Chinook	Coho
1982	0	1,379,100
1983	13,464	438,300
1984	71,250	1,316,128
1985	45,600	966,400
1986	138,120	738,402
1987	162,500	367,800
1988	239,158	335,600
1989	0	5,000
1990	115,300	0
1991	193,977	0
MEAN	122,421	791,676

OVERVIEW -- STRAIT OF JUAN DE FUCA SUMMER CHUM STOCKS

DISCOVERY BAY
SEQUIM BAY

STOCK DEFINITION AND ORIGIN

The summer chum salmon stocks in this region enter the terminal area from the first week of July through September. Spawning usually begins around the first week of September and continues through mid-October. This early spawn timing creates a temporal separation from fall chum stocks in Puget Sound.

The Strait of Juan de Fuca summer chum salmon were separated into two stocks based on two criteria: (1) geographic separation of the spawning grounds and (2) genetic analysis.

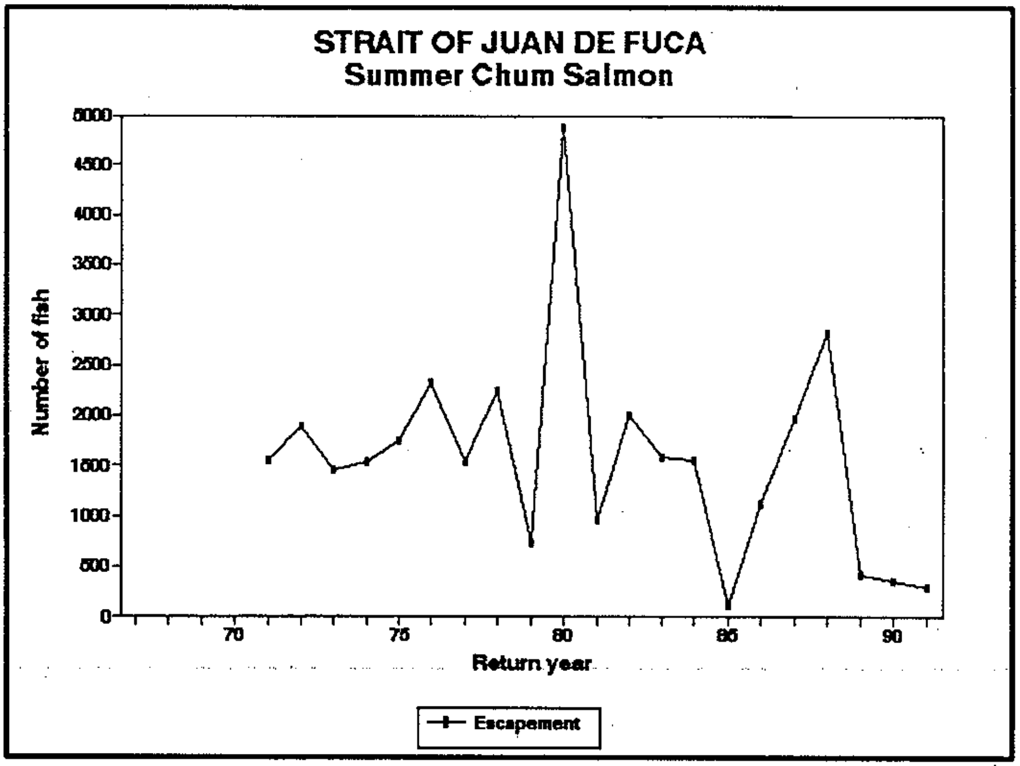
Natural spawning in Salmon and Snow creeks accounts for the production of summer chum salmon in Discovery Bay. These streams are geographically separated from the spawning grounds used by the Sequim Bay summer chum. Furthermore, genetic analysis has shown that the Discovery Bay summer chum are distinguishable from other Puget Sound summer chum stocks. Accordingly, these fish are considered a native stock.

Wild spawning in Jimmycomelately Creek accounts for the production of summer chum in Sequim Bay. Genetic analysis has shown that this stock is also distinguishable from other chum salmon stocks.

STOCK STATUS

Strait of Juan de Fuca summer chum stocks are not targeted by any directed fishery. Very few are taken incidentally in other fisheries in the Strait of Juan de Fuca (see figure). Sequim Bay summer chum escapements have declined, while the Discovery Bay summer chum escapement has declined to critically low levels. Together, the combined escapement goal has been met only three times since 1981.

Escapement data are shown in the figure below. Escapement data give a good representation of the number of wild spawners on the spawning grounds. Different escapement goals are used for even- and odd-year returns but are not plotted on the graph. The combined even-year and odd-year wild escapement goals are 1,950 and 1,300 respectively.



STRAIT OF JUAN DE FUCA
Summer Chum Salmon
Number of fish
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
70
75
80
85
90
Return year
Escapement

STRAIT OF JUAN DE FUCA -- DISCOVERY BAY SUMMER CHUM

STOCK DEFINITION AND ORIGIN

The Discovery Bay summer chum salmon stock is separated from other Puget Sound summer chum stocks by a distinct spawning distribution, temporal differences and genetic characteristics. Natural spawning in Snow and Salmon creeks accounts for the production of this stock. These streams enter Discovery Bay in the Strait of Juan de Fuca. The distance between these spawning streams and other Puget Sound streams creates geographic separation between Discovery Bay summer chum and the other Puget Sound summer chum stocks.

The Discovery Bay summer chum spawning season is over a month earlier (early September to mid-October) than that of the Strait of Juan de Fuca fall chum stocks, providing a temporal separation. They have similar run timing to that of the Sequim Bay summer chum stock, but are considered to be reproductively isolated through geographic separation. Genetic studies show that the Discovery Bay Summer chum salmon are distinguishable from other Puget Sound chum salmon stocks.

There is no record of non-native chum introductions, so Discovery Bay summer chum are considered to be a native stock.

STOCK STATUS

The status of Discovery Bay summer chum is Critical.

Escapement data derived from spawning ground surveys are the only consistent information available on the stocks status. Escapement estimates have been as large as 3,000 as recently as 1980 and as low as 45 in 1985. Although long-term escapement trends appear to be stable, there has been a severe short-term decline over the last three years.

Discovery Bay watershed residents initiated and committed to a 10-year recovery effort for summer chum in Salmon Creek beginning in 1992. The recovery effort involves collecting and spawning a portion (about 20%) of the wild summer chum adults and rearing the eggs and fry in streamside incubators and saltwater netpens prior to release in Discovery Bay. Technical assistance will be provided by WDFW salmon assessment and enhancement biologists and WDFW personnel from Hurd Creek Hatchery.

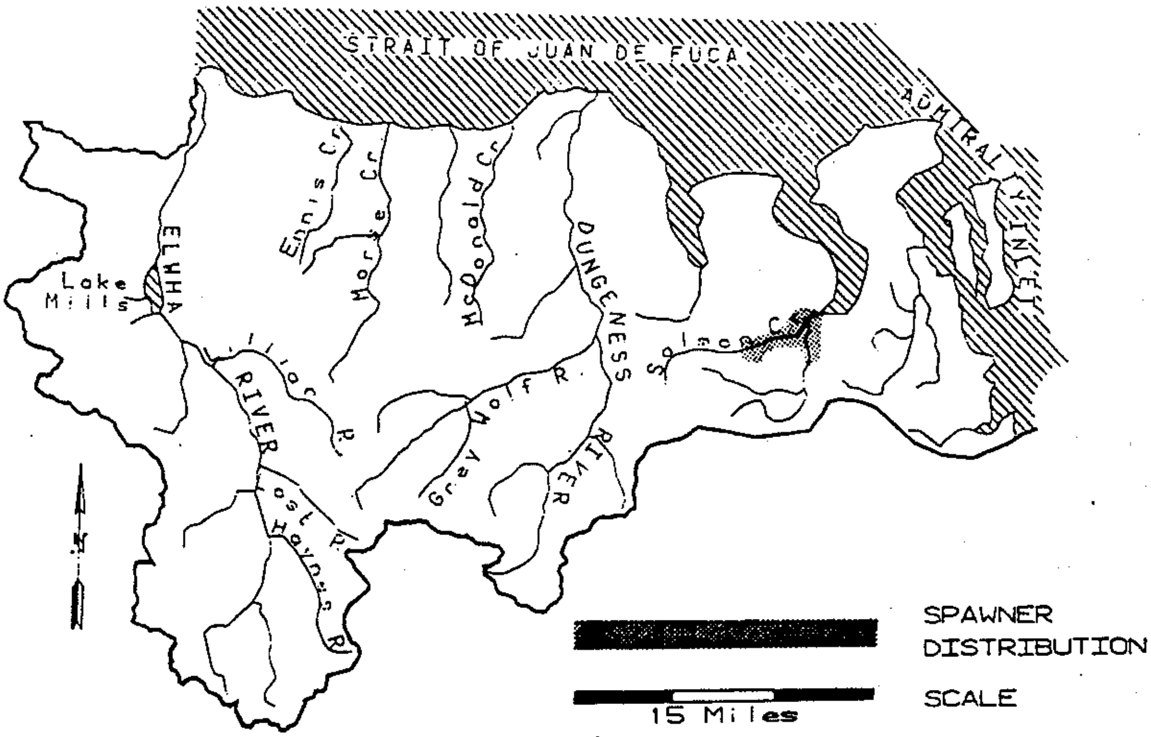
FACTORS AFFECTING PRODUCTION

Habitat -- Snow and Salmon creeks are fairly small streams with gentle gradients near their mouths and moderate to steep gradients for the remainder of the stream length. Natural limiting factors in fresh water for this stock include high flows and very high

STOCK DEFINITION PROFILE for Discovery Bay Summer Chum

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



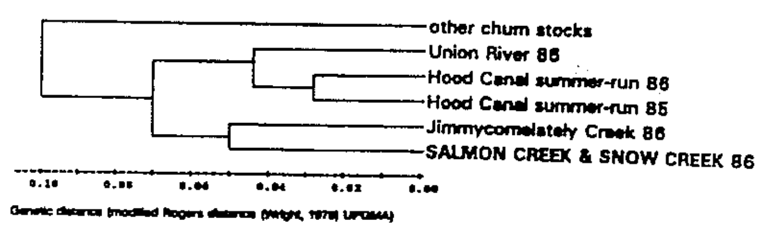
TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**YES**
SPAWNING													**YES**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - **YES**

GENETICS - Analysis of a 1986 combined collection from Snow Creek and Salmon Creek (N=100) indicated that these fish are significantly different from all other chum collections tested (21-locus G-tests: **p**<0.05).

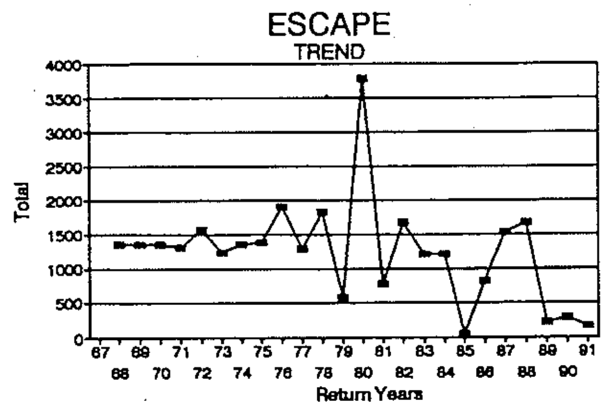


STOCK STATUS PROFILE for Discovery Bay Summer Chum

STOCK ASSESSMENT

DATA QUALITY-----> Good

Return Years	ESCAPE Total			
67				
68	1358			
69	1358			
70	1358			
71	1316			
72	1568			
73	1241			
74	1364			
75	1391			
76	1907			
77	1300			
78	1832			
79	581			
80	3784			
81	780			
82	1680			
83	1215			
84	1211			
85	45			
86	823			
87	1540			
88	1675			
89	226			
90	293			
91	174			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution, Genetics, Timing

STOCK STATUS
Critical

SCREENING CRITERIA
Short-Term Severe Decline

sedimentation in the lower reaches, both of which have increased in recent years primarily due to accelerated and extensive logging in each upper watershed. Habitat composition, substrate composition and amount and distribution of large wood in the stream has likely changed as a result of changes in flow patterns. The logging-generated impacts should lessen as most of the logging has been completed and regrowth is beginning. Streamside habitats in the lower sections of Snow and Salmon creeks have been impacted by land-use activities. For example, Nelson et al. (1992) reported that 50 percent to 75 percent of the streambanks were bare and eroding along a section of Snow Creek even though an overstory canopy was present. Fencing of the stream corridors to reduce livestock access and use would probably improve the condition of both the stream banks and streamside vegetation and reduce a potential source of bacterial contamination. The lower section of Salmon Creek was fenced in 1993 in a cooperative effort between a local landowner and the Soil Conservation Service.

Harvest Management -- Discovery Bay summer chum are commingled in Puget Sound and Canadian commercial harvest areas with other returning species, including sockeye, pink, chinook and coho and other summer chum stocks. Incidental harvest in fisheries directed at other more abundant, commingled species historically accounts for the majority of the commercial take of these fish.

Preterminal Areas - It is assumed that Discovery Bay summer chum are harvested incidentally in several preterminal commercial net and recreational fisheries directed at other species. The lack of stock migration and specific (e.g. GSI-derived) fisheries contribution data prevents estimation of the magnitude of these incidental harvests.

Net fisheries in the Strait of Juan de Fuca and the San Juan Islands harvest Washington- and Canadian-origin summer chum incidentally in sockeye, pink and coho-directed fisheries. Total Washington and Canadian-origin summer chum catches during the summer chum catch accounting period in the Strait of Juan de Fuca have averaged 718 (range 28-1725) per year from 1968 to 1991. Total summer chum catches in the San Juan Islands sockeye and coho fisheries have ranged from 62 in 1984 to 43,000 in 1976 (1990-1991 average 1,600). The contribution of Discovery Bay summer chum to these fisheries is unknown.

Coho-directed gill net and purse seine fisheries in the eastern Strait of Juan de Fuca and Admiralty Inlet (Areas 6B and 9) harvest summer chum, although large-scale fisheries have not been conducted since 1978 in those areas. Seattle-area (Area 10) coho fisheries may also harvest some Strait-origin summer chum. Canadian net fisheries on the west coast of Vancouver Island, the Johnstone Strait and the Strait of Georgia intercept summer chum in sockeye, pink and coho fisheries. Again, the contribution rates of Discovery Bay summer chum to these fisheries are unknown.

Terminal Areas - By state/tribal agreement, no fishing has occurred in Discovery Bay or its tributary streams since 1976.

Hatchery -- The Washington Department of Fish and Wildlife has operated a weir on Snow Creek since 1972. A weir on Salmon Creek has not been used since 1981. The weirs were left open during chum migration periods.

Relatively small numbers (35,000 to 88,000 juveniles per year) of Dungeness Hatchery-origin yearling and fingerling coho were released into Discovery Bay tributaries in 1965, 1968, 1969, 1970 and 1971. No releases have occurred since 1971. The impacts of these juvenile coho on native summer chum production is unknown.

STRAIT OF JUAN DE FUCA -- SEQUIM BAY SUMMER CHUM

STOCK DEFINITION AND ORIGIN

Sequim Bay summer chum salmon are separated from other Puget Sound summer chum salmon stocks by a distinct spawning distribution, temporal differences and genetic characteristics. Wild spawning in Jimmycomelately Creek accounts for the production of this stock. This stream enters Sequim Bay in the Strait of Juan de Fuca. The distance between this spawning tributary and other chum streams is presumed to create geographic separation between Sequim Bay summer chum and the other Puget Sound summer chum stocks.

The Sequim Bay summer chum salmon spawning season is over a month earlier (early September to mid-October) than that of the Strait of Juan de Fuca fall chum salmon stocks. Sequim Bay summer chum have similar run timing to Discovery Bay summer chum but are considered to be reproductively isolated through geographic separation. Genetic studies have shown that the Sequim Bay summer chum are distinguishable from other Puget Sound chum salmon stocks.

There is no evidence of non-native chum introductions in Sequim Bay, so this is considered to be a native stock.

STOCK STATUS

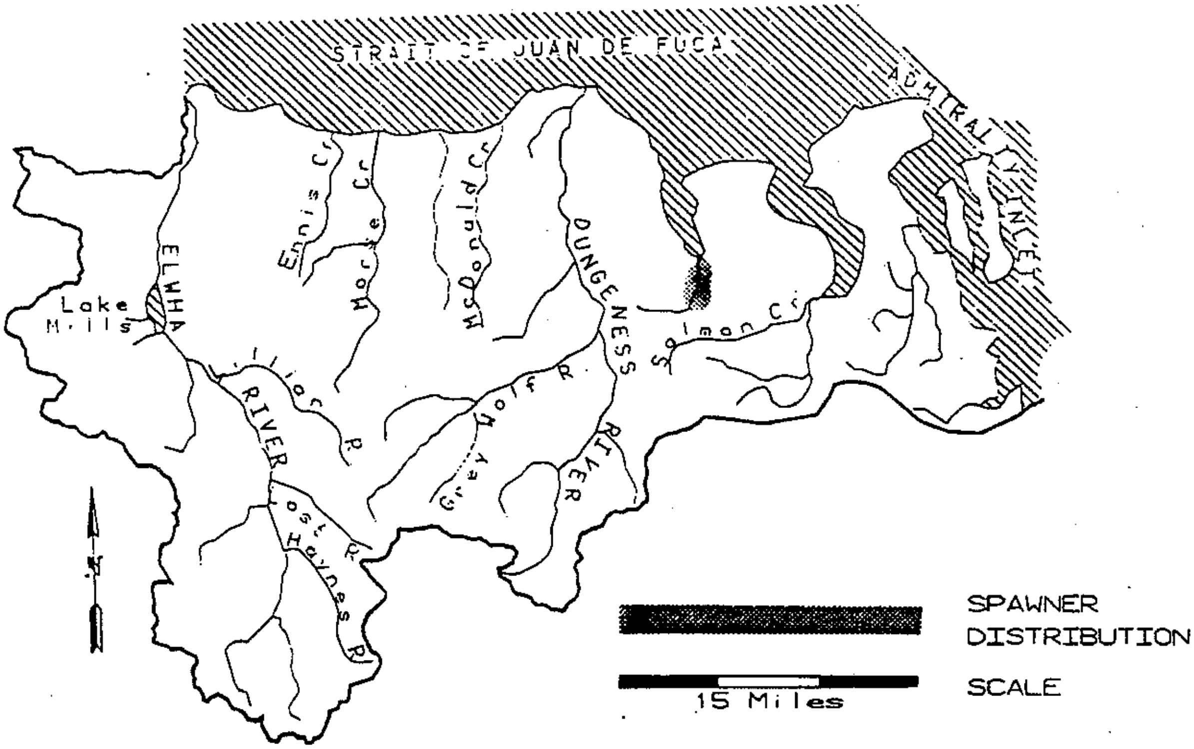
Escapements have ranged from 63 to 1,127 spawners. There has been a severe short-term decline in spawner escapement since 1990. Consequently, this stock is considered Depressed.

FACTORS AFFECTING PRODUCTION

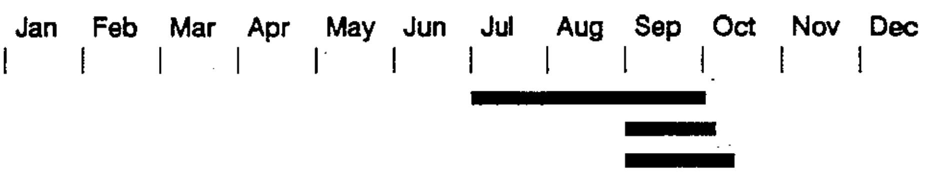
Habitat -- Historically, natural production has been limited by flooding and sedimentation. Today, forest practices have impacted freshwater and estuarine habitat, but quantitative data are lacking. Access to spawning and rearing habitat in Jimmycomelately Creek has been reduced by the improper placement of culverts during road construction. A log-rafting dump in the southwest corner of Sequim Bay has impacted the associated nearshore rearing area and deposited leachates on the bay floor. An irrigation ditch outfall has caused extensive erosion and sedimentation in Johnson Creek, degrading spawning and rearing habitat for coho salmon. A marina was built along the west shoreline of Sequim Bay in the 1980s. What effect this development has had on Sequim Bay coho salmon production is unknown. Agriculture has impacted the western Sequim Bay tributaries through the removal of riparian vegetation and grazing in and along stream banks.

STOCK DEFINITION PROFILE for Sequim Bay Summer Chum

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



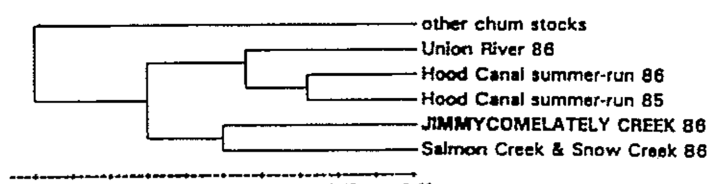
TIMING



	DISTINCT
TERMINAL RUN	**YES**
RIVER ENTRY	**YES**
SPAWNING	**YES**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **YES**

GENETICS - Analysis of a collection from Jimmycomelately Creek (N=100) indicated that these fish are significantly different from all other chum collections tested (21-locus G-tests: **p**<0.05).



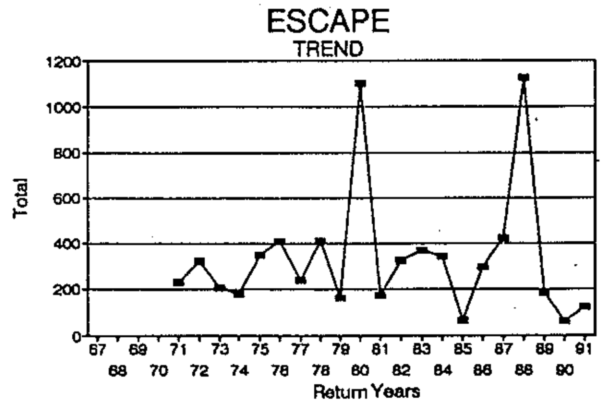
Genetic distance (modified Rogers distance (Wright, 1978) UPGMA)

STOCK STATUS PROFILE for Sequim Bay Summer Chum

STOCK ASSESSMENT

DATA QUALITY------> Good

Return Years	ESCAPE Total			
67				
68				
69				
70				
71	232			
72	322			
73	205			
74	179			
75	348			
76	412			
77	240			
78	412			
79	162			
80	1102			
81	172			
82	323			
83	366			
84	343			
85	64			
86	299			
87	423			
88	1127			
89	185			
90	63			
91	121			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Native

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution, Genetics, Timing

STOCK STATUS

Depressed

SCREENING CRITERIA

Short-Term Severe Decline

Harvest Management -- Sequim Bay summer chum are commingled in Puget Sound and Canadian commercial harvest areas with other returning species, including sockeye, pink, chinook and coho and other summer chum stocks. In all harvest areas, management periods for this stock overlap with two or more other species. Incidental harvest in fisheries directed at other more abundant, commingled species historically accounts for the majority of the harvest on this stock. Harvest rates on this stock are believed to be low.

Preterminal Areas - Sequim Bay summer chum are likely harvested in several preterminal commercial and recreational fisheries directed at other species. The lack of stock migration and specific fisheries contribution data prevents estimation of the magnitude of these harvests, however.

Net fisheries in the Strait of Juan de Fuca and San Juan Islands harvest Washington and Canadian-origin summer chum incidentally in sockeye, pink and coho-directed salmon fisheries. Total Washington- and Canadian-origin summer chum catches during the early summer chum salmon catch accounting period in the Strait have averaged 718 (range 28 to 1725) from 1968 to 1991. Total summer chum catches in the San Juan Islands sockeye and coho fisheries have ranged from 62 in 1984 to 43,000 in 1976 (1990 to 1991 average 1,600). The contribution of Sequim Bay summer chum to these fisheries is unknown.

Coho-directed gill net and purse seine fisheries in the eastern Strait of Juan de Fuca and Admiralty Inlet (Areas 6B and 9) harvest summer chum, although large-scale fisheries have not been conducted since 1978 in those areas. Seattle-area coho fisheries may also harvest some Strait-origin summer chum salmon. Canadian net fisheries on the west coast of Vancouver Island, the Johnstone Strait and Strait of Georgia intercept summer chum in sockeye, pink and coho fisheries. Again, the contribution rates of Sequim Bay summer chum to these fisheries are unknown.

Terminal Areas - There have been no Sequim Bay chinook or coho fisheries in which incidental catch of summer chum might occur in recent years.

Hatchery -- The Dungeness Hatchery has been releasing 850,000 yearling coho salmon annually into the Dungeness River, located immediately west of Sequim Bay. In addition, hatchery-origin coho fingerlings were released into Jimmycomelately Creek in 1982 through 1985, and coho yearlings were released in 1967, 1969, 1970 and 1971. The potential effect of these releases on the Sequim Bay summer chum stock is unknown.

OVERVIEW -- STRAIT OF JUAN DE FUCA FALL CHUM STOCKS

DUNGENESS/EAST STRAIT TRIBS
ELWHA
LYRE
DEEP/EAST & WEST TWIN CREEKS
PYSHT
HOKO/CLALLAM/SEKIU

STOCK DEFINITION AND ORIGIN

The fall chum salmon stocks in this region enter their respective rivers or creeks from mid-October through the third week in December. Spawning throughout Strait streams usually begins in early November and continues through the first half of January. This broad spawning season can be attributed to the differences in spawn timing among the stocks.

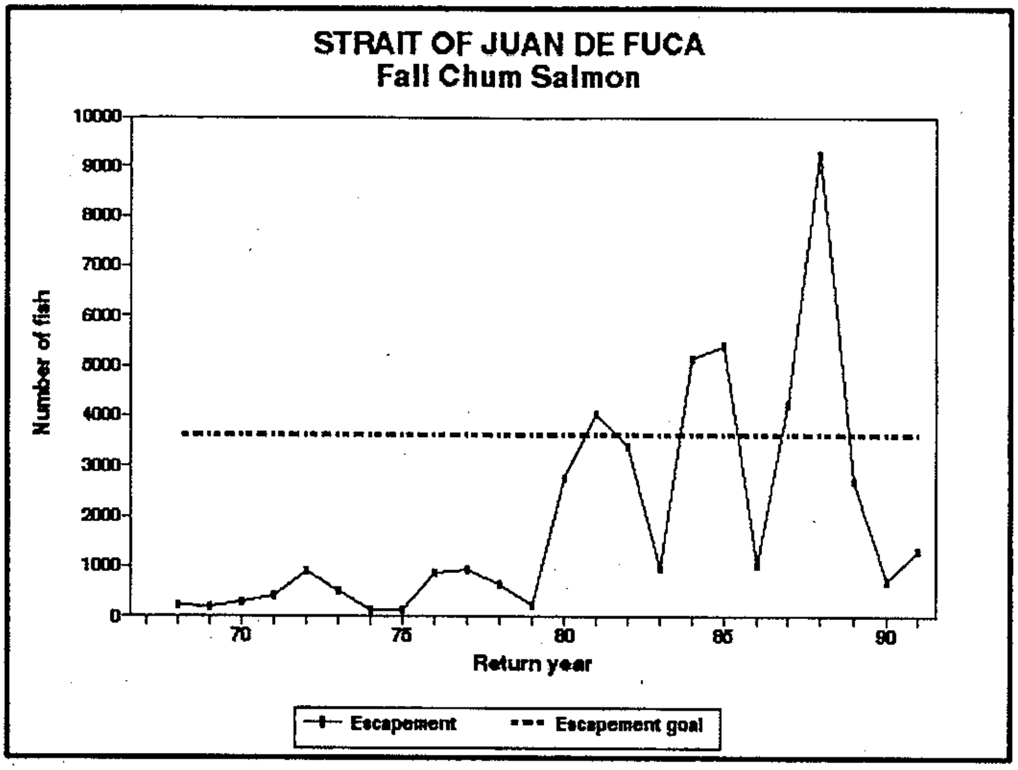
As a group, these fall chum stocks are isolated from Hood Canal and Puget Sound fall chum stocks by geographic distribution. Fall chum salmon in this region have been separated into six stocks based on differences in spawning distribution, and some are found to be genetically distinct. Spawning seasons are known for all of the stocks, but escapement estimates are made only for the Dungeness, Deep and Pysht rivers. Spawning ground survey data are sporadic for the rest of the systems, so assessments can only be made in a qualitative sense. Genetic studies on the Lyre, Pysht and Deep rivers fall chum show that these stocks are distinguishable from other chum salmon stocks. However, the remaining stocks are currently separated solely on the basis of geographic distribution of the spawning areas, until genetic stock identification data become available.

A minor hatchery stocking program was active on the Elwha from 1976 through 1985 using a mixture of native stock and chum salmon brood stock from Walcott Slough (Hood Canal). It is not considered to have had an impact on the native population. No other significant releases were made in the other streams so all fall chum stocks in this region have been classified as native stocks.

STOCK STATUS

As a group, these chum contribute to Canadian and U.S. fisheries. In Washington, a few are presumably caught in commercial fisheries in the Strait of Juan de Fuca and the area north of the San Juan Islands. Escapement levels for Strait of Juan de Fuca fall chum stocks have been near to or exceeded the escapement goal about half the time over the last decade.

The annual Strait of Juan de Fuca escapement goal aggregated across all stocks is 3,600 fall chum salmon. Information on individual fall chum salmon stocks is presented in the Stock Reports which follow.



Information on individual fall chum stocks is presented in the Stock Reports which follow.

STRAIT OF JUAN DE FUCA -- DUNGENESS RIVER / EAST STRAIT TRIBS FALL CHUM

STOCK DEFINITION AND ORIGIN

The Dungeness River/East Strait Tributaries fall chum salmon stock is isolated from other Puget Sound chum stocks by geographic separation and temporal differences. Natural spawning of native fall chum in the Dungeness River, McDonald, Siebert, Bagley and Morse creeks accounts for the production of this stock. Most of the spawning takes place in the Dungeness River itself. The Dungeness River drains into the Strait of Juan de Fuca just east of the city of Port Angeles. The distance between this spawning area and other fall chum streams is presumed to create geographic separation between stocks.

Although not present in great numbers, (record high 1,726 in 1988) fall chum are observed in the Dungeness River. Recently stream surveyors have observed fall chum salmon in the lower three miles while conducting chinook surveys. On a few occasions fish have been seen in the other tributaries, and they may have been strays from the Dungeness.

There is no evidence of non-native fall chum salmon introductions in the Dungeness River, so the stock is considered to be a native stock.

STOCK STATUS

Since escapement data are not available for the east Strait tributaries, stock status is Unknown.

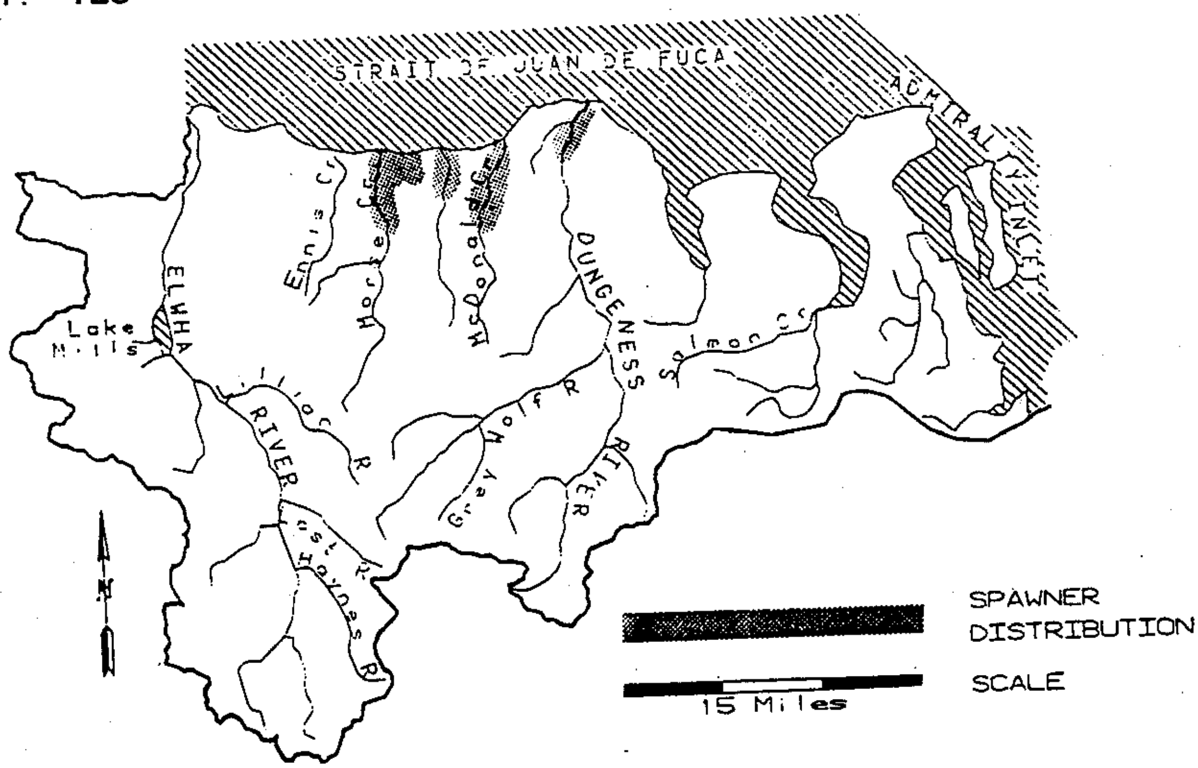
FACTORS AFFECTING PRODUCTION

Habitat -- The Dungeness River is located in a rain shadow of the Olympic Mountains and receives little annual precipitation (<20 inches). Water flow in the river is primarily dependent upon snow melt. Water withdrawals for irrigation substantially reduce river flows during the low-flow period (August through October).

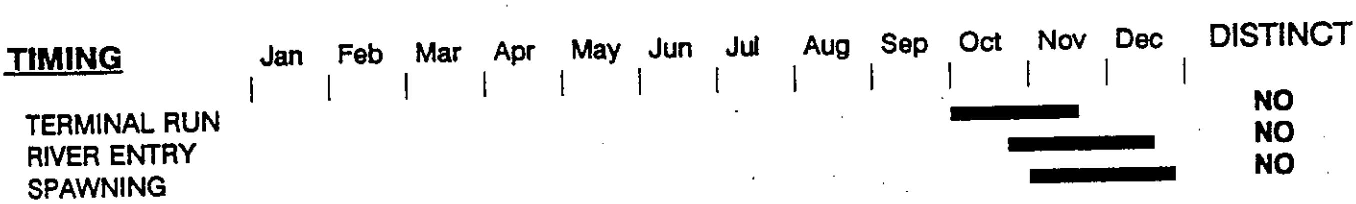
Human activities associated with agriculture, urban development and forest practices have caused gravel aggradation and river channelization in the middle and lower sections of the river. Low water flows through braided channels create barriers to migrating adults, increase water temperatures to marginal levels and reduce available spawning habitat. Diking for flood control has exacerbated impacts from high-water events by confining the energy of the river. Shifting bedloads kill incubating salmonid eggs and alevins during high-flow events in the fall and winter.

STOCK DEFINITION PROFILE for Dungeness/East Strait Tribs Fall Chum

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS
DISTINCT? - **UNKNOWN**

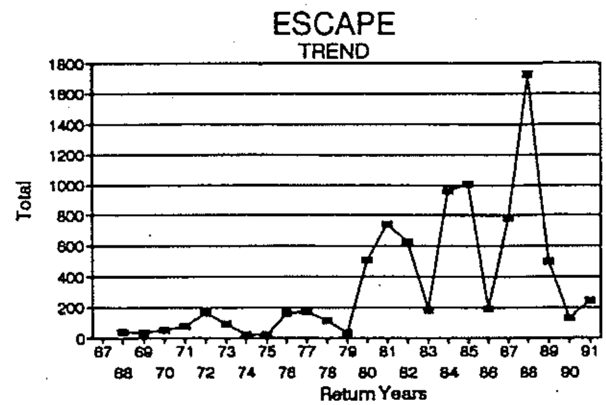
GENETICS - No GSI collections have been made from this river.

STOCK STATUS PROFILE for Dungeness/East Strait Tribs Fall Chum

STOCK ASSESSMENT

DATA QUALITY------> Poor

Return Years	ESCAPE Total			
67				
68	41			
69	35			
70	54			
71	76			
72	165			
73	92			
74	20			
75	23			
76	161			
77	171			
78	118			
79	39			
80	512			
81	748			
82	629			
83	182			
84	961			
85	1006			
86	190			
87	787			
88	1726			
89	502			
90	130			
91	241			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

Fish habitat impacts throughout the watershed have adversely affected the marine estuary, an important transition area for juvenile chum salmon migrating to sea.

Harvest Management -- Dungeness/East Strait tributaries fall chum salmon are harvested in both Canadian and U.S. preterminal fisheries. Domestic commercial net fisheries occur in the Strait of Juan de Fuca and the San Juan Islands. Dungeness fall chum salmon may be incidentally harvested in a coho-directed commercial net fishery in Dungeness Bay. In the Dungeness River, fall chum salmon are harvested in a non-treaty recreational fishery, and small numbers are taken in a treaty hook-and-line subsistence fishery.

Hatchery -- Coho salmon yearlings are annually released from the Dungeness Hatchery. The artificial propagation of coho salmon may result in increased predation on juvenile fall chum salmon in the river and estuary. However, direct impacts of these hatchery releases of coho salmon on fall chum salmon have not been quantified.

STRAIT OF JUAN DE FUCA -- ELWHA FALL CHUM

STOCK DEFINITION AND ORIGIN

The Elwha fall chum salmon stock was identified as a separate stock because it is isolated from other Puget Sound stocks by geographic separation. Wild spawning of chum in the Elwha River accounts for the production of this stock. The Elwha River is located on the Strait of Juan de Fuca just west of the city of Port Angeles. The distance between the Elwha and other chum streams provides a geographic separation among stocks.

Although not much is known about this stock, spawning ground surveys conducted in the 1950s showed significant numbers (329 on December 1, 1952) of chum present in the Elwha.

The Elwha tribal hatchery had a chum program (1976 through 1985) which used a Hood Canal stock (Walcott Slough) and a few native Elwha River and Lyre River chum as brood stock. The program successfully produced harvestable numbers of chum in subsequent seasons but was discontinued in favor of other interests. It is not known if this brood stocking program affected the native stock. However, the Lower Elwha S'Klallam Tribe, the U.S. Fish and Wildlife Service and the Washington Department of Fish and Wildlife have begun genetic sampling of Elwha fall chum in order to identify the impact of the past hatchery program on the genetic integrity of the stock.

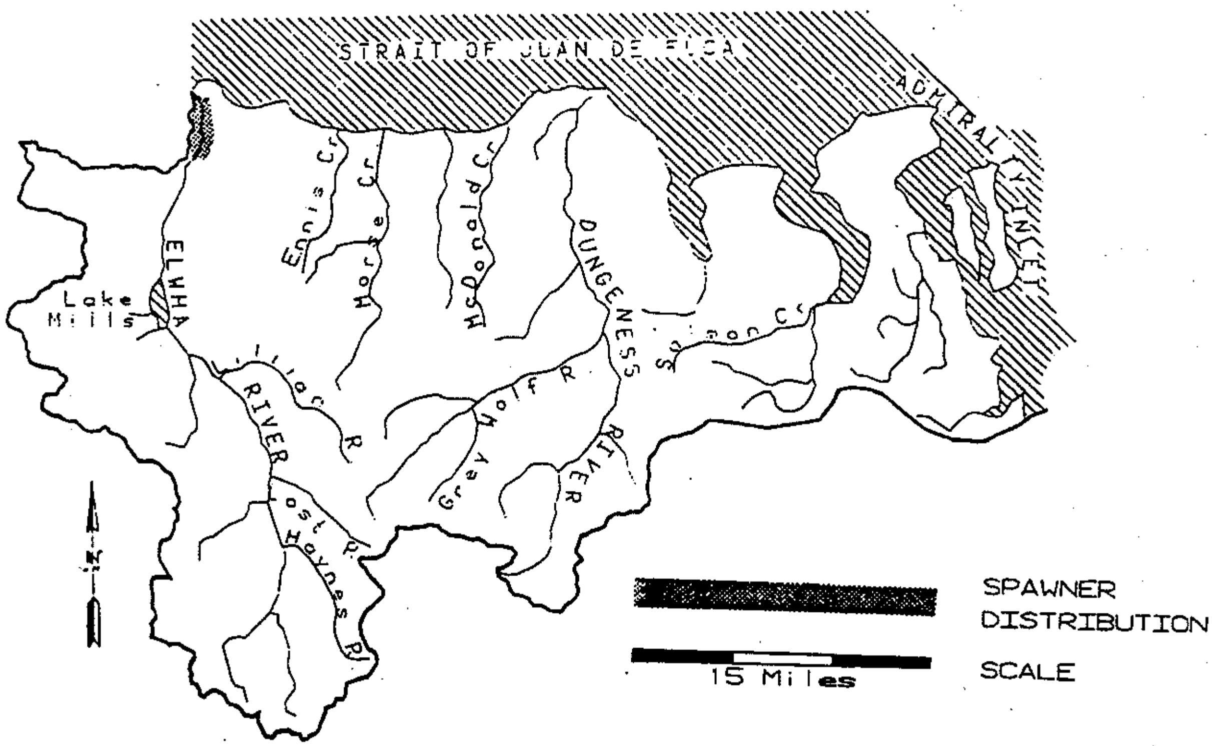
STOCK STATUS

Escapement information for Elwha River fall chum is lacking, so status at this time is Unknown. However, tribal harvest records show that at least a few chum are taken incidentally in coho and steelhead fisheries each year. In some years these harvests have been as high as 77 chum (1990). The Lower Elwha S'Klallam Tribe and the U.S. Fish and Wildlife Service have begun intensive survey efforts in an attempt to quantify annual escapement to the river.

STOCK DEFINITION PROFILE for Elwha Fall Chum

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**NO**
RIVER ENTRY													**NO**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - **UNKNOWN**

GENETICS - Analysis of a 1985 collection from the Lower Elwha Hatchery (N=100) indicated that these fish are similar to the Quilcene Hatchery (Hood Canal) chum stock (21-locus G tests: $p>0.05$).

STOCK STATUS PROFILE for Elwha Fall Chum

STOCK ASSESSMENT

DATA QUALITY------> No Data

Return Years	NO DATA			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Native

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution

STOCK STATUS

Unknown

SCREENING CRITERIA

STRAIT OF JUAN DE FUCA -- LYRE FALL CHUM

STOCK DEFINITION AND ORIGIN

Lyre River fall chum salmon were identified as a stock because they are isolated from other Puget Sound stocks by geographic distribution, and to some degree run-timing differences. Wild spawning of chum in the Lyre River and its tributaries accounts for the production of this stock. The Lyre River is located on the Strait of Juan de Fuca 15 miles west of the city of Port Angeles. The distance between the Lyre and other chum streams is thought to provide a geographic separation among stocks. In addition, the Lyre River is the only system in the Strait supporting chum salmon to be fed by a natural lake (Lake Crescent), which likely creates a unique temperature and flow regime in the river.

Spawning ground survey information is limited to a few years for Lyre chum. In most survey seasons only a few fish were seen. However, the largest single-day count of 166 live chum was observed on December 12, 1984. This stock is known to spawn as late as mid-January providing a temporal separation from the other Strait fall chum stocks.

Genetic studies showed that the Lyre River fall stock is distinguishable from other Strait of Juan de Fuca chum stocks.

The only known hatchery release occurred in 1969, and it is doubtful that these fish had a significant impact on the native population. The Lyre fall chum stock is therefore considered to be a native stock.

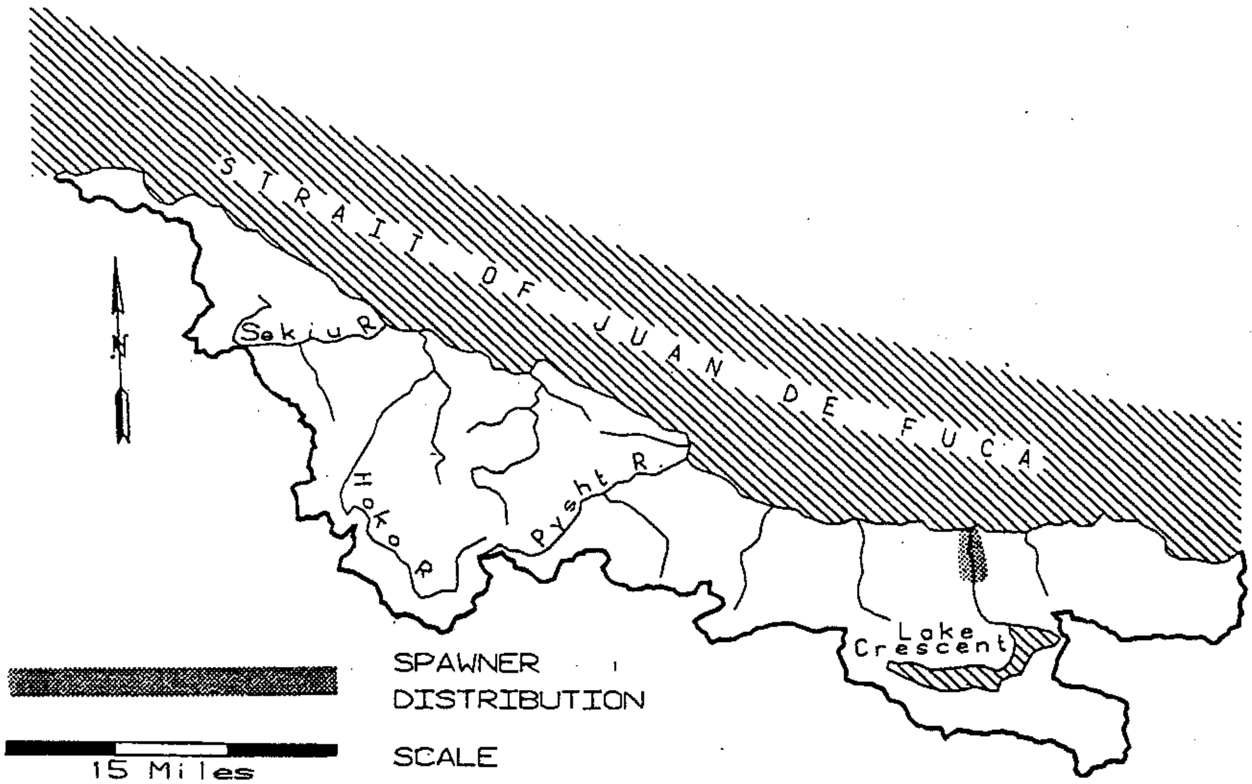
STOCK STATUS

Stock assessment data are limited so stock status is Unknown. However, the Lower Elwha S'Klallam Tribe began spawning ground surveys in 1991. The peak count (live and dead fish) was 63 chum. Additional information on run size is available from tribal steelhead by-catch data.

STOCK DEFINITION PROFILE for Lyre Fall Chum

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



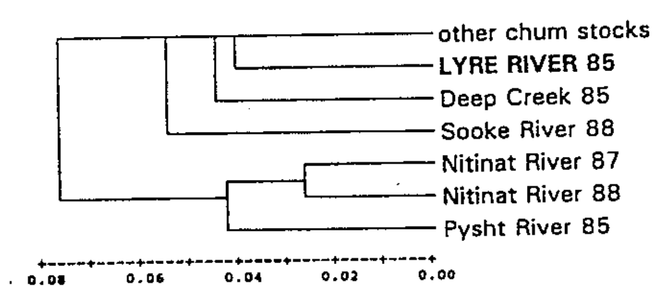
TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**NO**
RIVER ENTRY													**NO**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - **YES**

GENETICS - Analysis of a 1985 collection (N=100) indicated that these fish are significantly different from all other chum collections tested (21-locus G-tests: $p<0.05$).



Genetic distance (modified Rogers distance (Wright, 1978) UPGMA)

STOCK STATUS PROFILE for Lyre Fall Chum

STOCK ASSESSMENT

DATA QUALITY-----> No Data

Return Years	NO DATA			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution, Timing, Genetics

STOCK STATUS
Unknown

SCREENING CRITERIA

STRAIT OF JUAN DE FUCA -- DEEP / EAST AND WEST TWIN CREEKS FALL CHUM

STOCK DEFINITION AND ORIGIN

The Deep/East and West Twin creeks fall chum salmon stock is isolated from other Puget Sound stocks by geographic separation, and to some degree a run-timing difference. Natural spawning of chum accounts for the production of this stock. These streams are located on the Strait of Juan de Fuca between the Pysht and Lyre rivers east of Clallam Bay. The distance between these streams and other chum streams is thought to create a geographic separation among stocks.

Genetic studies indicate that Deep Creek fall chum are distinguishable from other Strait of Juan de Fuca chum stocks.

The mouths of the East Twin and West Twin rivers are adjacent to each other (0.5 miles apart) while Deep Creek lies just three miles west of these streams. Because of the proximity of these streams the chum spawning in these streams were considered to be the same stock. Most of the spawning takes place in the lower three miles of Deep Creek. Based on the limited spawning survey data available the fall chum in the Twin rivers have never been abundant (peak 1980s count = 36). This stock has a November through December spawn timing providing a temporal separation from the later-spawning Lyre fall stocks.

No records of hatchery introductions have been found, so the stock is assumed to be a native stock.

STOCK STATUS

Based upon spawning ground surveys in Deep Creek, this stock has been classified as Healthy.

Escapement estimates are lacking for the East and West Twin Rivers. Escapement estimates for Deep Creek are available from 1968 to 1991 and range from 40 to 1,800 fish. Spawner escapement estimates were less than 200 between 1968 and 1980. Between 1981 and 1989, escapement estimates generally increased, peaking at 1,800 fall chum in 1988. However, over the last three years, escapements have declined to the pre-1980 range. Additionally, an impassable log jam in the lower river and a major landslide in 1991 have likely reduced productivity to critically low levels.

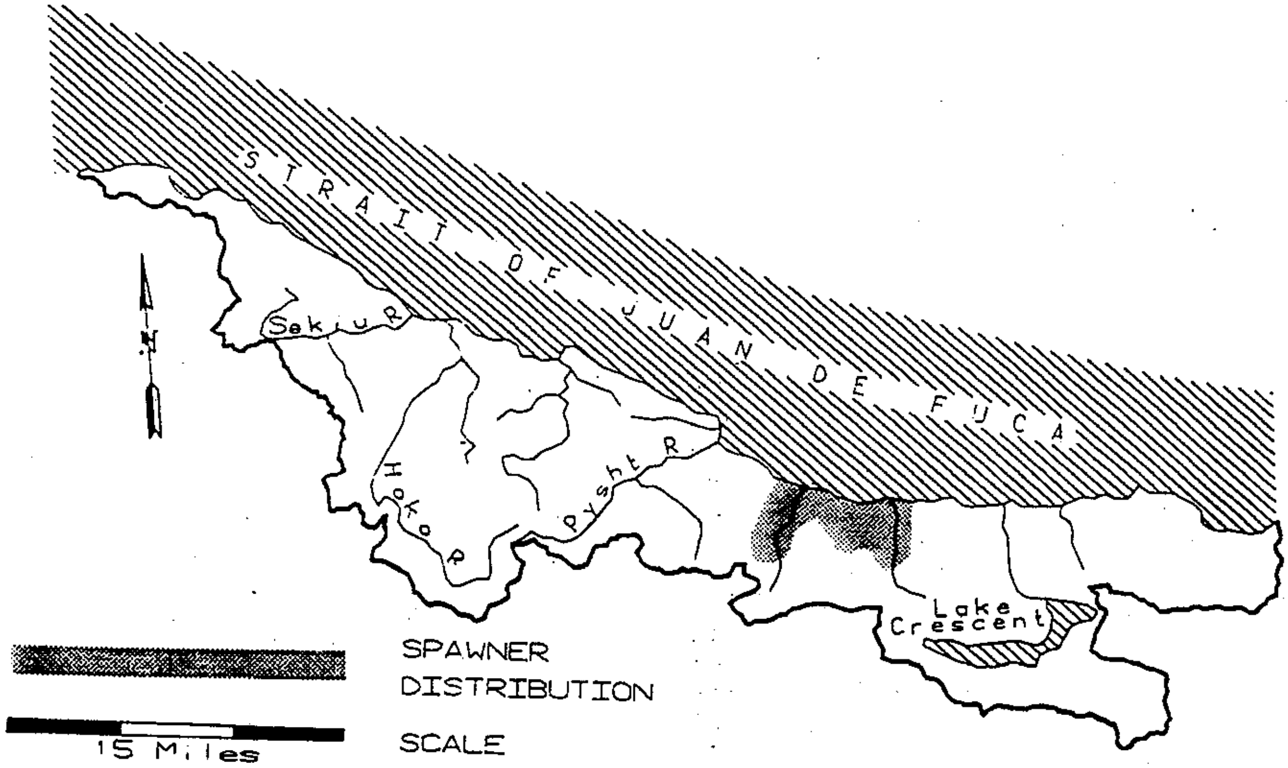
FACTORS AFFECTING PRODUCTION

Habitat -- Deep Creek is one of the most degraded basins in the western Strait of Juan de Fuca. Numerous debris flows originating from poor road-construction practices

STOCK DEFINITION PROFILE for Deep/East & West Twin Creeks Fall Chum

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



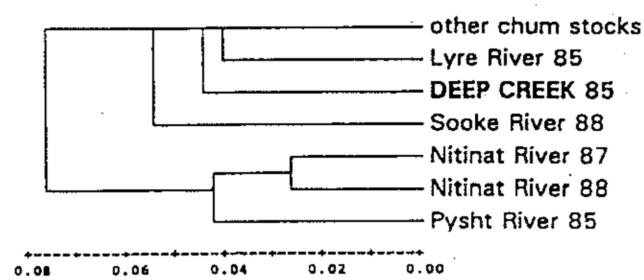
TIMING

TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**NO**
RIVER ENTRY													**NO**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - **YES**

GENETICS - Analysis of a 1985 collection from Deep Creek (N=100) indicated that these fish are significantly different from all other chum collections tested (21-locus G-tests: **p**<0.05).



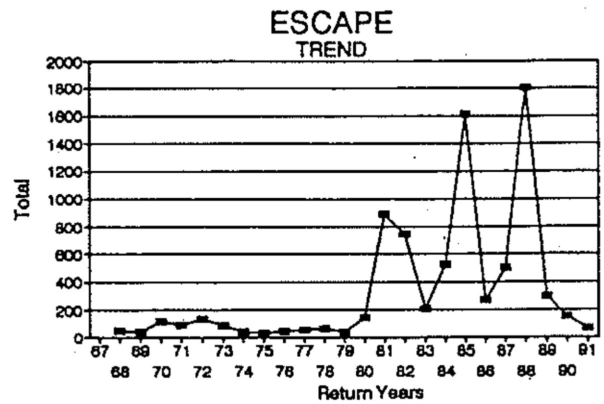
Genetic distance (modified Rogers' distance (Wright, 1978) UPGMA)

STOCK STATUS PROFILE for Deep/East & West Twin Creeks Fall Chum

STOCK ASSESSMENT

DATA QUALITY——> Fair

Return Years	ESCAPE Total			
67				
68	49			
69	42			
70	116			
71	91			
72	137			
73	87			
74	37			
75	28			
76	47			
77	55			
78	64			
79	37			
80	148			
81	891			
82	750			
83	211			
84	527			
85	1614			
86	271			
87	505			
88	1804			
89	295			
90	155			
91	66			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution, Timing, Genetics

STOCK STATUS
Healthy

SCREENING CRITERIA

have impacted the mainstem and nearly every tributary. Additionally, a large dam-break flood event in November of 1990 resulted in massive channel alterations in the lower five miles of the basin. This event, in combination with clear-cutting, triggered a deep-seated landslide downstream of the East Fork. Channel conditions are presently not favorable for fish production.

In the upper basin, the channel has been scoured to bedrock. The scouring has reduced the amount of stream area usable by anadromous fish for spawning. The majority of the large woody debris was tossed out of the channel by flooding.

In the lower river, the channel has widened by a factor of two to three, resulting in a low pool:riffle ratio, pool filling and increases in water temperatures. The lower Elwha S'Klallam Tribe has recorded stream temperatures approaching 70 °F in both the East Fork and the mainstem. Fine sediment in spawning gravel exceeds 20 percent of the total gravel volume.

Habitat in the Twin River basins has not been extensively studied. However, there is a history of mass wasting in the area. There are some indications that the East Twin has widened in response to aggradation. Riparian vegetation has been altered and is currently inadequate to supply large woody debris over the long term.

Harvest Management -- There are no targeted fisheries for this stock of chum salmon. All harvests occur incidentally in other preterminal fisheries, primarily Strait of Juan de Fuca and Puget Sound net fisheries. A small number of fish may also be taken incidental to Strait of Juan de Fuca recreational fisheries and Canadian fisheries.

Hatchery -- There are no records of releases of hatchery chum salmon into these rivers. Planting of hatchery coho smolts during the 1950s, 1960s and 1970s likely had a significant but unquantified impact on the chum stock due to predation.

STRAIT OF JUAN DE FUCA -- PYSHT FALL CHUM

STOCK DEFINITION AND ORIGIN

Pysht River fall chum salmon were identified as a separate stock because they are isolated from other Puget Sound stocks by geographic separation, and to some degree by run-timing differences. Natural spawning of chum accounts for the production of this stock. The Pysht River enters the Strait of Juan de Fuca near Pillar Point approximately eight miles east of Clallam Bay. The distance between the Pysht and other chum streams is thought to create a geographic separation between stocks.

Genetic studies have shown that the Pysht River fall chum are distinguishable from all other Strait of Juan de Fuca chum stocks. This stock has a November-December spawn timing providing a temporal separation from the later-spawning Lyre fall stocks.

No records of hatchery introductions have been found so the stock is assumed to be native.

STOCK STATUS

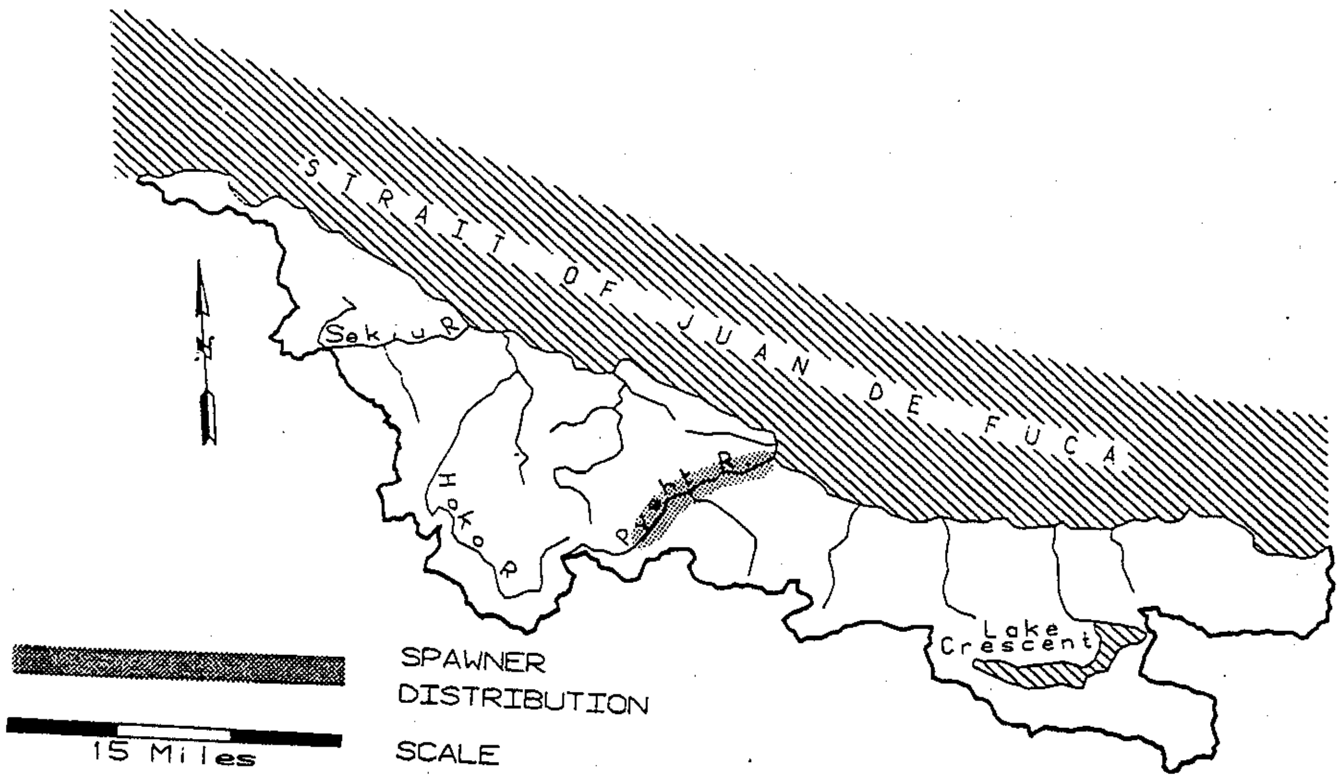
Based upon spawning ground escapement surveys, the Pysht fall chum salmon stock has been classified has Healthy. Escapement data derived from spawning ground surveys are the only consistent information available on the stocks status. Escapement estimates are available from 1968 to 1991 and range from 50 to 5,700. Escapement levels have been stable for the most part, with a slight increasing trend and a historical high of 5,700 in 1988.

FACTORS AFFECTING PRODUCTION

Habitat -- Rearing conditions within the Pysht River are largely adequate. The system has a high pool:riffle ratio, with adequate off-channel areas. Riparian vegetation has been extensively altered and is dominated by young stands of red alder. As a result, inadequate long-term recruitment of large woody debris is a serious problem. Elevated stream temperatures have been documented in Green Creek and the lower mainstem by the Lower Elwha S'Klallam Tribe. Like other rivers in the Strait region, the lower mainstem currently has high sediment levels. Tributaries such as Green Creek have huge volumes of sediment stored within the channel. This material is extremely erodible and contributes to persistent levels of fine sediments found in spawning gravel. Aggradation and scour of salmon redds has been documented and is a significant problem. This problem has contributed to the near extirpation of chinook salmon from the basin.

STOCK DEFINITION PROFILE for Pysht Fall Chum

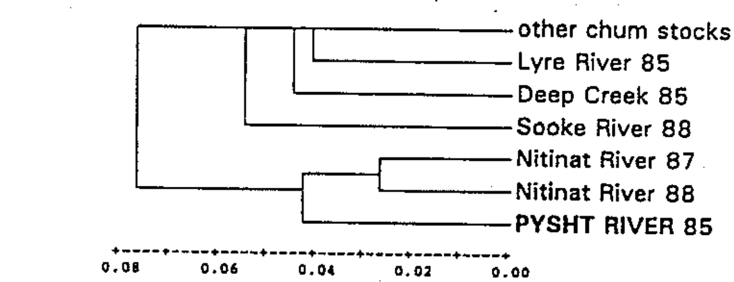
SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**NO**
RIVER ENTRY													**NO**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **YES**

GENETICS - Analysis of collections from 1985, (N=100) and 1991, (N=90) indicated that these fish are significantly different from all other chum collections tested (21-locus G-tests: $p<0.05$).



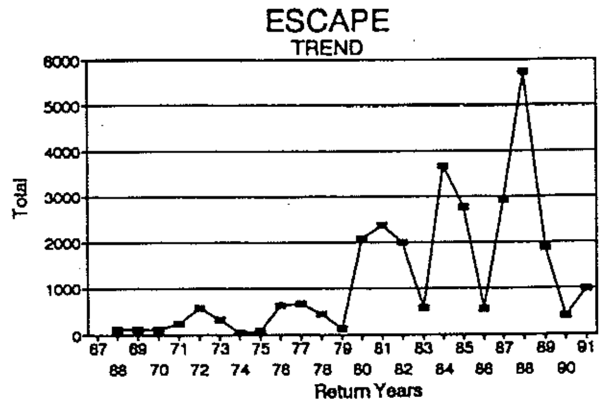
Genetic distance (modified Rogers distance (Wright, 1978) UPGMA)

STOCK STATUS PROFILE for Pysht Fall Chum

STOCK ASSESSMENT

DATA QUALITY-----> Fair

Return Years	ESCAPE Total			
67				
68	130			
69	112			
70	119			
71	242			
72	581			
73	316			
74	51			
75	74			
76	655			
77	691			
78	449			
79	135			
80	2087			
81	2373			
82	1996			
83	584			
84	3665			
85	2778			
86	559			
87	2930			
88	5726			
89	1896			
90	412			
91	985			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Native

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution, Genetics, Timing

STOCK STATUS

Healthy

SCREENING CRITERIA

Although the Pysht River estuary us one of the largest estuaries in the Strait, an important feature for chum salmon, it has been seriously degraded over the years due to siltation from logging-related landslides in the 1950s, subsequent dredging, and mechanical filling for industrial purposes.

Harvest Management -- No fisheries target Pysht River chum salmon. All harvests occur incidentally in other preterminal fisheries, primarily Strait of Juan de Fuca and Puget Sound net fisheries. A small number of fish may also be taken incidental to Strait of Juan de Fuca and Puget Sound recreational fisheries, Canadian fisheries, and in-river steelhead net fisheries.

Hatchery -- There are no records of hatchery planting of chum salmon into this river. Planting of hatchery coho and chinook smolts during the 1950s, 1960s and 1970s and continued planting of hatchery steelhead smolts likely had a significant but unquantified impact on the stock due to predation.

STRAIT OF JUAN DE FUCA -- HOKO/CLALLAM/SEKIU FALL CHUM

STOCK DEFINITION AND ORIGIN

The Hoko/Clallam/Sekiu fall chum salmon stock is isolated from other Puget Sound stocks by geographic separation. Natural chum spawn in all three rivers. The Clallam River enters the Strait on the eastern side of Clallam Bay, and the Hoko River enters about 5.5 miles to the west. The Sekiu River enters the Strait an additional 1.5 miles west of the Hoko River. These rivers were considered close enough to allow gene flow, resulting in a single stock. Until genetic testing is conducted, this stock designation is considered tentative.

Although not much is known about this stock, spawning ground surveys conducted in the 1980s showed significant numbers (200 on December 4, 1984) of chum present in the Hoko River. Chum are known to still be present in all three rivers. This stock spawns from mid-November to mid-December and may spawn somewhat later in December than the Pysht chum to the east.

There are no recorded hatchery releases in these rivers, so these chum are presently considered a native stock.

STOCK STATUS

Escapement information is lacking so no assessment of stock status is available, consequently the status of the stock is Unknown.

FACTORS AFFECTING PRODUCTION

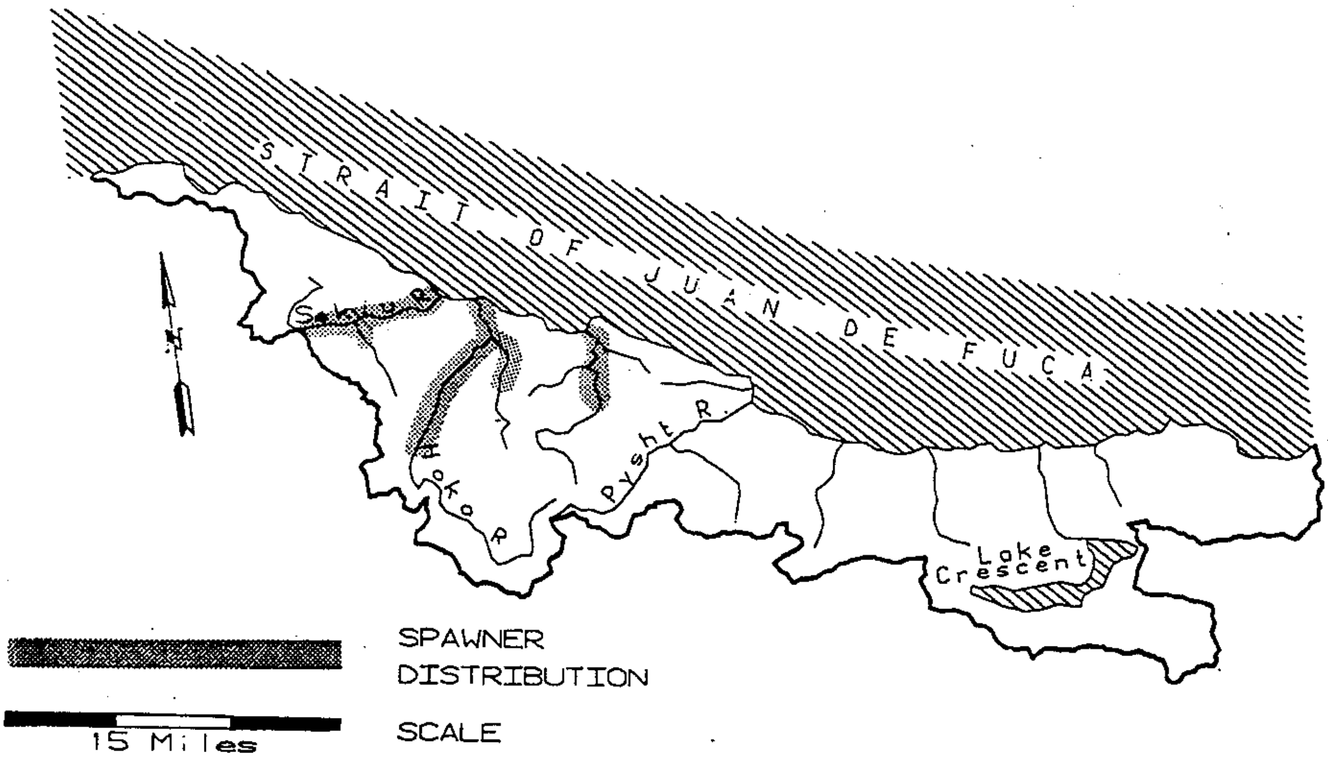
Habitat -- The Hoko River drainage is managed for timber production and has been impacted by past logging practices. The drainage has experienced over 300 mass-wasting events over the past 50 years as shown through the aerial photograph record (Hoko Watershed Analysis 1994). Many of these events originated either in harvested areas on Ellis, Stolzenberg or Sekiu mountains or from poorly constructed and maintained roads.

Virtually the entire drainage was originally harvested to the streambank and much of the drainage is currently being harvested for the second time. Although aerial photographs reveal that most riparian areas were predominately large conifer prior to the first logging, 91 percent of the current riparian stands are now young red alder (Hoko Watershed Analysis 1994). Logjam removal and other instream wood removal was conducted throughout the drainage into the 1970s (Williams et al. 1975), including removal of all wood from the lower Little Hoko River during 1937 (John Cowan, long-time resident, personal communication). The lower Little Hoko River subsequently

STOCK DEFINITION PROFILE for Hoko/Clallam/Sekiu Fall Chum

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**NO**
RIVER ENTRY													**NO**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - **UNK**

GENETICS - No GSI collections have been made from these rivers.

STOCK STATUS PROFILE for Hoko/Clallam/Sekiu Fall Chum

STOCK ASSESSMENT

DATA QUALITY------> No Data

Return Years	NO DATA			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

downcut one to two meters, and the channel is now entrenched within its floodplain. The wood removal from within and adjacent to streams has led to a shortage of in-channel wood throughout the Hoko drainage. On average, only 0.66 pieces of large woody debris per channel width presently exist and most of this is either small alder which rapidly decomposes or decaying residual old growth wood (Hoko Watershed Analysis 1994).

A substantial loss of coho and steelhead egg baskets in the 1990, 1991, and 1992 winters indicates that bedload scour and fill are significant and probably affect survival from egg deposition to fry emergence in many mainstem and tributary areas. Survival is also probably affected by the moderate to high level of fine sediments. A basin average of 14.27 percent fine sediments (<0.85 mm) in seventeen coho and steelhead spawning areas throughout the basin was determined through McNeil core sampling efforts during 1991 (McHenry et al. 1994).

Instream temperatures are also a problem. A thermograph placed at RM 16.6 in 1985 recorded temperatures as high as 73.4 °F (Blum and DiDomenico 1985) and thermographs recorded peak temperatures of 67 °F in the lower mainstem during 1992 and 69 °F in the lower Little Hoko River during 1991 (McHenry et al. 1994).

The drainage also appears to be deficient in steelhead and coho salmon rearing habitat, with pools comprising less than 25 percent of the measured habitat areas (Hoko Watershed Analysis 1994).

Historic landsliding in the upper Clallam basin related to poor logging practices on Ellis Mountain has resulted in a scoured stream channel deficient in woody debris in the upper basin and a sediment-rich aggraded channel in the lower mainstem. Additionally, alteration of the riparian zone by logging and agricultural practices subjects the mainstem to severe heating. The Lower Elwha S'Klallam Tribe has documented water temperatures between 63 to 70 °F for the majority of the summer in 1992 and 1993. Large woody debris is uniformly lacking throughout the basin, and sediment levels are high in the lower mainstem (14 to 22 percent). These impacts may be exacerbated by urbanization and water withdrawals.

The Sekiu watershed has been severely impacted by forest practices, particularly historic Crown-Zellerbach timber harvests in the 1960s and 1970s. During that period the entire drainage was heavily roaded (using substandard practices), and logged to stream edge. In-stream salvage was also apparently heavy as there is very little large woody debris in the system. Road densities are currently high, and landsliding has been frequent in many areas including Sekiu Mountain. The main haul route was constructed essentially in the flood plain of the Sekiu River. This has not only constrained the channel (eliminating off-channel areas) but represents a chronic source of sediment input. As a result of the in-channel wood removal, many channels of the Sekiu system have been scoured to bedrock. The South Fork Sekiu, for example, once was an index for WDFW coho surveys. This reach was eventually abandoned in the early 1980s. Today there are few areas that retain gravel of suitable size for anadromous fish to utilize. While many tributaries have been scoured, the low gradient mainstem is carrying an abundant sediment load.

Harvest Management -- There are no targeted fisheries for this stock of chum salmon. All harvests occur incidentally in other preterminal fisheries, primarily Strait of Juan de Fuca and Puget Sound net fisheries. A small number of fish may also be taken incidental to Strait of Juan de Fuca recreational fisheries, Canadian fisheries, and in-river steelhead net fisheries.

Hatchery -- There are no records of hatchery planting of chum salmon into this river. Planting of hatchery coho and chinook smolts during the 1950s, 1960s and 1970s and continued planting of hatchery steelhead and chinook smolts likely had a significant but unquantified impact on the stock due to predation.

OVERVIEW -- STRAIT OF JUAN DE FUCA COHO STOCKS

CHIMACUM CREEK
DISCOVERY BAY
SEQUIM BAY
DUNGENESS
MORSE CREEK
ELWHA
SALT CREEK
LYRE
PYSHT/TWIN/DEEP
CLALLAM
HOKO
SEKIU/SAIL

STOCK DEFINITION AND ORIGIN

Coho salmon utilize, to some degree, almost all of the accessible tributaries draining into the Strait of Juan de Fuca. Coho salmon returning to these streams typically enter fresh water from mid-September to early November and spawn from late October through January, with some variation observed between streams and between years within streams.

There have been substantial releases of hatchery-origin coho throughout this area, with significant yearling plants from the early 1950s to the early 1970s and irregular fingerling/fry plants, primarily released from the early 1970s to the mid-1980s. There are also annual yearling releases from hatchery facilities on the Dungeness and Elwha rivers and from a pen rearing program in Port Angeles Harbor. It should be noted that many of the early off-station yearling releases were not consistent with current optimal-size and time-of-release strategies, and their subsequent contribution to the wild spawning population is unquantified. Straying rates from the on-station and pen-rearing programs are also unknown, as are the potential survival differentials for the various stocks introduced into this area. Additional to those considerations are questions regarding the spawning success in the wild of hatchery-origin coho and any distinctions between native and introduced stocks in terms of either temporal or physical spawning distributions. As a result of these uncertainties, all of the stocks in this area have been designated as a probable mixture of native and non-native stocks, without any inference as to the relative influence of those stocks within the current populations. There can be no confident quantification of the genetic impact of non-native stock introductions, regarding either a current presence of hatchery components in these populations or hybridization of the native stock, until an effective genetic research tool is developed and implemented for coho salmon.

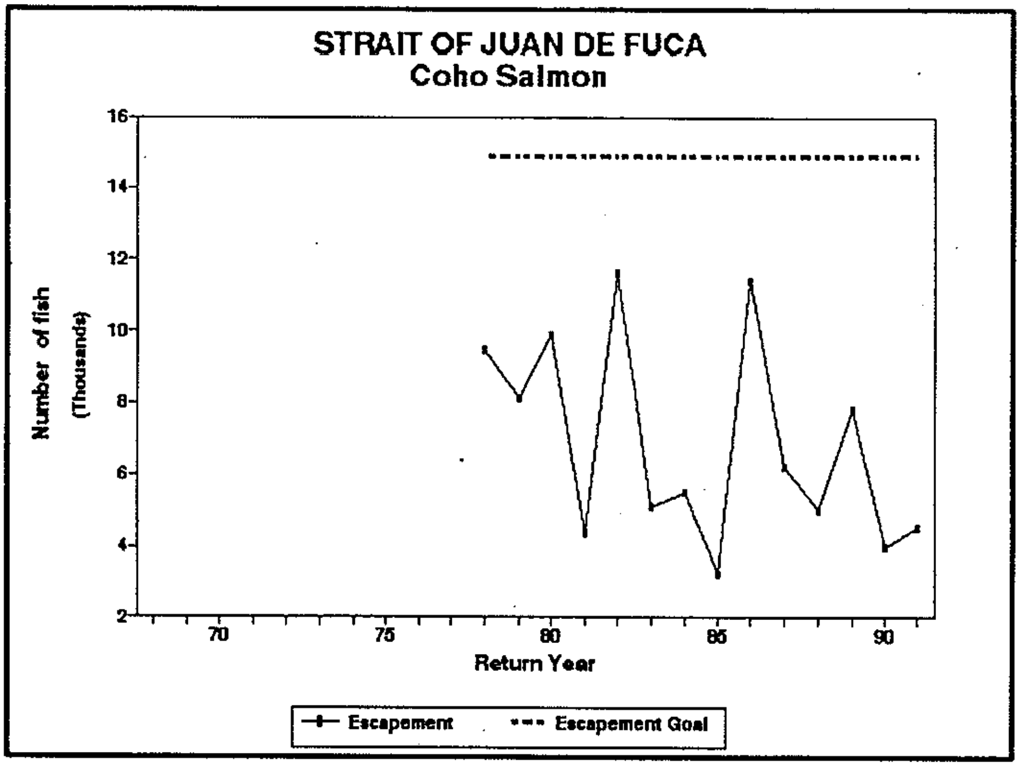
Given that there is no specific genetic determinant (GSI data) available and that there are no significant timing differences or any unique biological characteristics documented for these stocks, their distinction is primarily dependent upon geographic spawning separation. Those distinctions are the result of subjective judgments regarding the probability of significant spawner interchange between drainages. Differences in off-station planting histories are assumed to result in dissimilar stock impacts, so those differences, where present, have provided secondary support for stock distinction based on geographic separation. Until genetic distinctions are available, these stock designations are tentative.

STOCK STATUS

Strait-origin coho salmon are primarily harvested in Canadian and Washington troll, net and sport fisheries. There are in-river treaty commercial and non-treaty recreational fisheries each year in the Elwha River. A commercial net fishery occurs in Dungeness Bay (Area 6D). In the Dungeness River there are non-treaty recreational and treaty subsistence (hook-and-line) fisheries. Occasionally treaty commercial fisheries may be authorized in the Dungeness River, to harvest surplus hatchery coho salmon.

The natural escapement goal for all Strait tributaries (including Admiralty Inlet independent tributaries) is 14,900, based on available summer rearing habitat. The escapement data base shows escapement estimates from 1978 to present fluctuating over a broad range with escapements consistently below goal. Individual stock performance evaluation is dependent upon relatively limited stock assessment data bases (generally dating back to the early to mid-1980s) which provide no indication of present production's relationship with historic levels. These data cannot describe any short-term declines or chronically low escapements in relation to historic production levels. So even stocks deemed healthy in this basin should be closely monitored in the future. The Discovery Bay coho stock has exhibited an escapement decline severe enough to warrant classification as Critical. Sequim Bay, Dungeness River, Morse Creek, Pysht River and Sekiu River coho stocks all demonstrate short-term severe declines in their escapements, indicating cause for concern. The remainder of the stocks in this area have been relatively stable since the mid-1980s or the data have not sufficiently conclusive to suggest classification as a stock of concern. There are no data available for the Lyre River stock, so this stock's status is Unknown.

The figure below, which illustrates natural coho escapement trends in this region, is derived from the WDFW escapement data base. It should be noted that data prior to 1978 have been removed because of a general lack of confidence in their accuracy and questions regarding their true relationship with the later data.



STRAIT OF JUAN DE FUCA -- CHIMACUM CREEK COHO

STOCK DESCRIPTION AND ORIGIN

The Chimacum Creek coho salmon stock has been defined because of its distinct spawning distribution. Other than the Chimacum Creek system, streams in this area tend to be short with limited coho-rearing habitat. Chimacum Creek is quite isolated from any of the surrounding streams. This stock periodically displays large spawning peaks in January which may also support its designation as a separate stock. Spawning is typically from early November to late January. This stock does not exhibit any other documented unique biological characteristics.

There have been significant off-station coho releases into the Chimacum Creek system since 1960. Dungeness yearlings were planted there in 1960, 1965, 1967, 1970 through 1972, 1979 and 1981. Green River stock yearlings were released in 1964 and Minter Creek stock in 1976. Off-station fingerling/fry plants have been consistent since 1977. Quilcene stock was used in 1977 and 1985 through 1990, while Dungeness fish have been planted in the remaining years. This stock is likely a mixture of the native and introduced non-native stocks.

STOCK STATUS

The status of this stock is Healthy.

Escapement data are available for Admiralty Inlet, however, they include data for minor tributaries on Whidbey Island and the northern Kitsap Peninsula as well as for this stock. Good escapement index data are available for Chimacum Creek dating back to 1983, and cumulative redd count information is good back to 1984. Given that this stock is the primary coho producer in Admiralty Inlet, the escapement data probably best represent this stock's production trends.

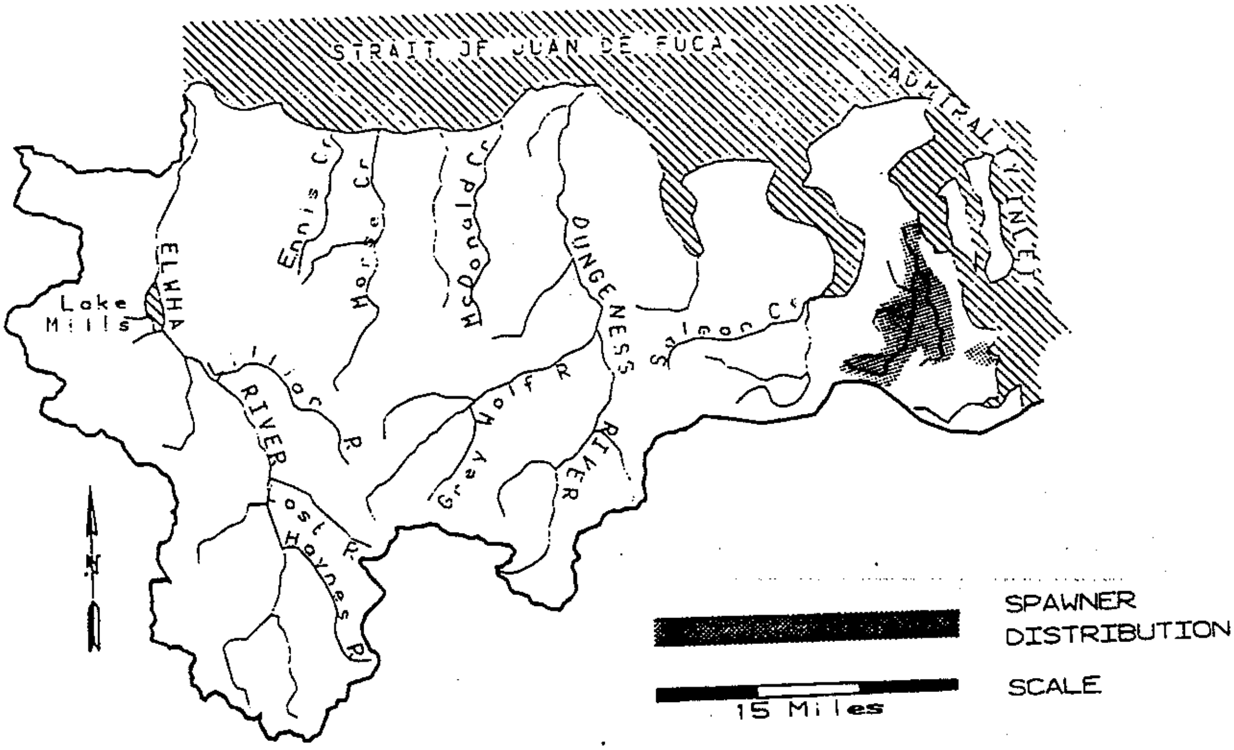
FACTORS AFFECTING PRODUCTION

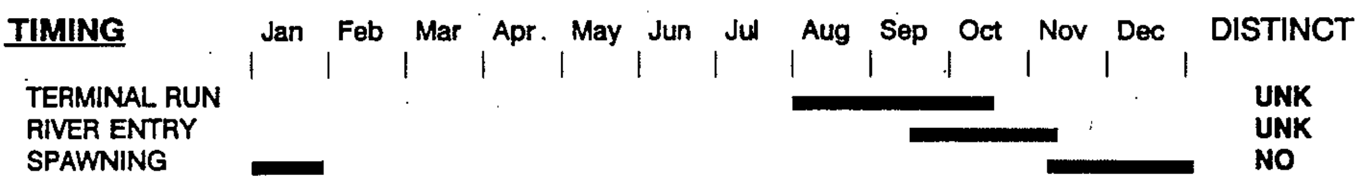
Habitat -- Chimacum Creek is a watershed of low gradient that has been subjected to extensive agricultural development. Riparian cover has been removed, and virtually the entire middle section of the creek has been dredged or channelized to protect the surrounding farmland from flooding. Cattle have been allowed to graze in and around the stream. The lack of complex riparian vegetation, a low pool:riffle ratio in the creek, lack of large woody debris and agricultural pollution have all contributed to the reduction in coho salmon productivity in this creek. High stream temperatures during critical low flow periods (summer and fall) are also of concern.

Harvest Management -- No distribution or harvest contribution rate information is currently available for this stock. It is assumed that Chimacum coho salmon are

STOCK DEFINITION PROFILE for Chimacum Creek Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**





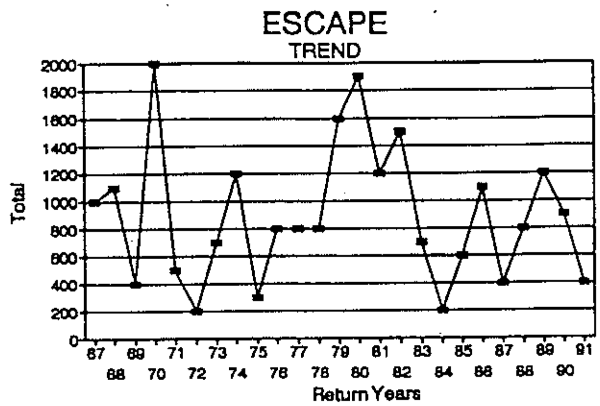
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

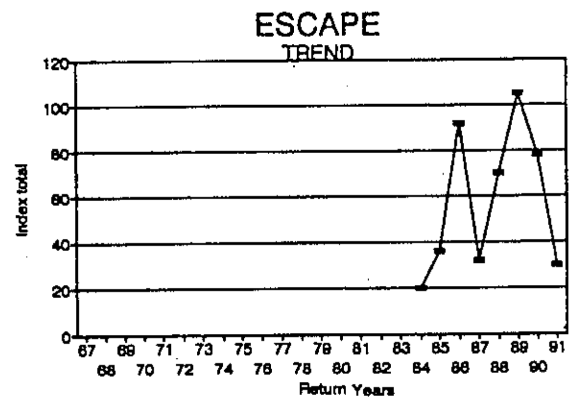
STOCK STATUS PROFILE for Chimacum Creek Coho

STOCK ASSESSMENT

DATA QUALITY-----> Good

Return Years	ESCAPE Total	ESCAPE Index total	ESCAPE Fish-days	
67	1000			
68	1100			
69	400			
70	2000			
71	500			
72	200			
73	700			
74	1200			
75	300			
76	800			
77	800			
78	800			
79	1600			
80	1900			
81	1200			
82	1500			
83	700		330	
84	200	20	79	
85	600	36	257	
86	1100	92	691	
87	400	32	547	
88	800	70	358	
89	1200	105	511	
90	900	78	597	
91	400	30	75	





AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Composite

STOCK DISTINCTION
Distribution

STOCK STATUS
Healthy

SCREENING CRITERIA

incidentally harvested in preterminal commercial and recreational fisheries directed at mixed stocks or other species in both the U.S. and Canada. No terminal or freshwater fisheries occur on this stock.

Hatchery -- Significant releases of hatchery coho salmon have occurred in this creek, as noted above. In addition, a local high school has operated a small, educational hatchery program in Chimacum Creek since the early 1970s. What impacts these hatchery releases have had on the wild stock are unknown.

STRAIT OF JUAN DE FUCA -- DISCOVERY BAY COHO

STOCK DEFINITION AND ORIGIN

The Discovery Bay coho salmon stock does not demonstrate a distinct temporal distribution, with most spawning occurring from late October to early January in Snow and Salmon creeks. Distinct biological characterizations have not been documented for this stock. We believe there is insignificant straying from surrounding drainages into these tributaries, so the stock is defined by its distinct spawning distribution.

Relatively small numbers (35,000 to 88,000 juveniles per year) of Dungeness Hatchery-origin coho were released into Discovery Bay tributaries in 1965, 1968, 1969, 1970 and 1971. This stock is likely a mixture of the native stock and non-native stocks introduced into these drainages.

STOCK STATUS

The status of the Discovery Bay coho stock is Critical.

Snow Creek has been the subject of an intensive coho production study by the Washington Department of Wildlife, and those results provide an indication of this stock's production trend.

Snow Creek escapement counts in 1988 and 1991 are the lowest in the data base, indicating a short-term severe decline. These two counts are brood-related (as is the previous low, observed in 1985), however, since 1985, Snow Creek parent broods have not produced replacement escapements.

FACTORS AFFECTING PRODUCTION

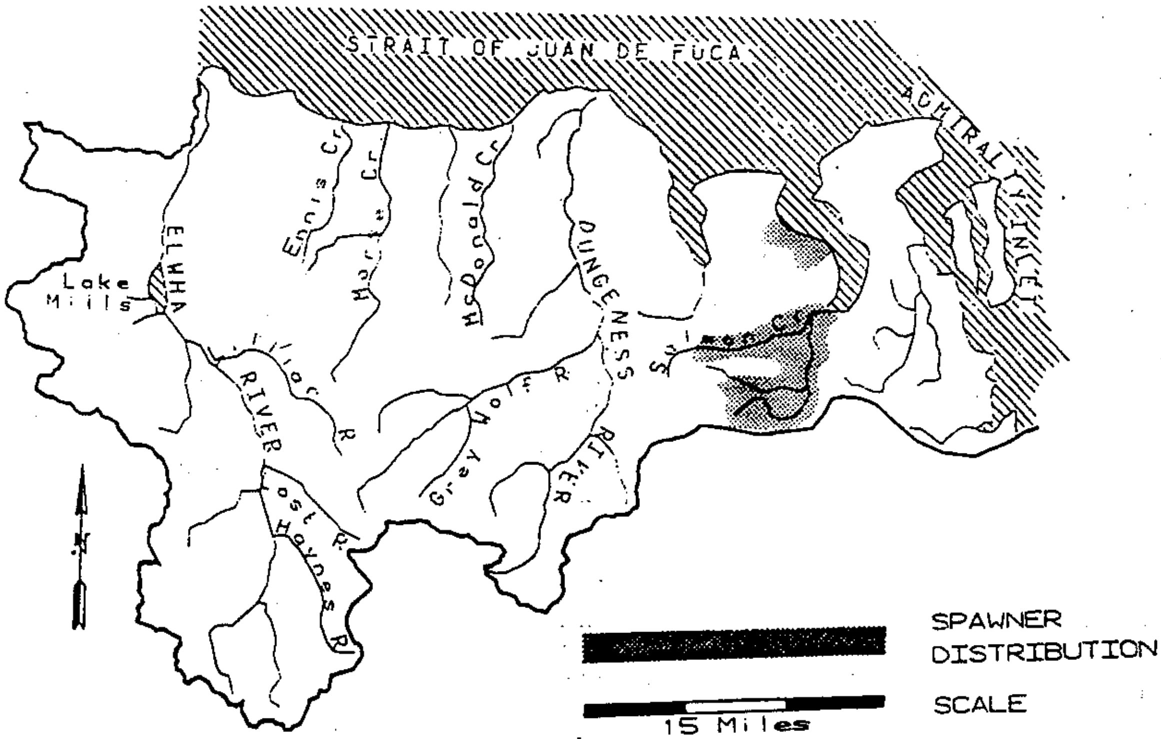
Habitat -- Snow and Salmon creeks are fairly small streams with gentle gradients near their mouths and moderate to steep gradients for the remainder of the stream length. Natural limiting factors in fresh water for this stock include high flows and sedimentation, both of which have increased in recent years primarily due to accelerated and extensive logging in each upper watershed. Habitat composition, substrate composition and amount and distribution of large wood in the stream has likely changed as a result of changes in flow patterns. The logging-generated impacts should lessen as most of the logging has been completed and regrowth is beginning. Grazing impacts occur in the lower Snow and Salmon Creeks.

Streamside habitats in the lower sections of Snow and Salmon creeks have been impacted by landuse activities. For example, Nelson et al. (1992) reported that 50 percent to 75 percent of the streambanks were bare and eroding along a section of Snow Creek even though an overstory canopy was present. Fencing of the stream

STOCK DEFINITION PROFILE for Discovery Bay Coho

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



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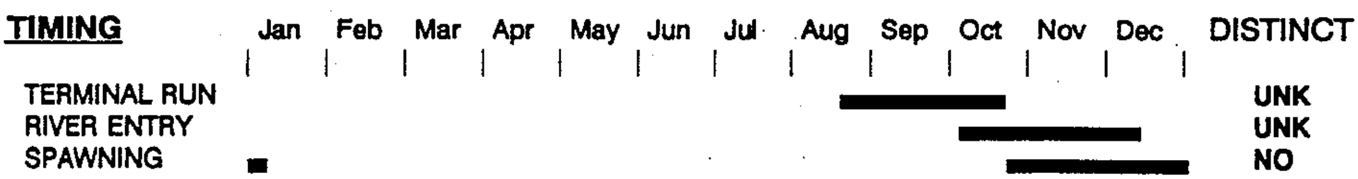


BIOLOGICAL CHARACTERISTICS

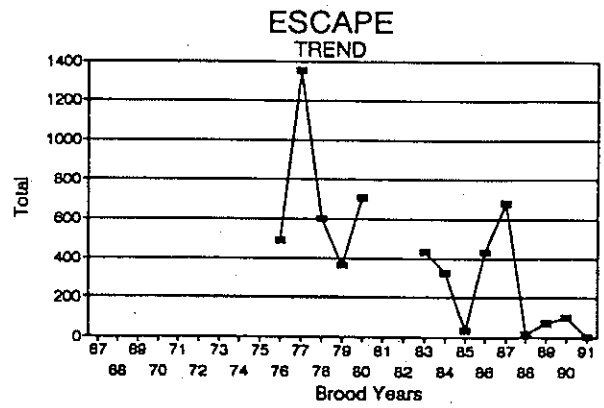
DISTINCT? - **NO**

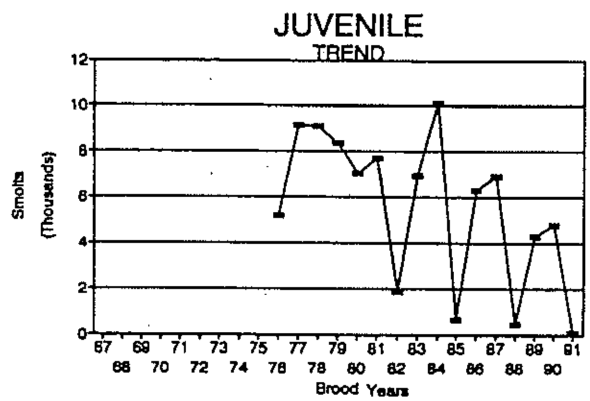
STOCK STATUS PROFILE for Discovery Bay Coho

STOCK ASSESSMENT

DATA QUALITY------> Very Good

Brood Years	ESCAPE Total	JUVENILE Smolts		
67				
68				
69				
70				
71				
72				
73				
74				
75				
76	488	5201		
77	1357	9156		
78	601	9090		
79	367	8344		
80	709	7048		
81		7700		
82		1871		
83	432	6947		
84	326	10113		
85	36	641		
86	432	6296		
87	681	6915		
88	17	448		
89	73	4300		
90	104	4787		
91	4	117		





AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Critical

SCREENING CRITERIA
Short-Term Severe Decline

corridors to reduce livestock access and use would probably improve the condition of both the stream banks and streamside vegetation and reduce a potential source of bacterial contamination. The lower section of Salmon Creek was fenced in 1993 in a cooperative effort between a local landowner and the Soil Conservation Service.

Low summer flows, reduced pool volume, diminished overwinter habitat, loss of lake habitat and migration blockages also affect coho spawning and survival in these streams.

Harvest Management -- No stock-specific information is available. Impacts are assumed to be similar to those observed for the Dungeness coho, except that this stock is not subject to any directed commercial or recreational fisheries so it likely experiences a lower harvest rate.

Hatchery -- There are no hatchery facilities in the general vicinity. Hatchery releases into this stream are noted above, however their effect on the production of this stock is unknown.

STRAIT OF JUAN DE FUCA -- SEQUIM BAY COHO

STOCK DEFINITION AND ORIGIN

The Sequim Bay coho salmon stock does not demonstrate a distinct temporal distribution, with most spawning occurring from late October to early January. Distinct biological characterizations have not been documented for this stock. We believe there is insignificant straying from surrounding drainages into these tributaries, so the stock is defined by its distinct spawning distribution.

This area received substantial off-station yearling releases between 1952 and 1971, primarily of Dungeness stock (in all years but 1956, 1961, 1962 and 1968). The other yearling plants utilized Green River (1956, and 1966) and Skagit (1961) stocks. There have been sporadic off-station fingerling releases between 1953 and 1985, almost all using Dungeness fish. This stock is likely a mixture of the native stock and non-native stocks introduced into these drainages.

STOCK STATUS

The status of the Sequim Bay coho stock is Depressed.

There are good escapement index data available back to 1979 and sporadic cumulative redd counts back to 1984.

Jimmycomelately Creek escapement index data in 1988 and 1991 are the lowest in the data base, indicating a short-term severe decline. These two estimates are brood-related.

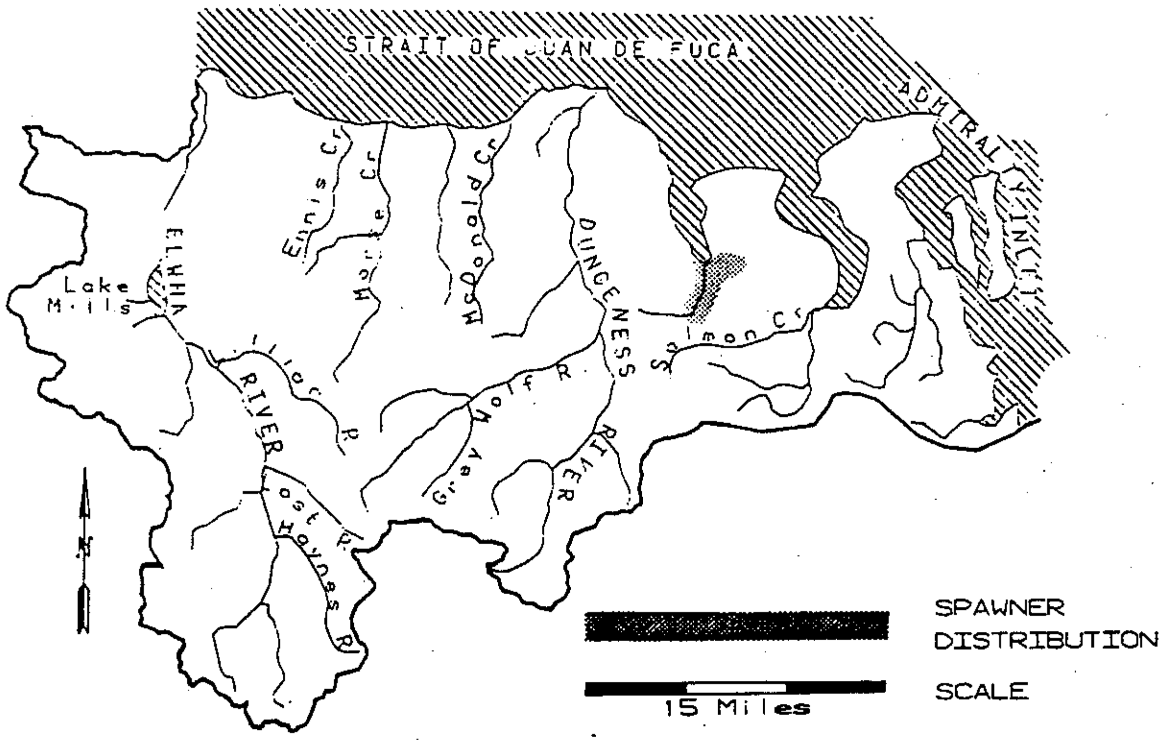
FACTORS AFFECTING PRODUCTION

Habitat -- Historically, natural production has been limited by flooding and sedimentation. Today, forest practices have impacted freshwater and estuarine habitat, but quantitative data are lacking. Access to spawning and rearing habitat in Jimmycomelately Creek has been reduced by the improper placement of culverts during road construction. A log-rafting dump in the southwest corner of Sequim Bay has impacted the associated nearshore rearing area and deposited leachates on the bay floor. An irrigation ditch outfall has caused extensive erosion and sedimentation in Johnson Creek, degrading spawning and rearing habitat for coho salmon production. A marina was built along the west shoreline of Sequim Bay in the 1980s. What effect this development has had on Sequim Bay coho salmon production is unknown. Agriculture has impacted the western Sequim Bay tributaries through the removal of riparian vegetation and grazing in and along stream banks.

4STOCK DEFINITION PROFILE for Sequim Bay Coho

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



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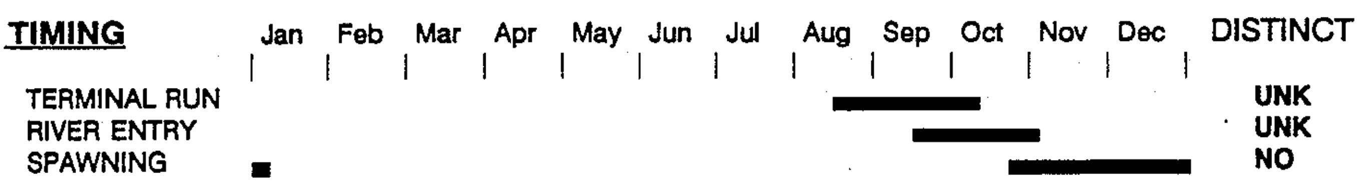


BIOLOGICAL CHARACTERISTICS

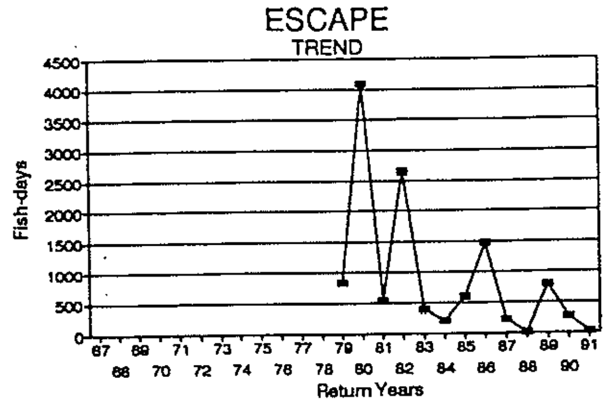
DISTINCT? - **UNKNOWN**

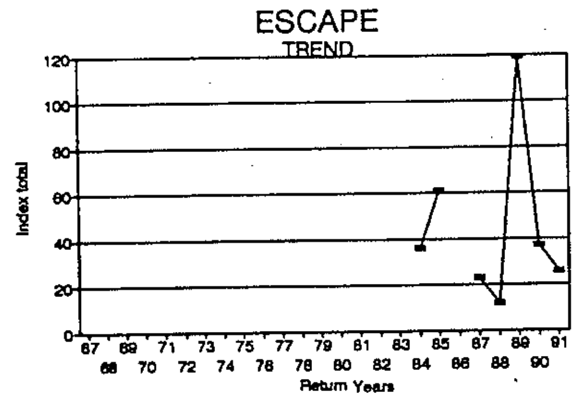
STOCK STATUS PROFILE for Sequim Bay Coho

STOCK ASSESSMENT

DATA QUALITY-----> Good

Return Years	ESCAPE Fish-days	ESCAPE Index total		
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79	828			
80	4088			
81	539			
82	2657			
83	389			
84	214	36		
85	598	61		
86	1478			
87	223	23		
88	10	12		
89	796	119		
90	261	37		
91	29	26		





AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Short-Term Severe Decline

Harvest Management -- No stock-specific information is available. Impacts are assumed to be similar to those observed for the eastern Strait coho, except that this stock is not subject to any directed commercial or recreational fishing, so it likely experiences a lower harvest rate.

Hatchery -- There are no rearing facilities in the general vicinity. Hatchery releases into Jimmycomelately Creek have been noted above. Additionally, the Dungeness Hatchery, located immediately west of Sequim Bay, has been releasing an average of about 600,000 salmon annually since 1985. The effect of those releases on the Sequim Bay coho stock is unknown.

STRAIT OF JUAN DE FUCA -- DUNGENESS COHO

STOCK DEFINITION AND ORIGIN

The Dungeness coho salmon stock does not demonstrate a unique temporal distribution, with most spawning occurring from November to early January. Distinct biological characteristics associated with this stock have not been identified at this time. This stock is defined on the basis of geographic segregation, assuming limited straying from other regions into these drainages.

Streams in this area have been heavily planted with hatchery coho. Between 1952 and 1981 there were annual off-station yearling releases within the area. The most consistent yearling plants were made in Hurd Creek with occasional releases into Canyon, Bell and Gierin creeks and the Gray Wolf River. Dungeness stock yearlings were released in all years of that period except 1956. There were also two off-station plants of Green River yearlings (1956 and 1966) and one each of Nooksack (1966), Toutle (1973) and Puyallup (1980) stocks. There have been annual on-station yearling releases into the Dungeness River since 1902. Releases of Elwha hatchery coho fry were made into the Dungeness in 1978 and 1979; Elwha yearlings were released into the Dungeness in 1982. There have been significant off-station fingerling releases in this area from 1952 to present, utilizing Dungeness stock almost exclusively. Fingerling releases over the last ten years were intended to supplement underescaped areas and repopulate areas opened by passage projects or areas undergoing habitat rehabilitation. This stock is likely a mixture of the native stock and the introduced non-native stocks.

STOCK STATUS

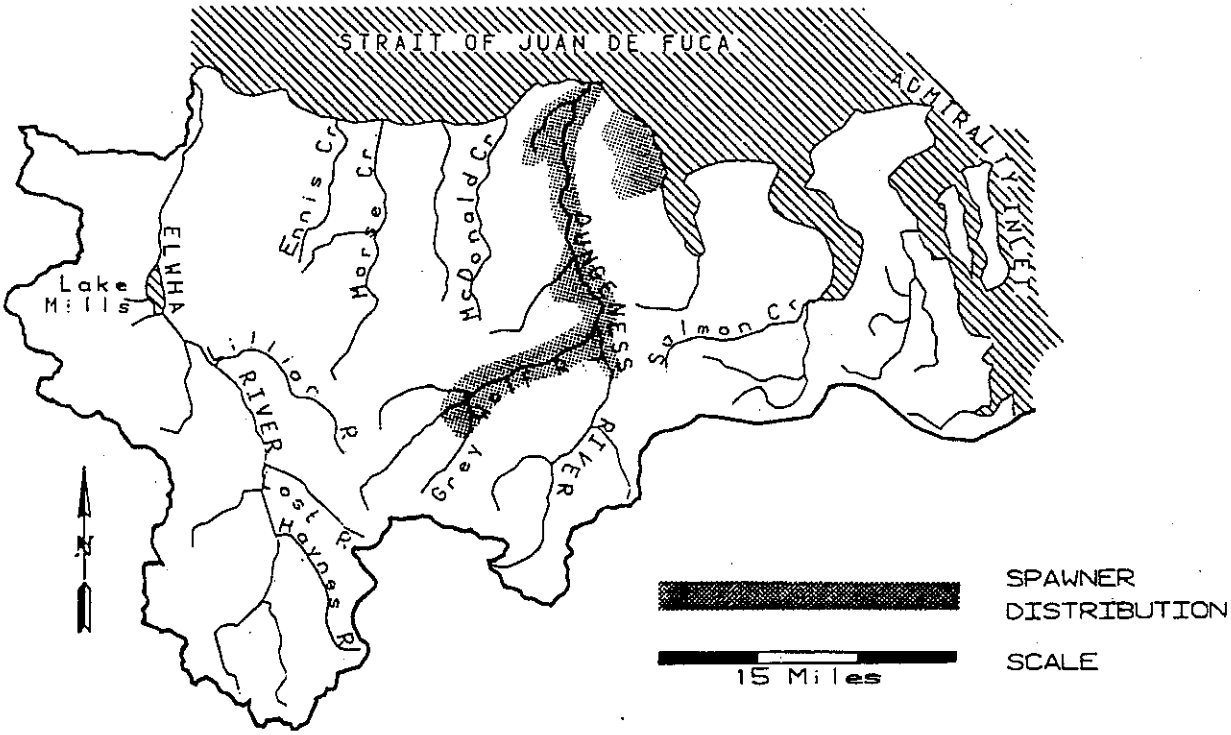
The status of the Dungeness coho stock is Depressed.

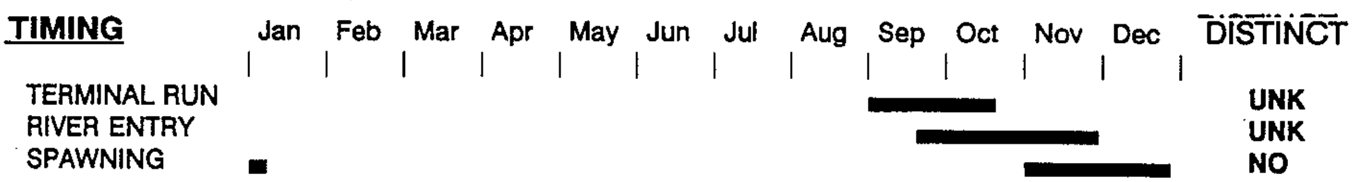
We have no coho escapement indices in the area, so the Dungeness River data set is used to represent this stock's production trend. This data set is based on Morse Creek and Sequim Bay stock observations, so its adequacy in describing the production of this stock is dependent on the degree to which Morse Creek and Sequim Bay data track Dungeness trends.

Escapements in three of the last five years have been at or below the previous historic low of 1985, indicating a short-term severe decline.

STOCK DEFINITION PROFILE for Dungeness Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**





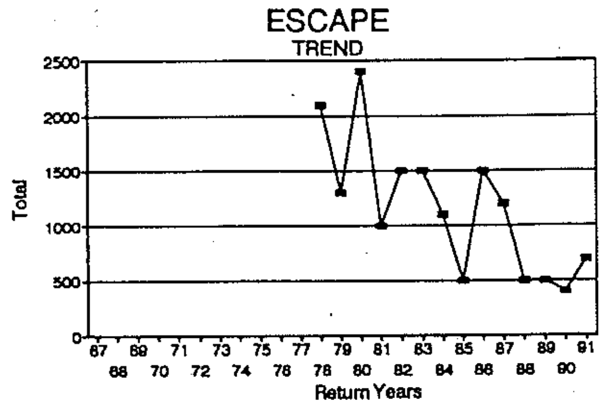
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

STOCK STATUS PROFILE for Dungeness Coho

STOCK ASSESSMENT

DATA QUALITY-----> Fair

Return Years	ESCAPE Total			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78	2100			
79	1300			
80	2400			
81	1000			
82	1500			
83	1500			
84	1100			
85	500			
86	1500			
87	1200			
88	500			
89	500			
90	400			
91	700			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Composite

STOCK DISTINCTION
Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Short-Term Severe Decline

FACTORS AFFECTING PRODUCTION

Habitat -- The Dungeness River is located in a rain shadow of the Olympic Mountains and receives little annual precipitation (<20 inches). Water flow in the river is dependent primarily upon snow melt. Water withdrawals for irrigation substantially reduce river flows during the low-flow period (August through October), which coincides with river entry and the beginning of coho spawning in the Dungeness River.

Human activities associated with agriculture, urban development and forest practices have caused gravel aggradation and river channelization in the middle and lower sections of the river. Low water flows through braided channels create barriers to migrating adults, increase the water temperature to marginal levels and reduce available spawning habitat. Diking for flood control has exacerbated impacts from high-water events by confining the energy of the river. Shifting bedloads kill incubating salmonid eggs and alevins during high-flow events in the fall and winter.

Fish habitat impacts throughout the watershed have adversely affected the marine estuary which provides important transitional habitat for juvenile coho salmon migrating to sea.

Harvest Management -- Dungeness River coho are primarily harvested in Canadian troll, net and sport fisheries and in Washington net and sport fisheries. In 1989, 63 percent of the harvest occurred in Canadian fisheries and 37 percent in Washington fisheries. In the preterminal areas, the harvest rates on these coho are determined by the needs for other stocks of coho or by other species. In the terminal area, Dungeness Bay and the Dungeness River, the harvest rate is set to take the full hatchery coho surplus, therefore natural production is limited.

Although marine survival cannot be measured for the naturally-produced coho from the Dungeness River, it is probable that the harvest rate is well above the optimum for this stock.

Hatchery -- There is a large coho rearing and release program on the Dungeness River. Effects of the juvenile hatchery coho resulting from competition and predation on the wild stock are unknown.

Last ten years salmon releases into the Dungeness basin.

Release Year	Spring Chinook	Fall Chinook	Coho	Pink
1982	26,600	0	4,661,652	0
1983	0	0	0	0
1984	0	0	721,000	0
1985	0	0	669,100	0
1986	0	0	499,400	0
1987	0	0	1,400,200	0
1988	0	0	336,700	27,200
1989	0	1,981,000	815,206	0
1990	0	0	423,414	0
1991	0	0	361,829	0
MEAN			1,098,722	

STRAIT OF JUAN DE FUCA -- MORSE CREEK COHO

STOCK DEFINITION AND ORIGIN

This stock includes coho salmon spawning in Morse, McDonald and Siebert creeks. The Morse Creek coho salmon stock does not demonstrate a unique temporal distribution, with most spawning occurring from November to early January. Distinct biological characteristics associated with this stock have not been identified at this time. This stock is defined on the basis of geographic segregation, assuming limited straying from other regions into these drainages.

Streams in this area have been heavily planted with hatchery coho. Hatchery yearlings were periodically released within the area between 1952 and 1981, with the most consistent plants being made in Morse, McDonald and Siebert creeks. Dungeness-stock yearlings were released in all years of that period except 1953, 1956, 1959 to 1961, 1963, 1964, 1966, 1968 and 1974 to 1976. There were also two plants of Green River yearlings (1956 and 1966) and Toutle River stock (1973 and 1974) and one of Minter Creek (1976) stock. Extended-reared coho, from a net pen program in the Port Angeles harbor since 1981, may also contribute to spawning in Morse, McDonald and Siebert creeks through straying. Sol Duc coho salmon stock was used in the initial release from that program, but local stocks have been used subsequently. There have been occasional off-station fingerling releases in this area from 1978 to the present, utilizing ~~Dungeness~~ stock exclusively. Fingerling releases over the last ten years were intended to supplement underescaped areas and repopulate areas opened by passage projects or areas undergoing habitat rehabilitation. This stock is likely a mixture of the native stock and the introduced non-native stocks.

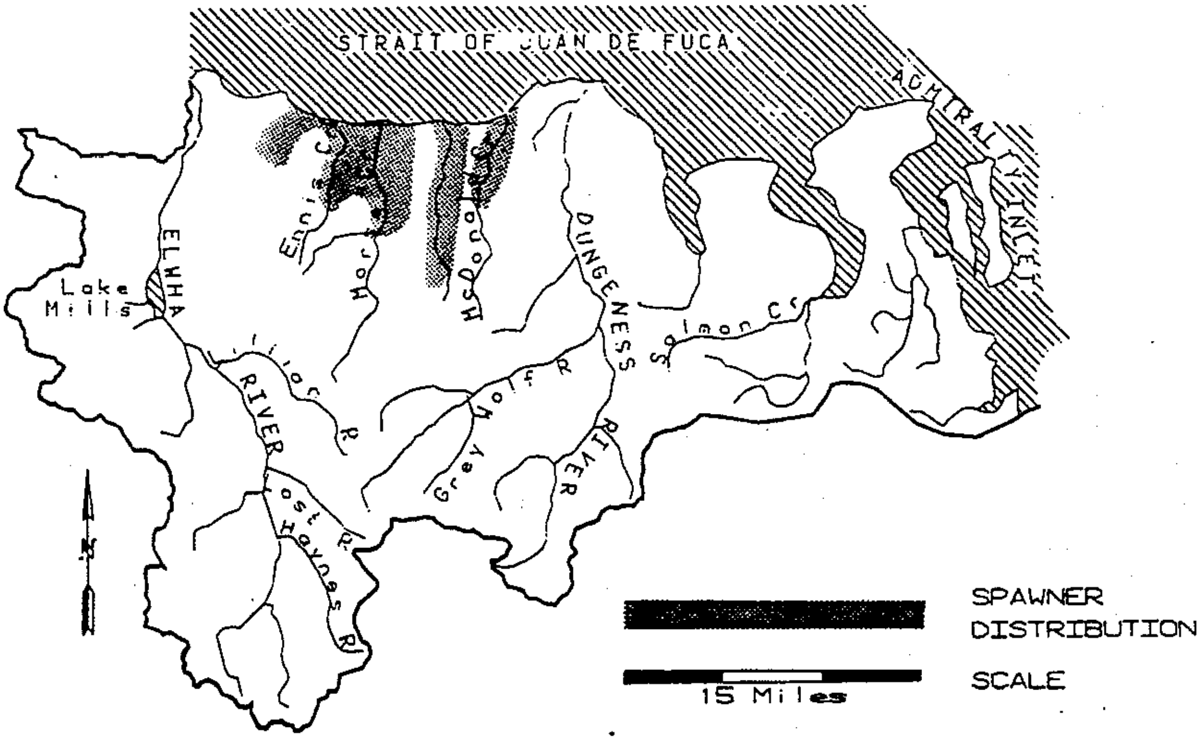
STOCK STATUS

The status of Morse Creek coho is Depressed.

Surveys of Morse Creek were begun recently and are being continued by the Lower Elwha S'Klallam Tribe. To date, not enough data from Morse Creek are available to assess stock status directly. There are good escapement index data and cumulative redd counts back to 1984 for both McDonald and Siebert creeks. These escapement data have been used to represent the Morse Creek coho stock production trend. Escapement data prior to 1984 are not useful because of the probable contribution of off-station yearling plants. Escapements, based on total redd counts, in 1987 and 1990 were below the previous historic low of 1985, indicating a short-term severe decline. These years are brood-related, and this is a relatively short data base, so continued monitoring is needed.

STOCK DEFINITION PROFILE for Morse Creek Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**NO**

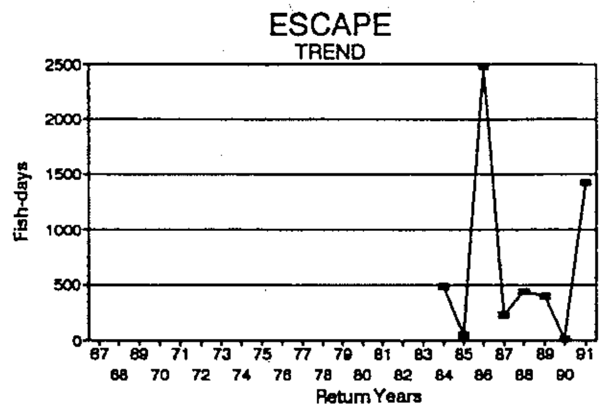
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

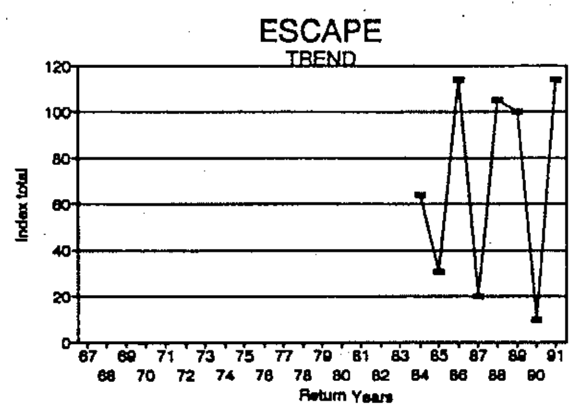
STOCK STATUS PROFILE for Morse Creek Coho

STOCK ASSESSMENT

DATA QUALITY------> Fair

Return Years	ESCAPE Fish-days	ESCAPE Index total		
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84	489	64		
85	45	31		
86	2481	114		
87	233	20		
88	441	105		
89	398	100		
90	7	10		
91	1427	114		





AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Short-Term Severe Decline

FACTORS AFFECTING PRODUCTION

Habitat -- In Morse Creek itself, habitat has been severely impacted due to: 1) loss of estuarine environment resulting from dredging and filling of the near shore area; 2) channelization of the lower river with rip rap and levees through the residential area; 3) loss of cover; 4) landslides from poor road construction; 5) low summer flow conditions above a hydropower facility, and; 6) potential changes in the temperature regime due to operation of the hydropower facility. In the other two primary contributors to this stock, McDonald Creek and Seibert Creek, habitat has been impacted by agriculture, some logging, community growth and upstream passage blockages during low water conditions at the Highway 101 culverts. Port Angeles Harbor streams have been heavily impacted by urban development.

Harvest -- There are no directed in-river coho fisheries in any of these creeks. Some coho may be taken incidental to tribal steelhead fisheries in Morse Creek, but effort has been extremely low in recent years due to poor steelhead returns. A substantial sport fishery is located near the mouth of Morse Creek, off Ediz Hook, which likely harvests some returning fish. Coho are also taken in net, troll and sport fisheries in the ocean, North Puget Sound and South Puget Sound as well as in Canadian troll, sport and net fisheries, but specific contributions of the Morse Creek stock to these fisheries are unknown.

Hatchery -- Releases of hatchery yearlings and fingerlings into these streams has undoubtedly had an affect on these stocks, hence the mixed-origin status. In addition, strays from the Port Angeles net pens likely enter into the Morse Creek group streams to spawn. Finally, plants of hatchery yearling steelhead may have an impact on coho fingerlings rearing in Morse Creek.

STRAIT OF JUAN DE FUCA -- ELWHA COHO

STOCK DEFINITION AND ORIGIN

The Elwha coho salmon stock does not demonstrate a unique temporal distribution, with most spawning occurring from November to early January. Distinct biological characteristics associated with this stock have not been identified at this time. This stock is defined on the basis of geographic segregation, assuming limited straying from other regions into this drainage.

The Elwha River stock is of mixed origin with composite production

The Elwha River system has been heavily planted with hatchery coho. Hatchery yearlings were periodically released between 1952 and 1971, with Dungeness stock released in 1952 through 1954, 1963, 1965, and 1969 through 1971. There was also a plant of Green River yearlings in 1956. There have been annual yearling releases in the Elwha since the WDFW and Tribal facilities came on line (1976). There have been relatively few off-station fingerling releases in this area from 1955 to present, and they have utilized Dungeness and Elwha stocks almost exclusively. Recent fingerling releases have been minimal and have been primarily directed towards evaluating habitat production above the dams and migration trends through the reservoir and hydropower facilities.

Due to the nature of the facilities and the river, homing of returning adults back to the hatchery rack is limited, and many fish stray into the river and spawn. In addition, there is no attempt or ability to differentiate between natural- and hatchery-origin coho during the hatcheries' brood stocking activities, hence the composite production status of the stock.

STOCK STATUS

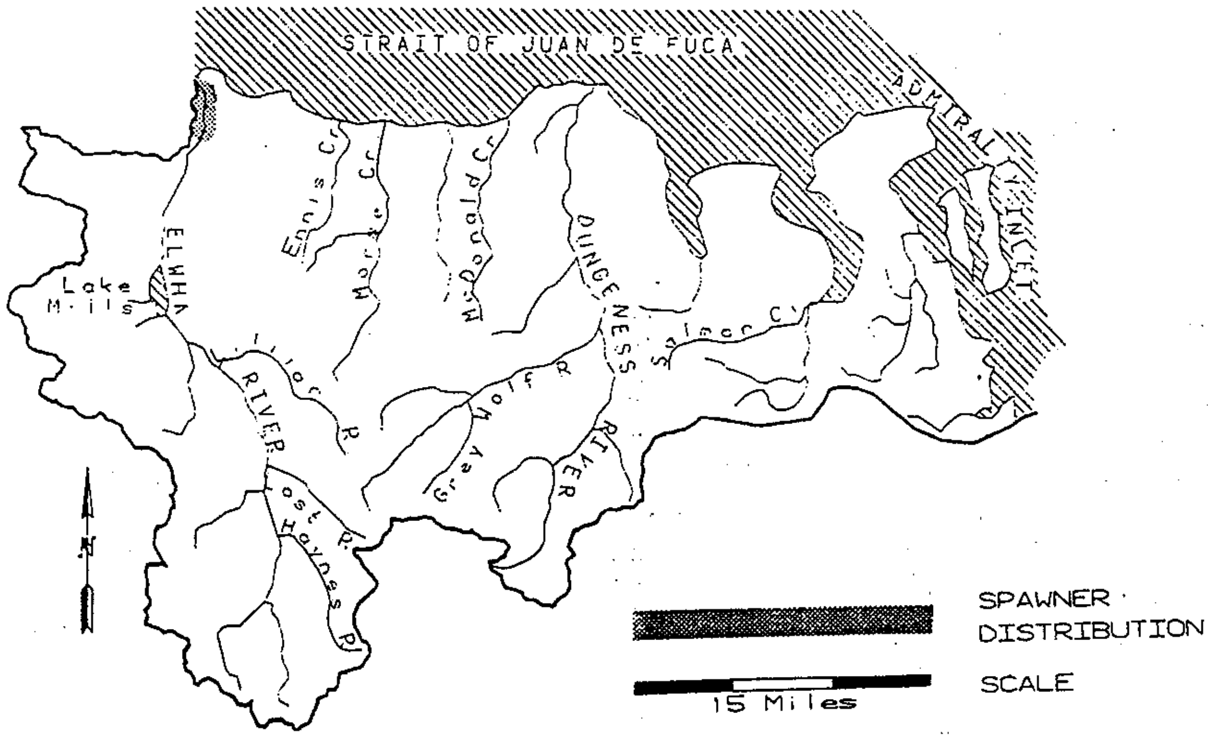
Stock status is Healthy, as escapement goals have been reached or exceeded in recent years.

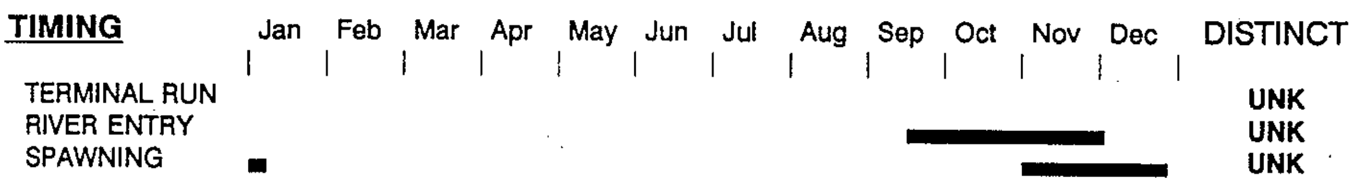
The escapement goals are 1,250 hatchery fish and 250 natural spawners. Stock status is based upon the observed escapement of hatchery spawning fish, as the stock is a composite production unit.

Escapements in the last three years have been at the previous historic low, indicating a short-term severe decline. This stock has been classified as Healthy, in spite of these escapements, because escapements of this magnitude have been observed four times previously in the data base, and estimated run sizes for the last three years have not dropped below the previous low in 1969.

STOCK DEFINITION PROFILE for Elwha Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**





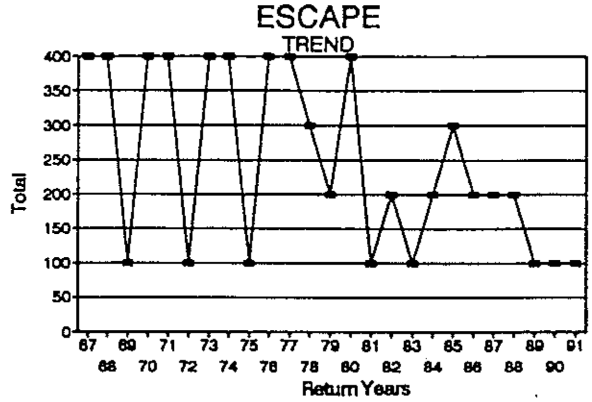
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

STOCK STATUS PROFILE for Elwha Coho

STOCK ASSESSMENT

DATA QUALITY——> Fair

Return Years	ESCAPE Total			
67	400			
68	400			
69	100			
70	400			
71	400			
72	100			
73	400			
74	400			
75	100			
76	400			
77	400			
78	300			
79	200			
80	400			
81	100			
82	200			
83	100			
84	200			
85	300			
86	200			
87	200			
88	200			
89	100			
90	100			
91	100			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Mixed

PRODUCTION TYPE

Composite

STOCK DISTINCTION

Distribution

STOCK STATUS

Healthy

SCREENING CRITERIA

In-river harvests have declined from a high of nearly 25,000 in 1980 to a low of 1,100 in 1992. However, it should be cautioned that this decline does not necessarily indicate a change in stock status and could be caused by any number of factors, including changes in pre-terminal harvest patterns or changes in ocean survival.

FACTORS AFFECTING PRODUCTION

Habitat -- Natural spawning of this stock is limited to the lower 4.9 miles of the river due to the presence of two impassible dams. What spawning habitat exists has been degraded by the loss of the natural recruitment of gravel into the lower river due to the dams. This stock may be vulnerable to mortality as the result of *Dermocystidium* outbreaks during drought conditions. These outbreaks are apparently tied to excessively high water temperatures (70+ °F, documented by the Lower Elwha S'Klallam Tribe). Warm water is the result of thermal stratification in the reservoirs followed by spills from the warmer upper water layers.

Harvest Management -- The Elwha River is primarily managed to meet the hatchery escapement goal of 1,250 fish and secondarily to meet a natural spawning escapement goal of 250 fish.

Harvest of Elwha coho has historically occurred in preterminal recreational and commercial fisheries in Canada, the Washington Coast, the Strait of Juan de Fuca and Puget Sound, as well as during directed in-river treaty commercial net fisheries, treaty subsistence fisheries and non-treaty recreational fisheries. Incidental in-river harvests are also observed during the chinook test fishery and during the early portion of water steelhead fisheries.

The total harvest rate of Elwha River-origin coho salmon from the years 1984 through 1991 was 77 percent. Just over 38 percent (about 50 percent of the harvest) of those years' returns were taken in Canadian fisheries while a similar amount was taken in U.S. fisheries (marine and freshwater combined). Of the U.S. harvests, 70 percent occurred in marine waters and 30 percent in-river. Just over 20 percent of the U.S. marine catch came in coastal areas while the remainder was taken in Puget Sound.

Hatchery -- The Elwha River coho stock is a composite stock, supported by both hatchery and natural production. Hatchery production of yearling fish is high, with a targeted total release of nearly 1,000,000 fish from the tribal hatchery facility. Due to the nature of the hatchery and the river, homing of returning adults back to the hatchery rack is somewhat limited, and many fish stray into the river. Therefore, natural spawning of hatchery-origin fish occurs annually. In addition, no attempt is made to differentiate between natural- and hatchery-origin fish during hatchery brood stocking, so natural-origin fish which recruit to the rack are incorporated into the hatchery program.

Although a number of fish were planted from other systems (primarily Dungeness) during the 1950s and 1960s, Elwha-origin fish have been used exclusively since 1977. In addition, eggs were often transferred from the Elwha to the Dungeness, partially incorporating the Elwha stock into the Dungeness gene pool. For these reasons, although the Elwha stock is defined as being of mixed origin, it is possible that the stock maintains a number of the characteristics of the original native stock.

Last ten years salmon releases into the Elwha basin.

Release Year	Fall Chinook	Chum	Coho
1982	1,250,944	884,684	3,108,507
1983	3,735,409	233,000	602,080
1984	2,188,950	99,200	751,010
1985	2,732,735	622,400	890,314
1986	2,363,712	272,170	1,038,000
1987	2,265,871	0	880,100
1988	4,265,153	0	267,148
1989	4,094,690	0	415,557
1990	880,085	0	995,204
1991	2,622,153	0	892,185
MEAN	2,639,970	422,291	984,011

STRAIT OF JUAN DE FUCA -- SALT CREEK COHO

STOCK DESCRIPTION AND ORIGIN

The Salt Creek coho salmon stock probably does not possess a unique temporal distribution, however, there is not sufficient information available to define its spawn timing. No other distinct biological characteristics have been documented for this stock, so its classification is dependent upon geographic separation from other stocks.

There have been off-station coho yearling releases in this region almost annually between 1959 and 1974. Dungeness stock was most commonly used (1959, 1960, 1962, 1964, 1965, 1967 and 1969 to 1971) along with single releases of Green River (1966), Skagit (1961) and Washougal (1974) stocks. Off-station fingerling/fry releases were infrequent, predominantly utilizing Dungeness and Elwha stocks (1959, 1971, and 1982 to 1987) supplemented with George Adams (Hood Canal) stock in 1977. This stock is likely a mixture of the native and introduced non-native stocks.

STOCK STATUS

This stock has been classified as Healthy based on observed escapements.

There are good escapement estimates dating back to 1982 and cumulative redd counts available back to 1985 for Salt Creek and one of its tributaries. This is a short data base, and it does not provide any clue to historic levels of production. Escapements appear to be relatively stable over the short term, however, these data would not point out any long-/short-term decline or chronic depression from historic levels. At the very least, this stock requires continued close monitoring, and, if higher escapement values observed in the data base are not approached in the future, it may be prudent to consider a Depressed classification for this stock.

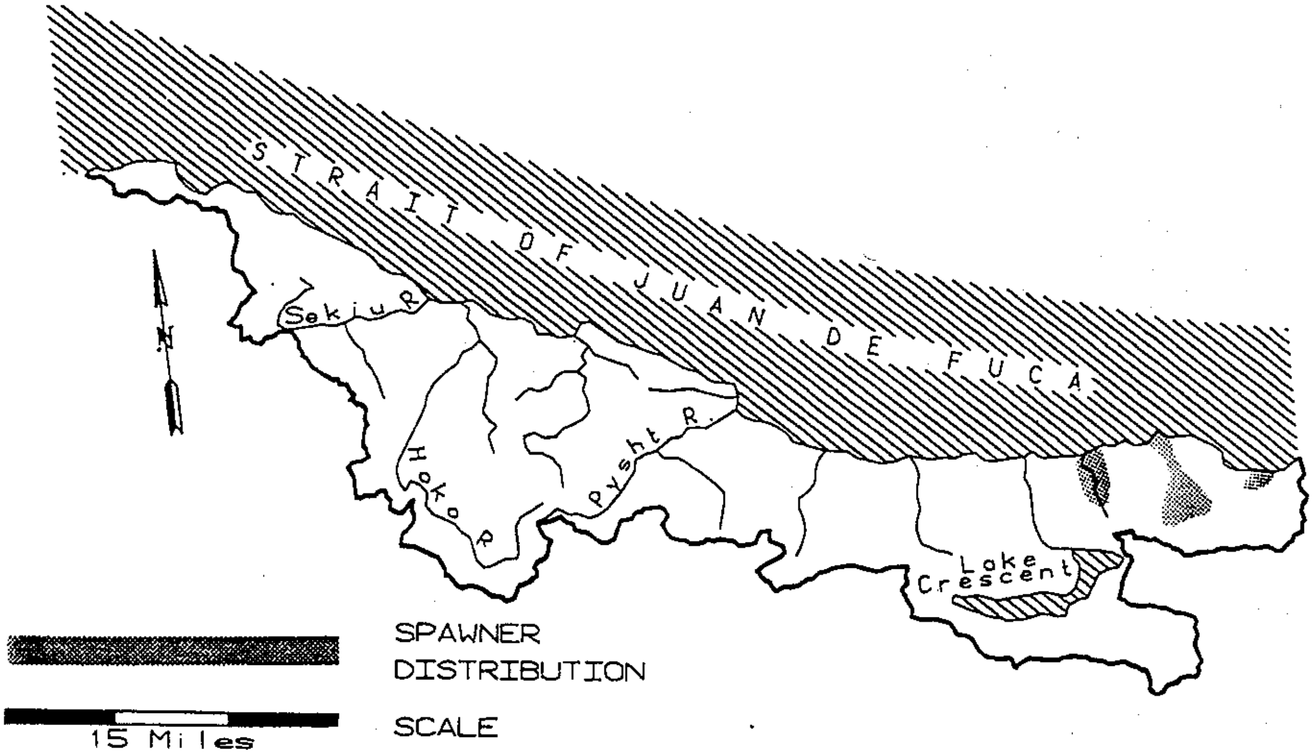
FACTORS AFFECTING PRODUCTION

Habitat -- The Salt Creek basin has not been extensively studied at this time. However, it is known to have a history of mass wasting. Riparian vegetation has been altered due to logging and agricultural practices and is currently inadequate to meet cover and long-term wood recruitment needs. Low pool:riffle ratios appear to be less than ideal for coho production. In addition, the creek is likely further impacted by water withdrawals and passage problems at several culverts.

Harvest Management -- No fisheries target Salt Creek coho salmon. All harvests occur incidentally in other preterminal fisheries, including Canadian fisheries, U.S. coastal fisheries and Strait of Juan de Fuca fisheries.

STOCK DEFINITION PROFILE for Salt Creek Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**NO**

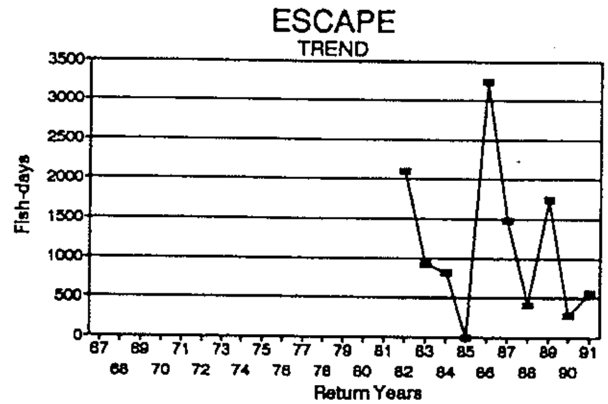
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **UNKNOWN**

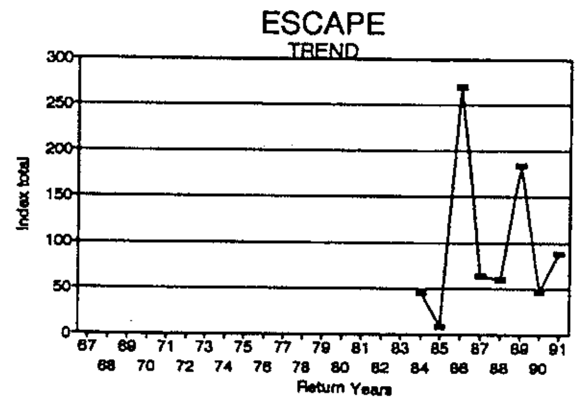
STOCK STATUS PROFILE for Salt Creek Coho

STOCK ASSESSMENT

DATA QUALITY------> Fair

Return Years	ESCAPE Fish-days	ESCAPE Index total		
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82	2102			
83	924			
84	825	45		
85	0	9		
86	3242	270		
87	1484	64		
88	421	60		
89	1747	184		
90	283	47		
91	563	89		





AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Mixed

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution

STOCK STATUS

Healthy

SCREENING CRITERIA

Hatchery -- Planting of hatchery coho smolts during the 1950s, 1960s and 1970s likely had a significant impact on the stock due to interbreeding between hatchery origin and native fish. Additional off-station fry releases as late as 1987 may also have had an effect on this stock.

STRAIT OF JUAN DE FUCA -- LYRE COHO

STOCK DESCRIPTION AND ORIGIN

The Lyre coho salmon stock probably does not possess a unique temporal distribution, however, there is insufficient information available to define its spawn timing. No other distinct biological characteristics have been documented for this stock, so its classification is dependent upon geographic separation from other stocks.

There were off-station coho yearling releases in this drainage almost every year between 1954 and 1971. Dungeness stock was most commonly used (1954, 1955, 1957 to 1960, 1962 to 1967 and 1969 to 1971) along with single releases of Green River (1956) and Skagit (1961) stocks. Off-station fingerling/fry releases were infrequent, utilizing Dungeness and Elwha stocks (1959 and 1982 through 1986). This stock is likely a mixture of the native and introduced non-native stocks.

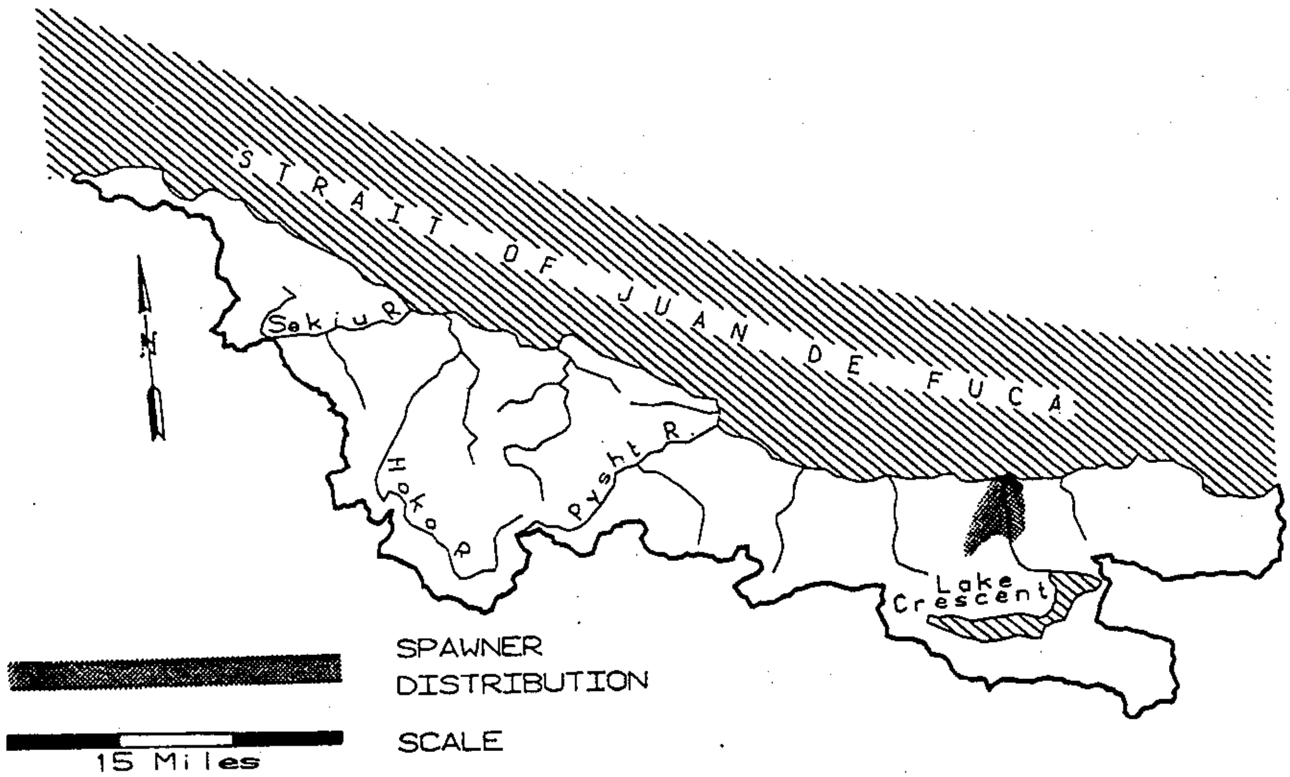
STOCK STATUS

The status of the Lyre coho stock is Unknown.

There are no escapement estimates or cumulative redd counts available for this stock. Because there are essentially no assessment data available for this stock, its production trend is unknown. The trends associated with surrounding coho stocks, if they are at all similar to this stock, would suggest that it is relatively stable, although the relation to historic production is unknown.

STOCK DEFINITION PROFILE for Lyre Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**UNK**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

STOCK STATUS PROFILE for Lyre Coho

STOCK ASSESSMENT

DATA QUALITY——> No Data

Return Years	NO DATA			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

STRAIT OF JUAN DE FUCA -- PYSHT/TWIN/DEEP COHO

STOCK DESCRIPTION AND ORIGIN

The Pysht/Twin/Deep coho salmon stock does not possess a unique temporal distribution, with most spawning occurring from early November to mid-January. No other distinct biological characteristics have been documented for this stock, so its classification is dependent upon geographic separation from other stocks.

There were off-station coho yearling releases in this region almost every year between 1954 and 1971. Dungeness stock was most commonly used (1954, 1955, 1957 to 1960, 1962, 1964 to 1967 and 1969 to 1971) with additional releases of Sol Duc (1963), Green River (1956 and 1966) and Skagit (1961) stocks. Off-station fingerling/fry releases were infrequent, predominantly utilizing Dungeness and Elwha stocks (1952, 1953, 1959, 1971, 1972, 1979 and 1982 through 1986) supplemented with Green River (1957) and George Adams (1977) stocks. This stock is likely a mixture of the native and introduced non-native stocks.

STOCK STATUS

This stock has been classified as Depressed, based on a short-term severe decline in production.

There are good escapement estimates dating back to 1984 and cumulative redd counts available back to 1985 for Sadie Creek (East Twin) and the South Fork of the Pysht River, which are used as indicators for the stock in general.

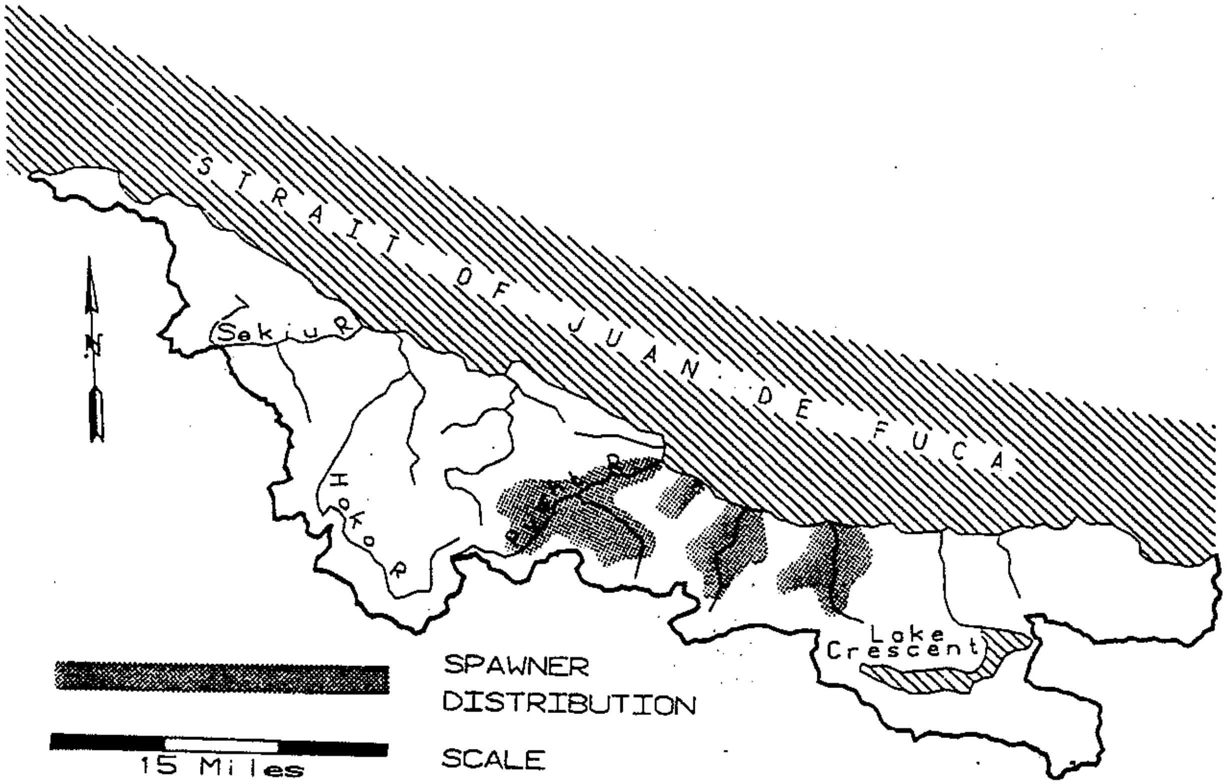
FACTORS AFFECTING PRODUCTION

Habitat -- Rearing conditions within the Pysht River are largely adequate. The system has a high pool:riffle ratio, with adequate off-channel areas. Riparian vegetation has been extensively altered and is dominated by young stands of red alder. As a result, inadequate long-term recruitment of large woody debris is a serious problem. Elevated stream temperatures have been documented in Green Creek and the lower mainstem by the Lower Elwha S'Klallam Tribe. Like other rivers in the Strait region, the lower mainstem currently has high sediment levels. Tributaries such as Green Creek have huge volumes of sediment stored within the channel. This material is extremely erodible and contributes to persistent levels of fine sediments found in spawning gravel. Aggradation and scour of salmon redds has been documented and is a significant problem. This problem has contributed to the near extirpation of chinook salmon from the basin. Although the Pysht River estuary is one of the largest estuaries in the Strait of Juan de Fuca, it has been seriously degraded over the years due to siltation from logging-related landslides in the 1950s and subsequent dredging and mechanical filling for industrial purposes.

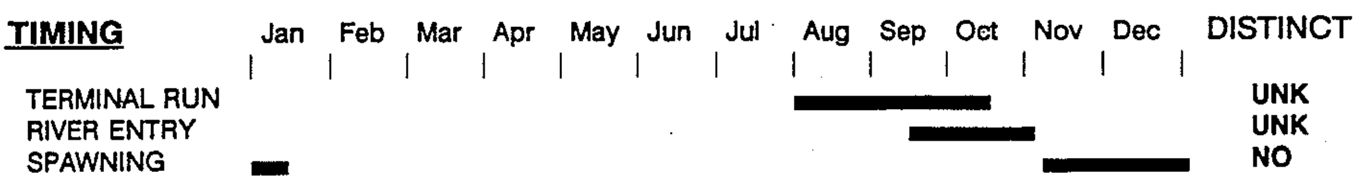
STOCK DEFINITION PROFILE for Pysht/Twin/Deep Coho

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS

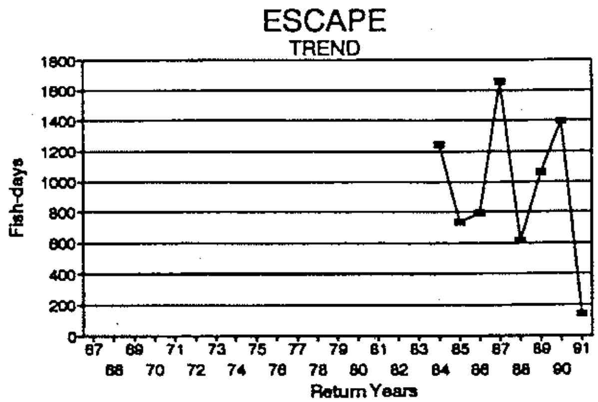
DISTINCT? - **NO**

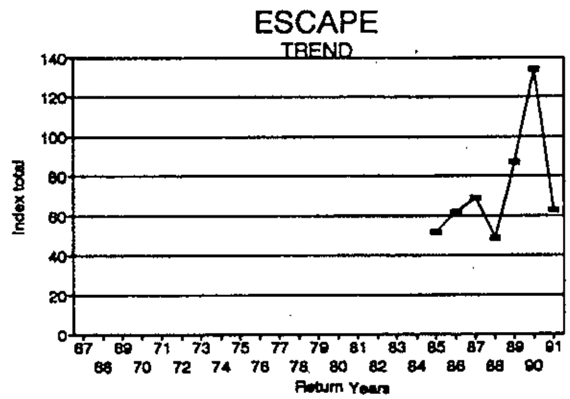
STOCK STATUS PROFILE for Pysht/Twin/Deep Coho

STOCK ASSESSMENT

DATA QUALITY----> Fair

Return Years	ESCAPE Fish-days	ESCAPE Index total		
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84	1241			
85	740	52		
86	794	62		
87	1658	69		
88	617	49		
89	1061	87		
90	1397	134		
91	141	63		





AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Short-Term Severe Decline

We have not studied the Twin Rivers extensively yet. However, we do know that the basins have some mass wasting history.

There are indications that the East Twin has widened in response to aggradation. Riparian vegetation has been altered and is currently inadequate to meet long-term wood recruitment needs.

Deep Creek is the most degraded basin in the western Strait of Juan de Fuca. Numerous debris flows originating from poor road construction practices have impacted nearly every tributary. Additionally a large dam-break flood event during the November 1990 flood event resulted in massive channel alterations in the lower five miles of the basin. This event, in combination with clear-cutting, triggered a large deep-seated landslide downstream of the East Fork. Channel conditions are presently not favorable for fish production. In the upper basin the channel has been scoured to bedrock. The scouring has reduced the amount of stream area usable by anadromous fish. The majority of large woody debris was tossed out of the channel. In the lower sections of Deep Creek, the channel has widened by a factor of two to three times, resulting in low pool:riffle ratio, pool filling and stream heating. The Lower Elwha S'Klallam Tribe has recorded stream temperatures approaching 70 °F in both the East Fork and the mainstem. Fine sediment levels in spawning gravel exceed 20 percent of the total gravel volume.

Harvest Management -- No fisheries target this stock of coho salmon. All harvests occur incidentally to other preterminal fisheries, including Canadian fisheries, U.S. coastal fisheries and Strait of Juan de Fuca fisheries. A small number of fish are also taken incidentally to in-river steelhead net fisheries.

Hatchery -- Planting of hatchery coho smolts during the 1950s, 1960s and 1970s likely had significant impact on the stock due to interbreeding between hatchery-origin and native fish. Additional off-station fry releases as late as 1986 may also have had an effect on this stock.

STRAIT OF JUAN DE FUCA -- CLALLAM COHO

STOCK DESCRIPTION AND ORIGIN

The Clallam coho salmon stock does not possess a unique temporal distribution, with most spawning occurring from early November to mid-January. No other distinct biological characteristics have been documented for this stock, so its classification is dependent upon geographic separation from other stocks.

There were off-station coho yearling releases in this drainage almost annually between 1958 and 1975. Dungeness stock was most commonly used (1958, 1959, 1962 to 1965, 1967, 1970 and 1971) followed by Sol Duc (1972 and 1975), Green River (1966) and Washougal (1974). There have also been on-station yearling releases into this drainage by a local enhancement cooperative since 1980 (Sol Duc stock in 1980 and 1982 and Dungeness stock in 1981 and 1986 to 1989). Sol Duc yearlings were also released from a pen-rearing program in Clallam Bay in 1981 and 1982. Off-station fingerling/fry releases were infrequent, predominantly utilizing Dungeness and Elwha stocks (1953, 1982 and 1984) supplemented by George Adams (Hood Canal) in 1977 and Sol Duc stocks in 1976 and 1981. This stock is likely a mixture of the native and introduced non-native stocks.

STOCK STATUS

There are good escapement index counts dating back to 1983 and cumulative redd counts available back to 1984 for Charley Creek, which have been used to represent this stock's production trend. The status of the stock is provisionally Unknown pending resolution of the extent to which Charley Creek data represent the entire Clallam basin.

This is a very short data base, and it does not provide any clue to historic levels of production. The escapement estimates and cumulative redd counts from Charley Creek data indicate that this stock's escapement is relatively stable.

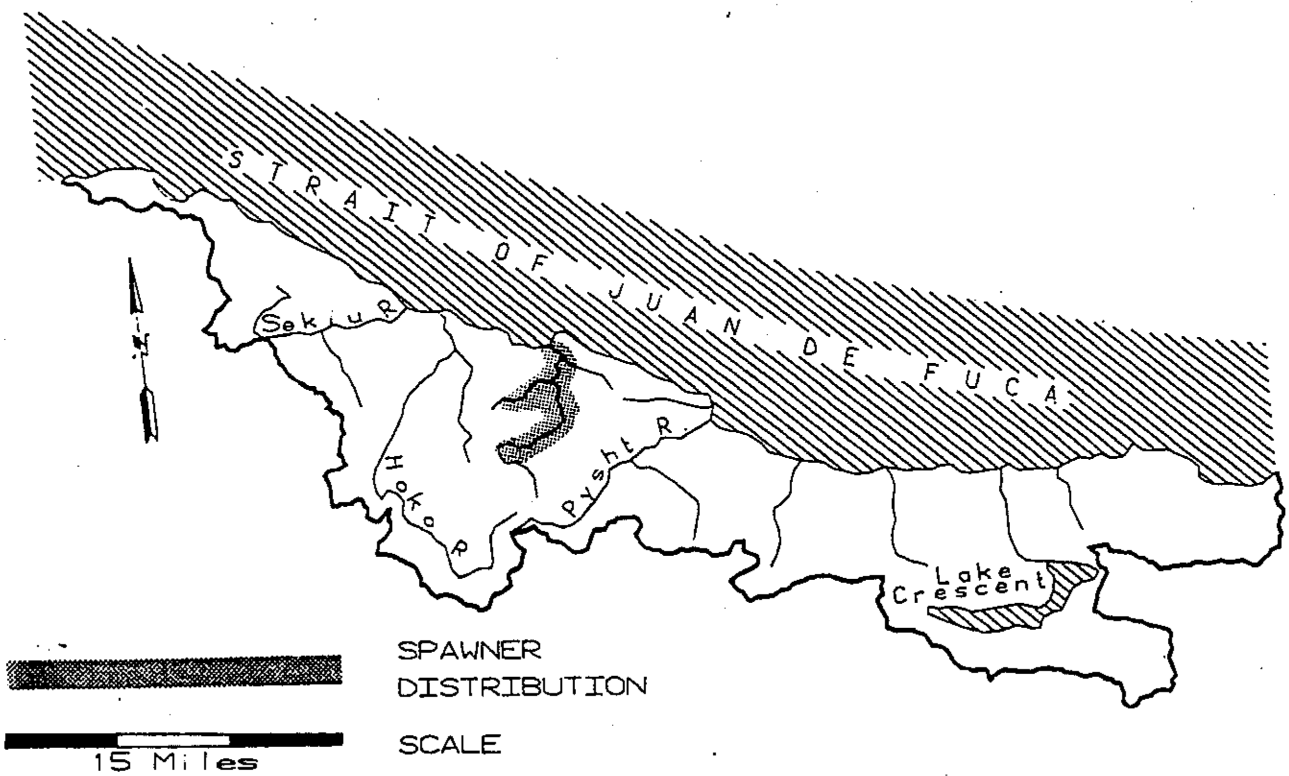
FACTORS AFFECTING PRODUCTION

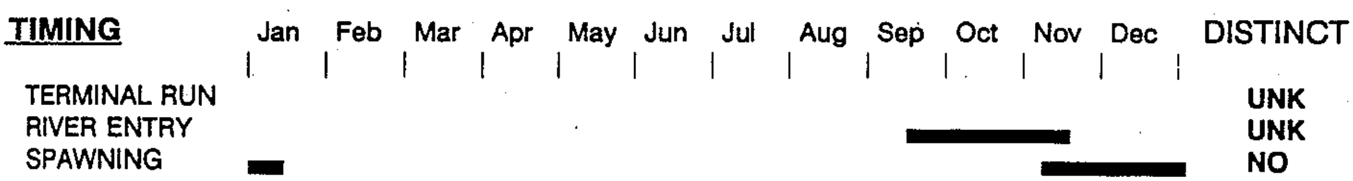
Habitat -- Historic landsliding in the upper Clallam basin related to poor logging practices on Ellis Mountain has resulted in a scoured stream channel deficient in woody debris in the upper basin and a sediment-rich aggraded channel in the lower mainstem. Additionally, alteration of the riparian zone by logging and agriculture practices subjects the mainstem to severe heating. The Lower Elwha S'Klallam Tribe has documented water temperatures between 63 to 70 °F for the majority of the summer in 1992 and 1993. Large woody debris is uniformly depleted throughout the basin, and sediment levels are high in the lower mainstem (14 to 22 percent). These impacts may be exacerbated by urbanization and water withdrawals.

STOCK DEFINITION PROFILE for Clallam Coho

SPAWNER DISTRIBUTION

DISTINCT? - **YES**





BIOLOGICAL CHARACTERISTICS

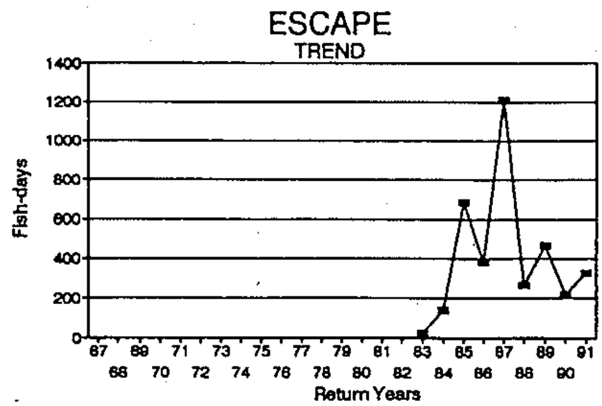
DISTINCT? - **NO**

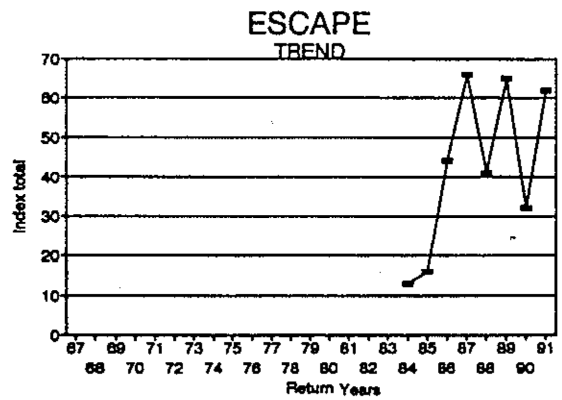
STOCK STATUS PROFILE for Clallam Coho

STOCK ASSESSMENT

DATA QUALITY——> Fair

Return Years	ESCAPE Fish-days	ESCAPE Index total		
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83	22			
84	138	13		
85	686	16		
86	380	44		
87	1213	66		
88	269	41		
89	468	65		
90	221	32		
91	330	62		





AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Mixed

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution

STOCK STATUS

Unknown

SCREENING CRITERIA

Harvest Management -- There are no targeted fisheries for this stock of coho salmon. All harvests occur incidentally in other preterminal fisheries, including Canadian fisheries, U.S. coastal fisheries and Strait of Juan of de Fuca fisheries. A small number of fish are also taken incidentally in in-river steelhead net fisheries.

Hatchery -- Planting of hatchery coho smolts during the 1950s, 1960s and 1970s likely had a significant impact on the stock due to interbreeding between hatchery-origin and native fish. Additional off-station fry releases as late as 1984 may also have had an effect on this stock. Yearling releases of non-local stocks were made from 1980 through 1989.

STRAIT OF JUAN DE FUCA -- HOKO COHO

STOCK DESCRIPTION AND ORIGIN

The Hoko coho salmon stock does not possess a unique temporal distribution, with most spawning occurring from early November to mid-January. Spawning occasionally begins as early as mid-October. No other distinct biological characteristics have been documented for this stock, so its classification is dependent upon geographic separation from other stocks.

There were occasional off-station coho yearling releases into this drainage between 1954 and 1972. Dungeness stock was most commonly used (1954, 1955, 1958 to 1960, 1967, 1970 and 1971) with single releases of Sol Duc (1972) and Green River (1966) stocks. Additionally, there were releases of Elwha stock yearlings from Hoko Ponds in 1986 and 1987. Off-station fingerling/fry releases were infrequent, predominantly utilizing Dungeness and Elwha stocks (1952, 1953, 1982 and 1984 through 1988) supplemented with George Adams stock (Hood Canal) in 1977 and Sol Duc stock in 1975 and 1979. This stock is likely a mixture of the native and introduced non-native stocks.

STOCK STATUS

This stock has been classified as Healthy, based on relatively stable escapement estimates since the mid-1980s. There are good escapement estimates dating back to 1983 and cumulative redd counts available back to 1984 for the Hoko River and Cub Creek, which are used as indicators for the stock in general.

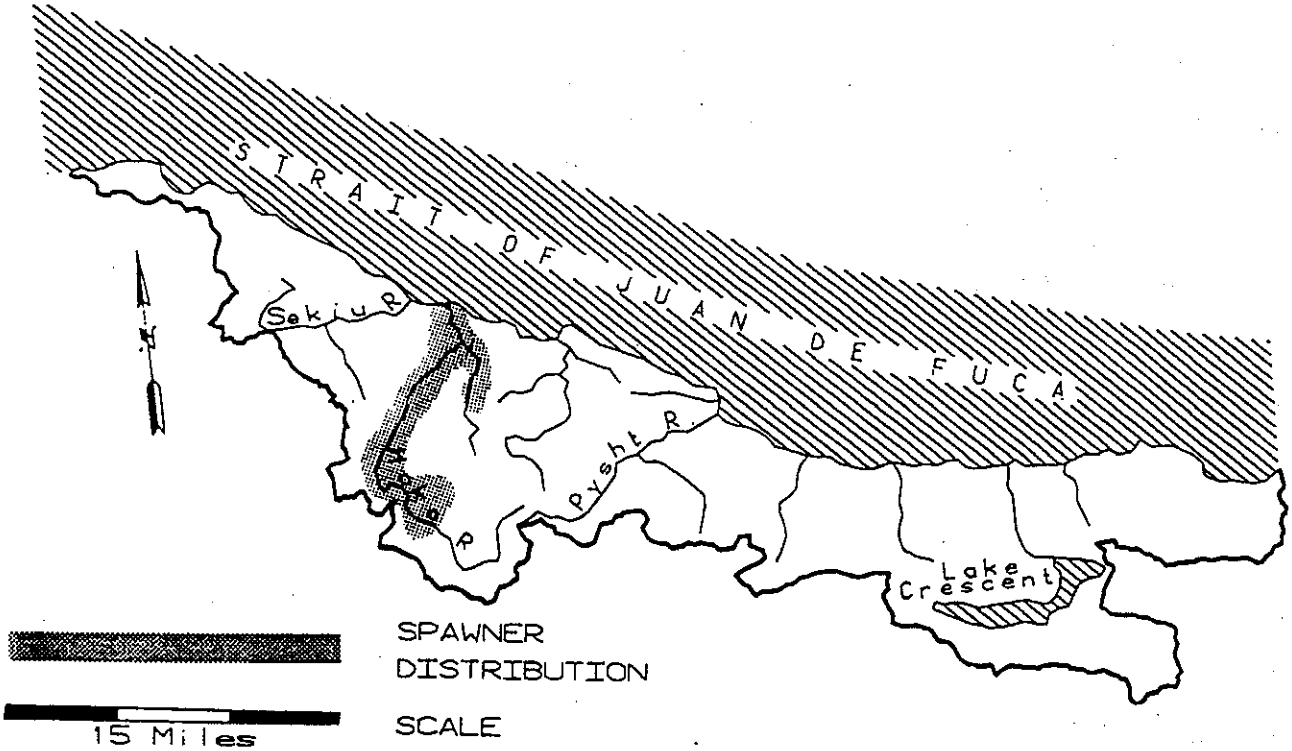
Escapement in the Hoko River has remained at relatively stable levels, between 300 and 1,600 fish-days from 1984 to 1992. However, in 1983 escapement only reached 166 fish-days while escapement in 1987 was exceptionally high, at 4,720 fish-days. Though recent escapement counts have approached the documented lows in this data base, the escapement data, by strict definition, do not indicate a short-term severe decline. However, as the data base for this stock is short, there is no way of knowing where recent escapement observations fall in terms of the overall long-term production potential of the stock. Therefore, it is suggested that this stock be closely monitored and, if higher escapements are not attained, a classification of Depressed be considered.

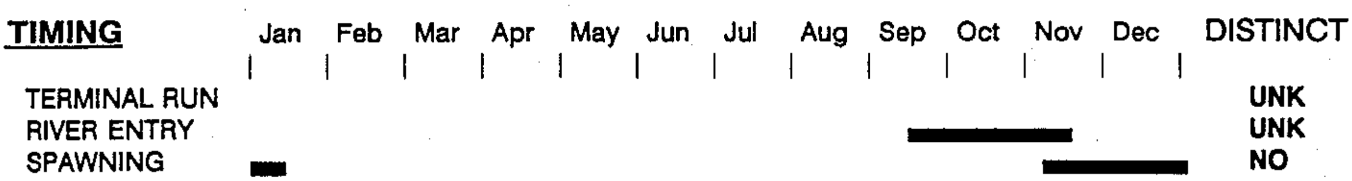
FACTORS AFFECTING PRODUCTION

Habitat -- The Hoko River drainage is managed for timber production and has been impacted by past logging practices. The drainage has experienced over 300 mass-wasting events over the past 50 years as shown through the aerial photograph record (Hoko Watershed Analysis 1994). Many of these events originated either in harvested

STOCK DEFINITION PROFILE for Hoko Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**





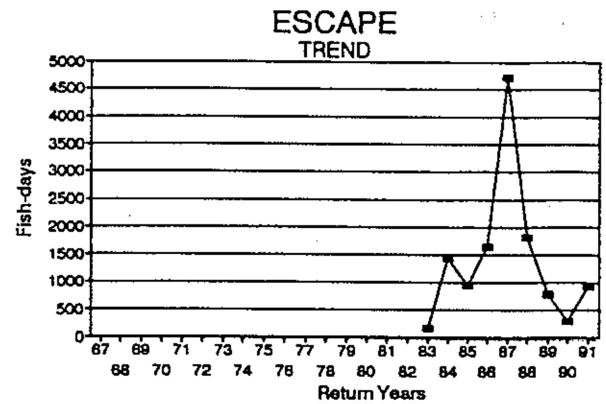
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **NO**

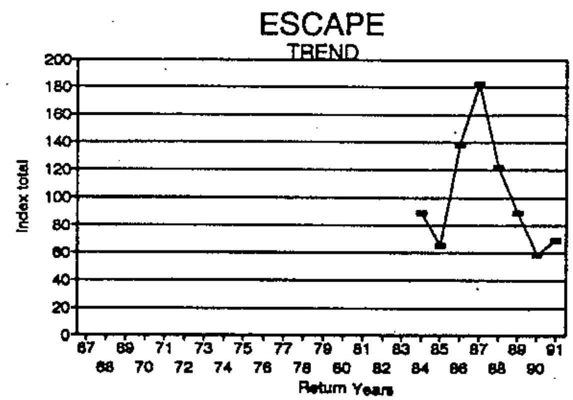
STOCK STATUS PROFILE for Hoko Coho

STOCK ASSESSMENT

DATA QUALITY------> Fair

Return Years	ESCAPE Fish-days	ESCAPE Index total		
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83	166			
84	1446	89		
85	947	65		
86	1660	138		
87	4720	182		
88	1815	122		
89	795	89		
90	303	59		
91	929	69		





AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Mixed

PRODUCTION TYPE

Wild

STOCK DISTINCTION

Distribution

STOCK STATUS

Healthy

SCREENING CRITERIA

areas on Ellis, Stolzenberg or Sekiu mountains or from poorly constructed and maintained roads.

Virtually the entire drainage was originally harvested to the streambank and much of the drainage is currently being harvested for the second time. Although aerial photographs reveal that most riparian areas were predominately large conifer prior to the first logging, 91 percent of the current riparian stands are now young red alder (Hoko Watershed Analysis 1994). Logjam removal and other instream wood removal was conducted throughout the drainage into the 1970s (Williams et al. 1975), including removal of all wood from the lower Little Hoko River during 1937 (John Cowan, long-time resident, personal communication). The lower Little Hoko River subsequently downcut one to two meters, and the channel is now entrenched within its floodplain. The wood removal from within and adjacent to streams has led to a shortage of in-channel wood throughout the Hoko drainage. On average, only 0.66 pieces of large woody debris per channel width presently exist and most of this is either small alder which rapidly decomposes or decaying residual old growth wood (Hoko Watershed Analysis 1994).

A substantial loss of coho and steelhead egg baskets in the 1990, 1991, and 1992 winters indicates that bedload scour and fill are significant and probably affect survival from egg deposition to fry emergence in many mainstem and tributary areas. Survival is also probably affected by the moderate to high level of fine sediments. A basin average of 14.27 percent fine sediments (<0.85 mm) in seventeen coho and steelhead spawning areas throughout the basin was determined through McNeil core sampling efforts during 1991 (McHenry et al. 1994).

Instream temperatures are also a problem. A thermograph placed at RM 16.6 in 1985 recorded temperatures as high as 73.4 °F (Blum and DiDomenico 1985) and thermographs recorded peak temperatures of 67 °F in the lower mainstem during 1992 and 69 °F in the lower Little Hoko River during 1991 (McHenry et al. 1994).

The drainage also appears to be deficient in steelhead and coho salmon rearing habitat, with pools comprising less than 25 percent of the measured habitat areas (Hoko Watershed Analysis 1994).

Harvest Management -- No fisheries target this stock of coho salmon. All harvests occur incidentally to other preterminal fisheries, including Canadian fisheries, U.S. coastal fisheries and Strait of Juan de Fuca fisheries. A small number of fish are also taken incidentally to in-river steelhead net fisheries.

Hatchery -- Planting of hatchery coho smolts during the 1950s, 1960s and 1970s likely had a significant impact on the stock due to interbreeding between hatchery-origin and native fish. Additional off-station fry releases as late as 1984 may also have had an affect on this stock.

Yearling releases of non-local stocks were made from 1980 through 1989.

STRAIT OF JUAN DE FUCA -- SEKIU/SAIL COHO

STOCK DESCRIPTION AND ORIGIN

The Sekiu/Sail coho salmon stock does not possess a unique temporal distribution, with most spawning occurring from early November to early January. No other distinct biological characteristics have been documented for this stock, so its classification is dependent upon geographic separation from other stocks.

There have been very few off-station coho yearling releases in the Sekiu drainage. The other numerous small drainages between the Sekiu and Sail rivers have apparently not had non-native introductions. The Sail River, Agency and Village creeks had USFWS Makah National Fish Hatchery Sooes/Quinault/Quilcene-origin coho fry releases from 1984 through 1988. Dungeness stock was planted there in 1958 and 1970 and Sol Duc stock in 1972. Off-station fingerling/fry releases were infrequent as well, predominantly utilizing Dungeness and Elwha stocks (1971, 1972, 1982, 1984 and 1986) supplemented with George Adams (Hood Canal) and Sol Duc (1979) stocks. This stock is likely a mixture of the native and introduced non-native stocks.

STOCK STATUS

The status of the Sekiu/Sail coho stock is Depressed.

There are good escapement estimates and cumulative redd counts available back to 1985 for Carpenter and East Fork Carpenter creeks. These data have been used to represent this stock's production trend.

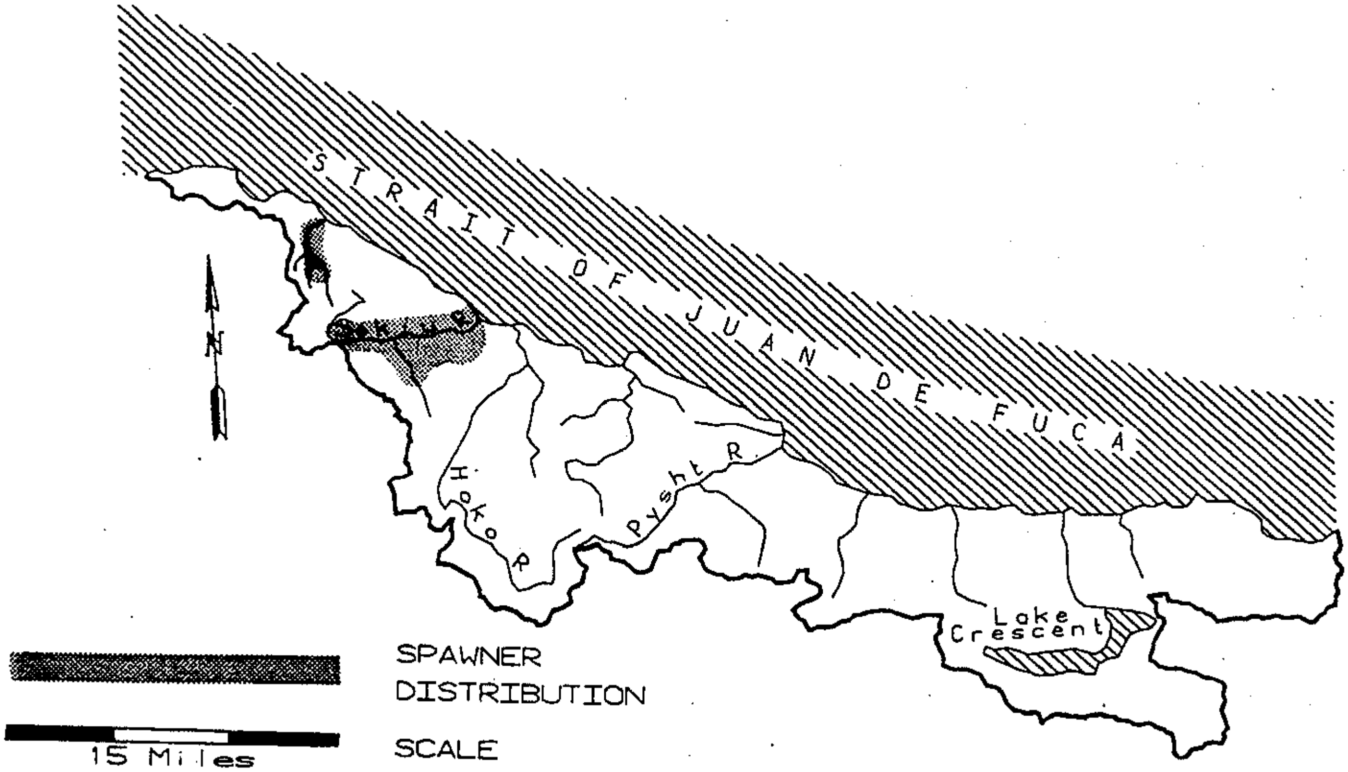
This is a very short data base, and it does not provide any clue to historic levels of production. The cumulative redd data indicate, by strict definition, a short-term severe decline in this stock's production.

FACTORS AFFECTING PRODUCTION

Habitat -- The Sekiu watershed has been severely impacted by forest practices. Timber harvesting started along the North Fork in the early 1940s and along the mainstem in the late 1940s. The steeper areas of the South Fork and Carpenter Creek were harvested later. By the late 1980s virtually the entire watershed, including the riparian areas, was harvested. During that period the drainage was heavily roaded using substandard practices. Road densities are currently high, and landsliding has been frequent in many areas including Sekiu Mountain. The main haul route was constructed essentially in the flood plain of the Sekiu River. This road has constrained the channel and reduced off-channel rearing areas and until recently represented a chronic source of sediment input into the Sekiu River.

STOCK DEFINITION PROFILE for Sekiu/Sail Coho

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													**UNK**
RIVER ENTRY													**UNK**
SPAWNING													**NO**

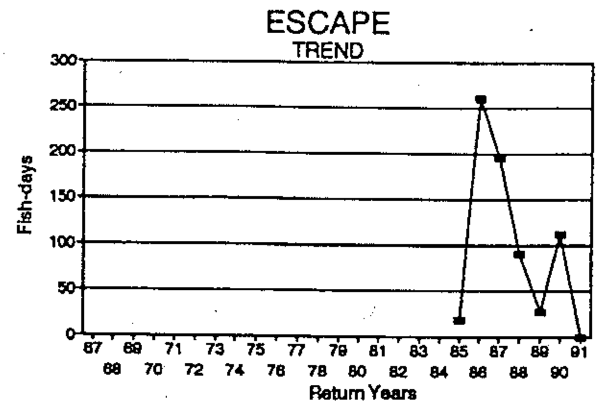
BIOLOGICAL CHARACTERISTICS
DISTINCT? - **UNKNOWN**

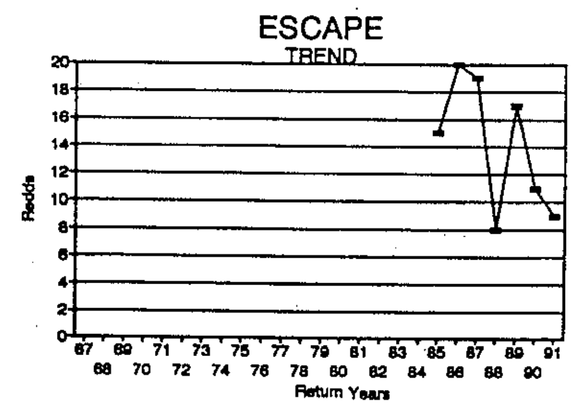
STOCK STATUS PROFILE for Sekiu/Sail Coho

STOCK ASSESSMENT

DATA QUALITY——> Fair

Return Years	ESCAPE Fish-days	ESCAPE Redds		
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85	19	15		
86	260	20		
87	195	19		
88	91	8		
89	27	17		
90	112	11		
91	0	9		





AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Short-Term Severe Decline

Substantial road improvements including hauling in harder rock has reduced sediment input.

The geology of the Sekiu basin is predominantly marine-origin, fine-grained, poorly consolidated bedrock which is susceptible to ravel mass wasting and shallow rapid-failure mass wasting. This rock also rapidly breaks back down to the parent fine sediment material when used for road surfacing and experiencing wet-weather haul or when being transported by streams. The sediment input to channels increased substantially due to road-related debris torrents and other failures from the 1970s through 1990, especially from roads in the steeper areas including Sekiu Mountain and the adjoining ridge which swings northwestward draining into the South Fork, the lower North Fork, and into Sunnybrook Creek from Sooes Peak. Although recent improvements have been seen for perhaps 50 percent of the road network, and more improvements are planned, road maintenance has generally been insufficient to adequately protect wild salmonids for at least the past 20 years. Abandoned railroad grade fills have also failed in the North Fork. Carpenter Creek is currently transporting a high bedload and the lower section presently goes subsurface annually.

In-stream salvage has been substantial, consequently there is very little large woody debris in the drainage network. Without the in-stream wood, some moderate gradient, moderately confined channels (including the South Fork) no longer retain spawning gravels. The last logjams on the mainstem were removed in the 1970s (Mike Dukes, Makah Forestry Enterprises, personal communication).

An apparent result of the wood removal from within and adjacent to the streams and the increased sediment delivery to these streams is a reduced number of pools and reduced pool volume, channel instability in the form of bedload scour and fill, and high fine sediments (<0.85 mm) from nine sampling areas in 1991 (McHenry et al. 1994). Temperatures are also a concern for this drainage. A thermograph placed downstream of the forks confluence recorded a peak temperature of 74.3 °F and was 69.8 degrees or warmer for a portion of 20 days during July, 1985 (Blum and DiDomenico 1985).

Freshwater habitat in the Sail River drainage has been impacted by land-use activities including early timber harvesting of the entire watershed, and the former earthen impoundment of one of the major low-gradient tributaries. The dam site continues to contribute sediment and presents passage problems to fish destined for spawning habitat upstream. During early timber harvesting, logs appear to have been yarded through and across the river, as was common for that era. Older railroad grade fills also from the first rotation of timber harvesting still have the potential to contribute sediment to the river. Consistent with the entire outer Strait streams, there is a lack of high quality rock for road surfacing, and there is potential for creating fine sediments from wet-weather timber hauling. The present watershed consists of mature and maturing second growth timber, with some recent clear-cutting. The fish-bearing portions of the drainage are quite deficient in large wood. Wood was actively removed from the lower river channel as recently as the early 1980s (Chad Bowechop, Makah Planning Council, personal communication). Without this wood, the moderately confined and moderate gradient mainstem is lacking in spawning gravels since most are transported. Portions of the channel are confined by bedrock, and there are numerous small slope failures on the sideslopes down to the river.

The estuary has had a history of wood clearing and dredging for storing logs from the railroad log dump, and more recently for the small sport fishing resort.

Today there are few areas that retain gravel of suitable size for anadromous fish to utilize. While many tributaries have been scoured, the low gradient mainstem is carrying an abundant sediment load. The Lower Elwha S'Klallam Tribe measured fine sediment (<0.85 mm) levels in spawning gravel ranging from 16 to 22 percent in the mainstem.

Harvest Management -- No fisheries target this stock of coho salmon. All harvests occur incidentally to other preterminal fisheries, including Canadian fisheries, U.S. coastal fisheries and Strait of Juan de Fuca fisheries. A small number of fish are also taken incidentally to steelhead net fisheries.

Hatchery -- Planting of hatchery coho smolts during the 1950s, 1960s and 1970s likely had a significant impact on this stock due to interbreeding between hatchery-origin and native fish.

OVERVIEW -- STRAIT OF JUAN DE FUCA PINK STOCKS

UPPER DUNGENESS
LOWER DUNGENESS
ELWHA

STOCK DEFINITION AND ORIGIN

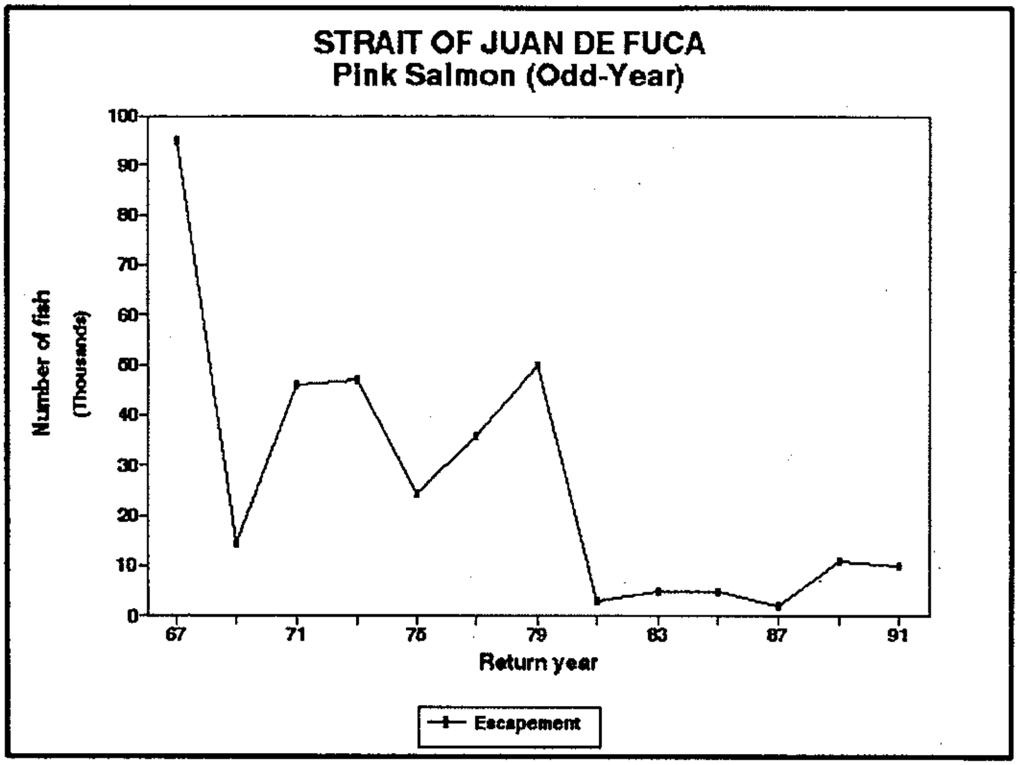
Pink salmon spawning in this region are isolated from other Washington pink salmon stocks through geographic separation of the spawning grounds. A run-timing difference exists for the upper Dungeness pink salmon stock which spawns from July through September. The other two Strait pink salmon stocks have the typical pink spawn timing (September through October). All three stocks return as two-year-old fish in odd years only.

The upper Dungeness pink stock differs from the lower river pink stock in two major ways. The upper river stock enters the river about two months earlier than the lower river stock, and it generally spawns in the upper reaches of the Dungeness mainstem (above river mile 10) and at least five miles up the Gray Wolf River, while the majority of the lower river stock spawns in the lower three miles of the Dungeness River. Genetic studies show that both of these populations are distinguishable stocks.

The Elwha pink salmon were identified as a separate stock based solely on the geographic separation of the spawning grounds. Pink salmon spawning grounds in the Elwha River are separated from those of other pink stocks in the region by over 15 miles. Elwha pinks spawn from September through October in the lower three miles of the river in side channels and braided areas. No genetic sampling has been conducted on this stock. Considering the low number of fish observed in the system, it may be impossible to obtain sufficient samples.

STOCK STATUS

While there have been no directed fisheries on these stocks in recent years, the Strait of Juan de Fuca pink salmon are harvested incidentally in Canadian fisheries and in the Strait of Juan de Fuca and north Puget Sound commercial fisheries. Additionally, Strait of Juan de Fuca pink salmon may be affected by local hatchery chinook, coho and steelhead hatchery programs, however, impacts are unknown. There are no established escapement goals for the Strait of Juan de Fuca pink salmon. The available spawning ground survey information shows a severe long-term decline in escapement levels for the Dungeness pinks, and an extreme decline for Elwha pinks, which may be extinct. Elwha pink spawner counts have been chronically depressed since 1981. In spawner surveys conducted in 1989, a total of four fish were seen all season. These fish may be strays from other pink stocks. One more year of spawner surveys will be conducted on the Elwha River (1993) to determine the status of the stock. Currently, the Elwha pink salmon stock is classified as Critical. The figure below shows combined escapements for all three stocks.



Information on individual pink salmon stocks is presented in the Stock Reports which follow.

STRAIT OF JUAN DE FUCA -- UPPER DUNGENESS PINK

STOCK IDENTIFICATION AND ORIGIN

Upper Dungeness summer-migrating pink salmon were identified as a separate stock because they are isolated from other Puget Sound pink stocks by a distinct spawning distribution and run-timing differences.

This stock spawns primarily in the upper river (above RM 10.0) in both forks (the Gray Wolf River and the mainstem) of the Dungeness River, geographically separating this stock from the other pink salmon stocks in the area. The upper Dungeness pink salmon enter the river in late July and complete spawning by mid-September. This unique run timing is a month earlier than that of other Puget Sound fall pink salmon stocks including the lower Dungeness pink salmon stock.

The upper Dungeness pink salmon have two unique biological characteristics. First, unlike most fall pink stocks, this stock enters the river early, in "ocean-bright" condition, lacking many of the secondary sexual characteristics seen in mature salmon near spawning condition. They hold in pools while maturing then slowly migrate upstream. Second, genetic studies show that these fish are distinguishable from all other Washington pink salmon stocks, including the lower Dungeness pink salmon stock.

Hatchery planting records show Dungeness River-origin pink salmon were planted back into the Dungeness River in 1977 and 1987. It is unlikely there were any residual effects as a result of these plants. Therefore, upper Dungeness pink salmon are considered a native wild stock.

STOCK STATUS

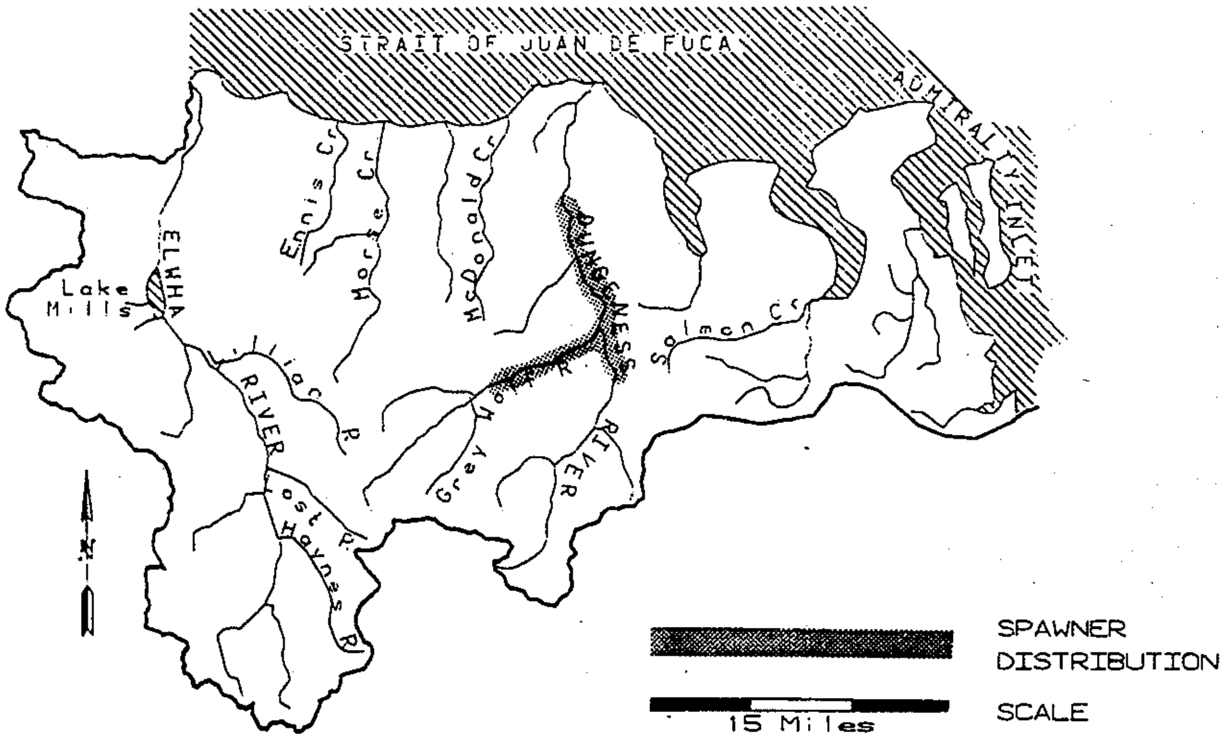
The status of the Upper Dungeness pink salmon is Depressed based on chronically low escapements.

Escapement has ranged from 1,700 to 190,000 over the past 30 years. Stream surveys cover much of the accessible spawning area in the Dungeness watershed, including over 18 miles in the Dungeness River and five miles in the Gray Wolf River. Escapement estimates are judged to be very good as stream flows are generally low and water clarity is good during the migration timing. Escapement information shows a steep decline in abundance in the 1970s. The stock has remained chronically depressed ever since.

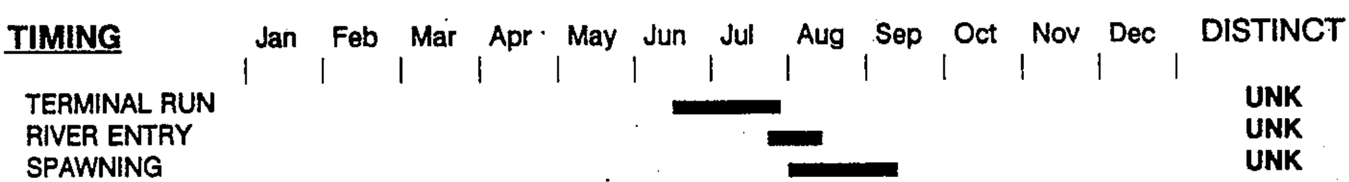
Although a record escapement of 190,000 occurred in 1963, escapement levels from 1959 through 1979 were approximately 30,000. A major flood event during incubation of the 1979 brood nearly decimated the run.

STOCK DEFINITION PROFILE for Upper Dungeness Pink

SPAWNER DISTRIBUTION
DISTINCT? - **YES**

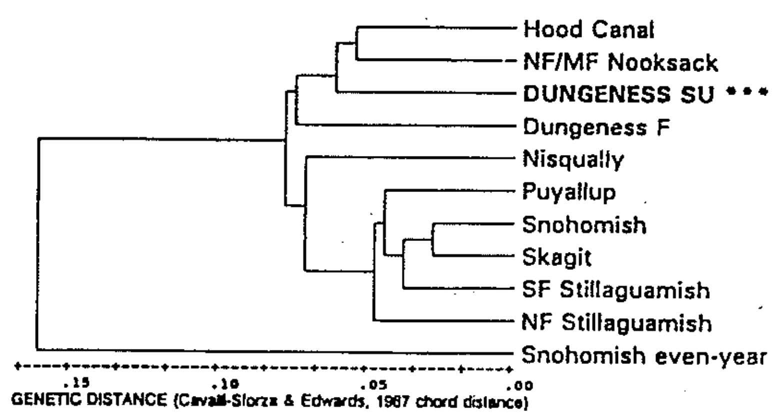


TIMING



BIOLOGICAL CHARACTERISTICS
DISTINCT? - **YES**

GENETICS - This stock is significantly different from all other Washington stocks tested [collections from mid-Dungeness and Gray Wolf (N=303); 28-locus G-tests: **p**<0.001].



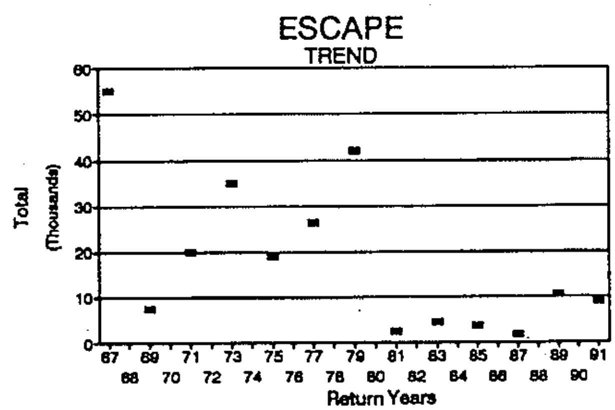
STOCK STATUS PROFILE for Upper Dungeness Pink

STOCK ASSESSMENT

DATA QUALITY——> Good

Return Years	ESCAPE Total			
67	55000			
68				
69	7500			
70				
71	20000			
72				
73	35000			
74				
75	19000			
76				
77	26300			
78				
79	42000			
80				
81	2400			
82				
83	4476			
84				
85	3764			
86				
87	1768			
88				
89	10579			
90				
91	9132			

Odd-year returns only.



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution, Timing, Genetics

STOCK STATUS
Depressed

SCREENING CRITERIA
Chronically Low

Escapement levels from 1981 through 1987 did not exceed 4,500 fish. The 1989 and 1991 runs have shown some evidence of recovery with escapement estimates of approximately 11,000 fish.

FACTORS AFFECTING PRODUCTION

Habitat -- The Dungeness River is located in a rain shadow of the Olympic Mountains and receives little annual precipitation (<20 inches). Water flow in the river is dependent primarily on snow melt. Water withdrawals for irrigation substantially reduce river flows during the low-flow period (August through October), which coincides with pink salmon migration and spawning.

Upper Dungeness River pink salmon spawn primarily in the upper river (above RM 10.0) in both the Gray Wolf River and the mainstem of the Dungeness River. Agriculture, urbanization, water withdrawals, and forest practice activities have caused gravel aggradation and channelization in the middle and lower sections of the river. These impacts are potential production bottlenecks for pink salmon. Low flows through the braided channels create barriers to migrating adults, increase the water temperature, and reduce the available spawning area. Diking for flood control in the lower river has exacerbated impacts from high-water events by confining the energy of the river. Shifting bedloads kill incubating pink eggs and alevins during high flows in winter.

Fish habitat impacts throughout the watershed have adversely affected the marine estuary which provides critical early life history habitat for pink salmon.

Harvest Management -- Upper Dungeness pink salmon are harvested incidentally in Canadian and United States fisheries directed at Fraser River sockeye and pink salmon. In these fisheries, Dungeness pink salmon are harvested at the rate appropriate for Fraser River pink salmon stocks.

<u>Preterminal Areas</u> - Incidental harvest of upper Dungeness pink salmon occurs in Johnstone Strait, Georgia Strait, the west coast of Vancouver Island, the Strait of Juan de Fuca (Area 4B, 5 and 6C) and the San Juan Islands (Areas 6, 7 and 7A). Catches occur during both commercial net fisheries and recreational fisheries in these areas.

<u>Terminal Areas</u> - No directed fisheries on Dungeness summer pink salmon have occurred in recent years, as the stock has returned at levels below escapement needs. However, they are harvested incidentally during in-river recreational fisheries directed at other species.

Hatchery -- Coho are reared and released at the Dungeness Hatchery. The artificial propagation of coho salmon may result in increased predation on juvenile pink salmon, contributing to the decline in production. However, the hatchery program began at the turn of the century, and upper Dungeness pinks were abundant until recently.

Last ten years salmon releases into the Dungeness basin.

Release Year	Spring Chinook	Fall Chinook	Coho	Pink
1982	26,600	0	4,661,652	0
1983	0	0	0	0
1984	0	0	721,000	0
1985	0	0	669,100	0
1986	0	0	499,400	0
1987	0	0	1,400,200	0
1988	0	0	336,700	27,200
1989	0	1,981,000	815,206	0
1990	0	0	423,414	0
1991	0	0	361,829	0
MEAN			1,098,722	

STRAIT OF JUAN DE FUCA -- LOWER DUNGENESS PINK

STOCK DEFINITION AND ORIGIN

The lower Dungeness River fall-migrating pink salmon enter the river in mid-September. Spawning is usually completed by late October, which is similar to other Puget Sound fall pink salmon runs and is a month later than the upper Dungeness summer-migrating pink salmon stock. This stock generally spawns in the lower three miles of the river, while the upper Dungeness pink stock spawns above RM 10.0. The other fall-migrating pink salmon stock spawns in the Elwha River, 15 miles from the Dungeness. This distance is considered sufficient to create a geographic separation between the two stocks.

Genetic studies show that these fish are distinguishable from the upper Dungeness pink salmon stocks.

STOCK STATUS

The status of the lower Dungeness pink salmon stock is Critical.

Estimates of lower Dungeness River pink salmon escapements have ranged over the last 30 years from a low of 150 to a high of 210,000. This stock once comprised nearly half of the total pink run to the river. The record low escapement of 150 occurred in 1987. Since then, the number of spawners has slowly increased to nearly 800 in 1991, however this stock is currently undergoing a short-term severe decline and may require assistance for rehabilitation.

The quality of escapement estimates is good because surveys are usually conducted under ideal weather and stream flow conditions.

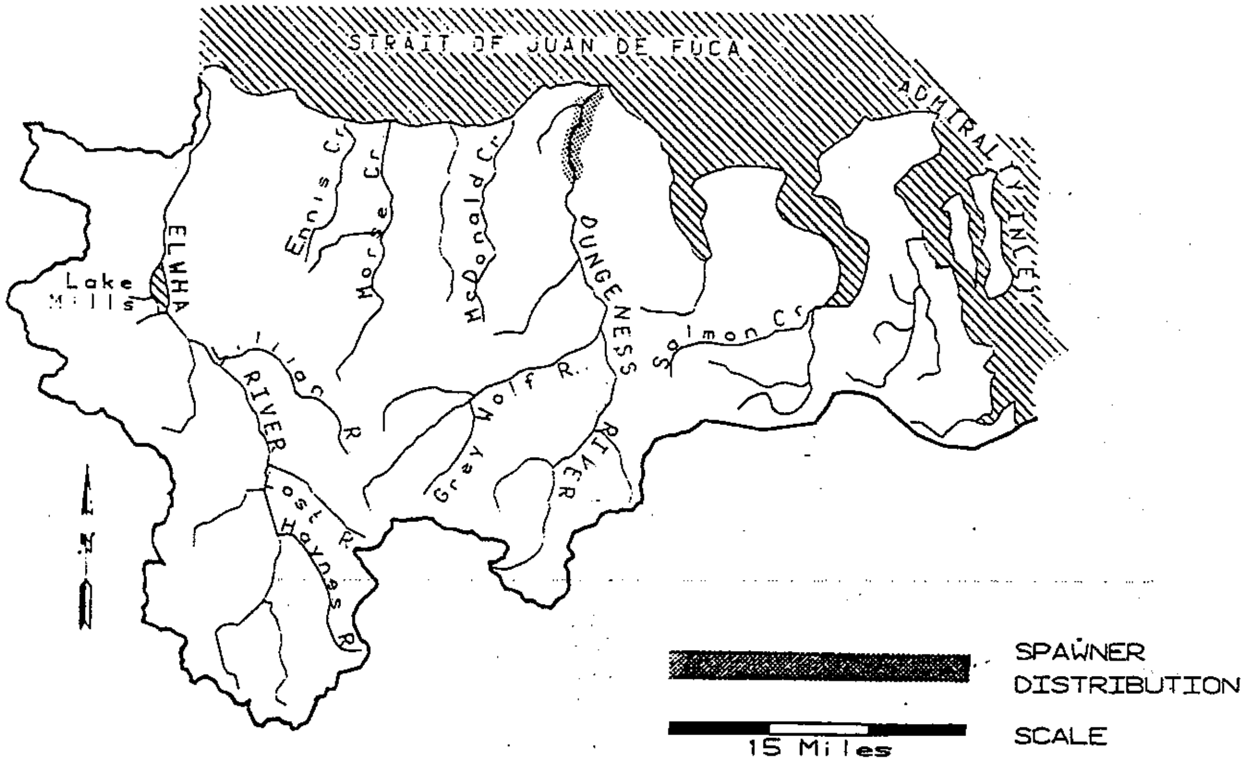
FACTORS AFFECTING PRODUCTION

Habitat -- The Dungeness River is located in a rain shadow of the Olympic Mountains and receives little annual rainfall (<20 inches). Water flow in the river is dependent primarily upon snow melt. Water withdrawals for irrigation substantially reduce river flows during the low-flow period (August through October), which coincides with pink salmon migration and spawning.

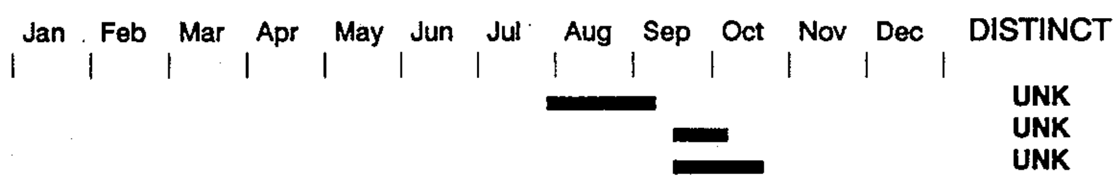
Human activities associated with agriculture, urbanization, water withdrawal, and forest practices have caused gravel aggradation and river channelization in the middle and lower sections of the river. Low flows through the braided channels create barriers to migrating adults, increase the water temperature, and reduce the available spawning habitat. Diking for flood control has exacerbated impacts from high-water events by confining the energy of the river. Shifting bedloads kill incubating pink eggs and alevins

STOCK DEFINITION PROFILE for Lower Dungeness Pink

SPAWNER DISTRIBUTION
DISTINCT? - **YES**

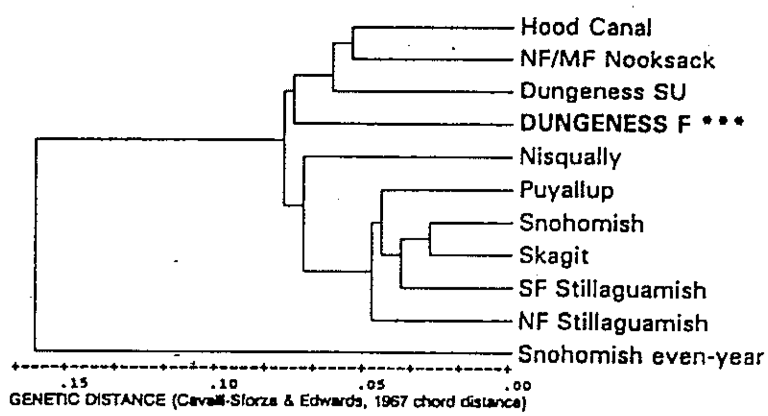


TIMING



BIOLOGICAL CHARACTERISTICS
DISTINCT? - **YES**

GENETICS - This stock is significantly different from all other Washington stocks tested [collection from lower Dungeness River (N=68); 28-locus G-tests: **p**<0.001].



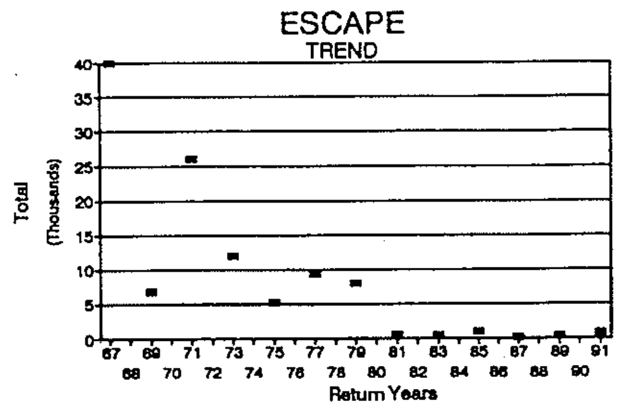
STOCK STATUS PROFILE for Lower Dungeness Pink

STOCK ASSESSMENT

DATA QUALITY——> Good

Return Years	ESCAPE Total			
67	40000			
68				
69	6900			
70				
71	26000			
72				
73	12000			
74				
75	5300			
76				
77	9400			
78				
79	8100			
80				
81	500			
82				
83	412			
84				
85	966			
86				
87	138			
88				
89	323			
90				
91	763			

Odd-year returns only.



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution, Timing, Genetics

STOCK STATUS
Critical

SCREENING CRITERIA
Chronically Low

during high flows in winter. Fish habitat impacts throughout the watershed have adversely affected the marine estuary which provides critical early life history habitat for pink salmon.

The 1979 brood was largely lost following major flooding and in-stream work, including diking and gravel removal, on spawning beds. Following that event, the stock declined dramatically and has not recovered.

Harvest Management -- Lower Dungeness pink salmon are harvested incidentally in Canadian and United States fisheries directed at Fraser River sockeye and pink salmon. In these fisheries, Dungeness pinks are harvested at the rate appropriate for Fraser River pink salmon stocks.

Preterminal Areas - Incidental harvests of lower Dungeness pink salmon occur in Johnstone Strait, Georgia Strait, the west coast of Vancouver Island, the Strait of Juan de Fuca (Areas 4B, 5 and 6C) and the San Juan Islands (Areas 6, 7, and 7A). Catches occur in both commercial net fisheries and recreational fisheries in these areas.

Preterminal harvest areas in Washington waters under Fraser Panel management that may impact this stock include Strait of Juan de Fuca and San Juan Islands.

Terminal Areas - No directed fisheries on Dungeness summer pink salmon have occurred in recent years as the stock has returned at levels below escapement needs. However, they are harvested incidentally by in-river recreational fisheries directed at other species.

Hatchery -- There were some minor enhancement efforts using this stock several years ago. Coho salmon are reared and released at the Dungeness Hatchery. The artificial propagation of coho salmon could have increased predation on juvenile pink salmon, contributing to the decline in population. However, the hatchery program began at the turn of the century, and lower Dungeness pinks were abundant until recently.

Last ten years salmon releases into the Dungeness basin.

Release Year	Spring Chinook	Fall Chinook	Coho	Pink
1982	26,600	0	4,661,652	0
1983	0	0	0	0
1984	0	0	721,000	0
1985	0	0	669,100	0
1986	0	0	499,400	0
1987	0	0	1,400,200	0
1988	0	0	336,700	27,200
1989	0	1,981,000	815,206	0
1990	0	0	423,414	0
1991	0	0	361,829	0
MEAN			1,098,722	

STRAIT OF JUAN DE FUCA -- ELWHA PINK

STOCK IDENTIFICATION AND ORIGIN

Elwha River pink salmon are September to October spawners. Although only about three miles of river are accessible for spawning, the river used to contain many side channels and braided areas, but they are no longer wetted.

These fish are geographically separated from the Dungeness pink stocks by about 15 miles.

There has been no genetic stock identification work on this stock of fish to date because only a handful of fish is observed during the spawning season.

STOCK STATUS

The status of Elwha pink salmon is Critical.

The escapement data for this stock are sporadic and inconsistent. Instantaneous counts of over a thousand pinks were made in the early 1970s. Following the flood event which severely damaged the 1979 brood, not more than 30 pinks were seen on any single survey. Extensive surveys were conducted in 1989, with a total of four fish seen all season. It is possible that these few fish are strays.

FACTORS AFFECTING PRODUCTION

Habitat -- Access to historic spawning areas in the Elwha River has been blocked by the Lower Elwha dam at RM 4.9. Only 3.4 miles of the main river channel above the mouth are accessible to naturally-spawning salmonids.

Pink salmon freshwater production is limited by lack of adequately-sized spawning gravel (available gravel is too large) because gravel recruitment is precluded by the dams. Inadequate gravel recruitment has also led to loss of estuarine habitat which also limits production.

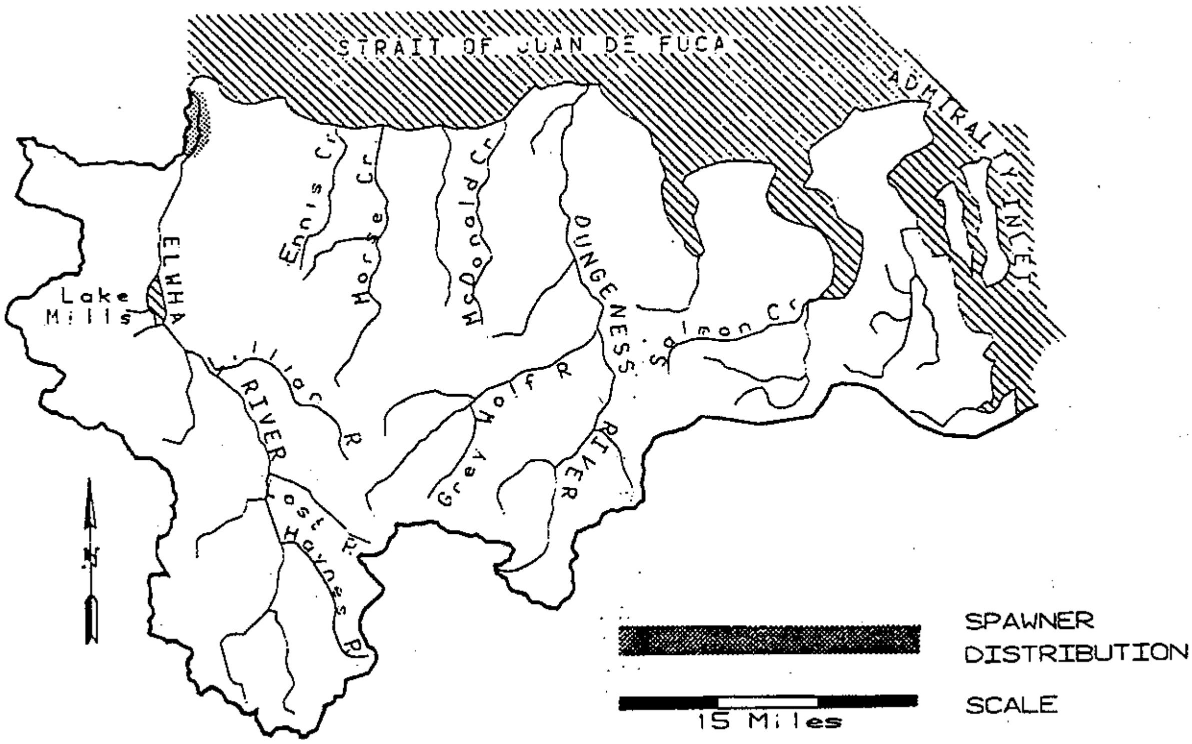
In addition, Elwha pink salmon have also suffered prespawning mortality due to increased water temperature and *Dermocystidium* infection during years of low summer flow in the river.

Harvest Management -- Elwha pink salmon are harvested in Canadian and United States fisheries and in eastern Strait of Juan de Fuca commercial net, troll and recreational fisheries. In Fraser Panel fisheries, Elwha pinks are harvested at the rate

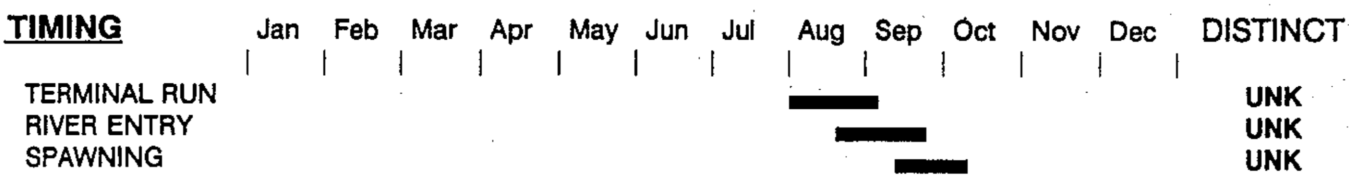
STOCK DEFINITION PROFILE for Elwha Pink

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS

DISTINCT? - **UNKNOWN**

GENETICS - No data available.

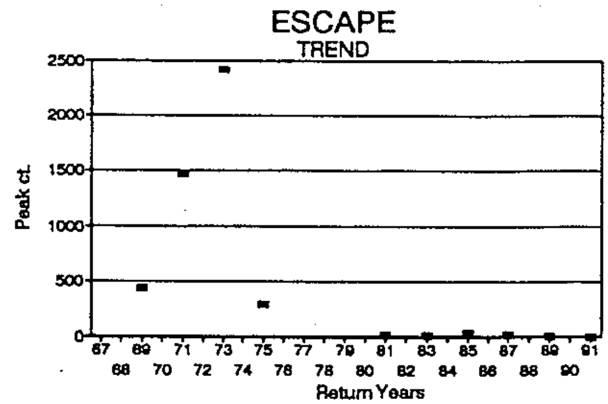
STOCK STATUS PROFILE for Elwha Pink

STOCK ASSESSMENT

DATA QUALITY------> Poor

Return Years	ESCAPE Peak ct.			
67				
68				
69	441			
70				
71	1473			
72				
73	2414			
74				
75	300			
76				
77				
78				
79				
80				
81	11			
82				
83	8			
84				
85	30			
86				
87	20			
88				
89	3			
90				
91	0			

Odd-year returns only.



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Distribution

STOCK STATUS
Critical

SCREENING CRITERIA
Chronically Low

appropriate for Fraser River pink stocks.

Preterminal Areas - Elwha pinks may be harvested in Vancouver Island fisheries targeting Fraser River pinks in late August and September. The Pacific Salmon Commission estimate of the catch of all Washington-origin pink salmon in 1989 Canadian Fraser Panel-regulated fisheries was 2,057,000, or 25 percent of the total combined Washington-Canada stock catch of 6,165,000 in southern British Columbia fisheries (PSC Joint Interceptions Committee 1991; PSC 1989-90 Annual Report).

Preterminal commercial harvest areas in Washington waters under Fraser Panel management that may impact this stock include the Strait of Juan de Fuca (Areas 4B, 5 and 6C) and the San Juan Islands (Areas 6, 7 and 7A).

Terminal Areas - No directed commercial net fisheries on Elwha pinks have occurred in the last 17 years.

From 1985-1989 there was no terminal area catch of Elwha pinks (data from WDF/tribal catch records).

Hatchery -- There are large-scale chinook, coho and steelhead rearing and release programs at two hatcheries located on the Elwha River. Effects on Elwha pink salmon are unknown, however juvenile hatchery fish may prey on or compete with juvenile pink salmon in both freshwater and estuarine areas.

Last ten years salmon releases into the Elwha basin.

Release Year	Fall Chinook	Chum	Coho
1982	1,250,944	884,684	3,108,507
1983	3,735,409	233,000	602,080
1984	2,188,950	99,200	751,010
1985	2,732,735	622,400	890,314
1986	2,363,712	272,170	1,038,000
1987	2,265,871	0	880,100
1988	4,265,153	0	267,148
1989	4,094,690	0	415,557
1990	880,085	0	995,204
1991	2,622,153	0	892,185
MEAN	2,639,970	422,291	984,011

OVERVIEW -- STRAIT OF JUAN DE FUCA SUMMER AND WINTER STEELHEAD STOCKS

SUMMER:	WINTER:	
DUNGENESS	DISCOVERY BAY	LYRE
ELWHA	SEQUIM BAY	PYSHT / INDEPENDENTS
	DUNGENESS	CLALLAM
	MORSE CREEK / INDEPENDENTS	HOKO
	ELWHA	SEKIU
	SALT CREEK / INDEPENDENTS	SAIL

STOCK DEFINITION AND ORIGIN

In the Strait of Juan de Fuca, two wild summer steelhead stocks and twelve wild winter steelhead stocks have been identified. Wild summer steelhead are found in the Dungeness River and Elwha River and wild winter steelhead in Discovery Bay tributaries, Sequim Bay tributaries, Dungeness River, Morse Creek and nearby independent drainages, Elwha River, Lyre River, Salt Creek and nearby independent drainages, Pysht River and nearby independent drainages, Clallam, Hoko, Sekiu and Sail rivers.

There is little or no information available to indicate that these are genetically distinct stocks. The stocks are treated separately due to the geographic isolation of the spawning populations. There may be more or fewer stocks identified once more comprehensive genetic, life history, and ecological information is available.

The run timing of the summer steelhead stocks, generally from May through October, is distinct from run timing of the winter steelhead stocks, generally from December through May, in the Strait of Juan de Fuca.

Hatchery steelhead stocks will be discussed in a separate inventory. Hatchery steelhead will be mentioned here only in the context of how they may impact the origin and/or productivity or production of the wild stock. Hatchery steelhead smolts are stocked in many streams to provide recreational and tribal fishing opportunities, but not all hatchery fish are harvested and some may spawn in the wild. The WDFW Bogachiel/Chambers Creek hatchery winter steelhead or Bogachiel hatchery summer steelhead are used in most streams where hatchery steelhead are release. However, the Elwha, Hoko, Sekiu, and Sail rivers have programs which have recently utilized some wild steelhead in the hatchery brood stocks.

STOCK STATUS

Where possible, the trend in wild steelhead spawning escapement and its relationship to potential steelhead production in available habitat or to established spawning escapement objectives was used to determine the status of wild steelhead stocks. If spawning escapement information was not available for a stock then trends in sport harvest or other indices were used.

To estimate spawning escapement, standardized methods are used. Redd counts were conducted on foot, by boat, and/or by air every two or three weeks (or as water conditions allowed) from March through June or the end of the spawning season, whichever occurred first. Spawner escapements were calculated as: (Number of redds) x (0.81 females per redd) x (an adjustment for sex ratio; typically one male per female unless system-specific information is available).

For most streams, the Washington Department of Fish and Wildlife estimates steelhead sport harvest based on projections of the number of steelhead reported on permit cards that are returned by anglers for each stream. The projection is necessary because not all permit cards are returned. Harvest estimates are also derived from angler surveys ("creel surveys") on several river systems; these harvest estimates are more accurate and are compared with the number of steelhead reported on permit cards for those same systems to calculate the projection factor. In western Washington, winter-run steelhead are those caught between November 1 and April 30; summer-run steelhead are those caught between May 1 and October 31. Most hatchery steelhead are marked with an adipose fin-clip and marked and unmarked steelhead have been reported separately by anglers on the permit cards since the 1986 summer steelhead season and since the 1986-87 winter steelhead season.

The non-treaty sport fishery for summer steelhead occurs from June through February in the Dungeness River and from June through April 15 in the Elwha River; wild steelhead release regulations have been in effect in all freshwater areas since 1992 to protect the wild summer steelhead from sport harvest. For winter steelhead, the non-treaty sport fisheries in Morse Creek, Salt Creek, and the Dungeness, Lyre, Pysht, Clallam, Hoko, and Sekiu rivers are directed at hatchery winter steelhead from December through February; in addition, wild steelhead release regulations have been in effect in the Dungeness River since 1993 and will begin with the 1994-95 season in Morse Creek to protect the wild winter steelhead from sport harvest. There are no recreational fisheries in Discovery Bay tributaries, Sequim Bay tributaries or some of the other independent drainages containing certain stocks. Wild steelhead release regulations have been in effect in all marine areas since 1993 to protect wild summer and winter steelhead from sport harvest.

Treaty net fisheries and hook-and-line subsistence fisheries occur in some marine and freshwater areas along the Strait of Juan de Fuca. Treaty net fisheries only occur in areas if the streams are stocked with hatchery steelhead smolts. If no hatchery steelhead smolts are stocked, limited tribal hook-and-line subsistence fisheries may still take place. Treaty net fisheries occur from December through February in marine areas near the mouths of the Dungeness River, Morse Creek, Pysht River and Sail River. Treaty net fisheries occur from December through February or the first week in March in the Dungeness River, Morse Creek, Lyre River, Pysht River, Clallam River, Sekiu River, and Sail River and from December through the end of March in the Elwha River and Hoko River. Hook-and-line subsistence fisheries occur from December through the first week in April in all streams except Discovery Bay tributaries, Sequim Bay tributaries, Salt Creek and nearby independent streams, Deep Creek, and the Sekiu River; hook-and-line subsistence fisheries are operated with a bag limit when and where treaty net fisheries are closed and with no bag limit when treaty net fisheries are open.

A recent Washington Department of Wildlife study (Cooper and Johnson 1992) concluded that there have been long-term fluctuations and recent declines in winter, summer, hatchery and wild steelhead abundance and survival in the Puget Sound, Strait of Juan de Fuca, Pacific coast, and Columbia River areas in Washington. There were also similarities in the overall trends and year-to-year trends of steelhead abundance in Washington, British Columbia and Oregon. Similarities in survival trends over widespread geographic areas indicate that common factor(s) to each of these areas are partially responsible for recent changes in steelhead survival. A combination of factors contributed to the recent decline in steelhead abundance including low ocean productivity, competition for food in the ocean, and catch of steelhead in authorized and unauthorized high seas drift net fisheries.

More information on each stock is presented in separate Stock Reports.

STRAIT OF JUAN DE FUCA -- DUNGENESS SUMMER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild summer steelhead in the Dungeness River, Gray Wolf River and tributaries have been designated as a distinct stock based on the geographic isolation of the spawning population. The specific spawning distribution is unknown, but spawning is assumed to take place in the upper reaches of the river.

Summer steelhead are distinct from wild winter steelhead in the Dungeness River based on run timing. No system-specific information is available, but run timing is assumed to be from May through October. Spawn timing is unknown but probably occurs from February through April.

No information is available regarding the genetic composition of the stock.

STOCK STATUS

The status of the stock has been designated as Depressed based on the trend in sport harvest of wild steelhead. Two of the lowest sport harvests have been recorded during the last five years, indicating a short-term decline. The stock may also be chronically depressed.

Sport harvest data are available from steelhead permit cards but wild summer steelhead were not reported separately until the 1986 summer steelhead season. An estimated 26, 42, 25, 47, 8 and 23 wild summer steelhead were harvested in the sport fishery during the 1986, 1987, 1988, 1989, 1990 and 1991 steelhead seasons, respectively. Sport harvest of wild summer steelhead is available over the entire run and the number of fish harvested can be used to rate the status of the wild stock as Depressed.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified.

FACTORS AFFECTING PRODUCTION

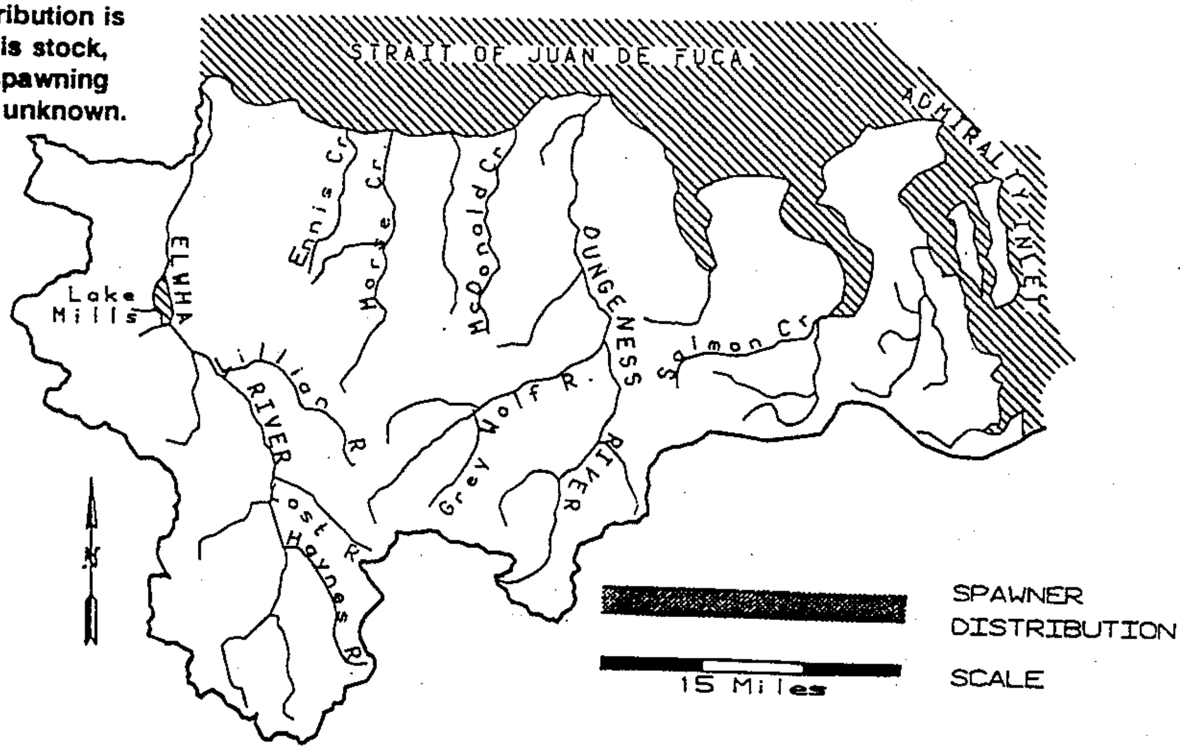
Habitat -- The Dungeness watershed is uniquely located in a rain shadow created by the Olympic Mountains. This geographic feature limits the average annual precipitation in the lower ten miles of the river to less than 20 inches per year, though the upper watershed receives two to three times this amount (U.S. Department of Agriculture 1965). A significant portion of the water flow in the Dungeness River is provided by melting snow from the surrounding mountains, which varies from year to year. As a result, the amount of water available for fish production is somewhat limited compared to neighboring watersheds.

STOCK DEFINITION PROFILE for Dungeness Summer Steelhead

SPAWNER DISTRIBUTION

DISTINCT? - **YES**

Spawner distribution is distinct for this stock, but specific spawning locations are unknown.



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													
RIVER ENTRY					████	████	████	████	████	████			**NO**
SPAWNING													**UNK**

BIOLOGICAL CHARACTERISTICS

DISTINCT? - UNKNOWN

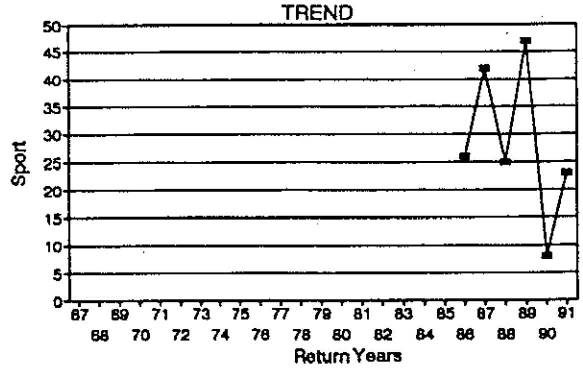
STOCK STATUS PROFILE for Dungeness Summer Steelhead

STOCK ASSESSMENT

DATA QUALITY-----> Fair

Return Years	HARVEST Sport			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86	26			
87	42			
88	25			
89	47			
90	8			
91	23			

HARVEST
TREND



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Unresolved

PRODUCTION TYPE

Unresolved

STOCK DISTINCTION

Spawning Distribution

STOCK STATUS

Depressed

SCREENING CRITERIA

Short-Term Severe Decline

In general, summer steelhead production in the Dungeness River has been affected by human activities, including removal of riparian vegetation for urban and agricultural development, forest practices in the upper watershed, flood control, water withdrawals for irrigation, and pollution of the river and estuary by urban and agricultural run-off.

Five irrigation withdrawals occur between river miles 6.8 and 11 and remove as much as 60 percent of the natural flow during critical low flow periods (August through October) which coincides with the upstream migration of summer steelhead adults and the juvenile rearing of summer steelhead. Erosion has caused extensive gravel aggradation and channel braiding in the river. These factors reduce the water depth, increase water temperature and velocity, and destabilize the bedload of the river. In addition, fine sediments reduce the quality of spawning habitat by smothering incubating eggs. Flood control measures, such as dikes, confine the river during high water events, exacerbating bedload instability and subjecting rearing fish to extreme conditions. In combination, these production bottlenecks adversely impact fish production by impeding both upstream and downstream migration of anadromous salmonids, reducing the quality and quantity of spawning and rearing habitat, and killing incubating eggs in the unstable bedload during high water flows.

A short-term decline in abundance may additionally be due, in part, to changes in ocean survival of steelhead which has occurred over widespread areas in Washington, Oregon, and British Columbia (Cooper and Johnson 1992).

Harvest Management -- It is assumed that low numbers of summer steelhead are incidentally harvested in preterminal Canadian and U.S. fisheries. Commercial treaty net fisheries occur in the Dungeness River from December through February, downstream of Highway 101, and a limited tribal hook-and-line subsistence fishery occurs from early December through early April. Incidental harvest of wild summer steelhead in these treaty fisheries may occur in some years. The non-treaty sport fishery occurs from June through February and has been managed with wild steelhead release regulations in the Dungeness River since 1992 and in all marine areas since 1993, although some hook-and-release mortality of wild summer steelhead may occur.

Hatchery -- Hatchery summer steelhead smolts have been stocked in the Dungeness River and nearby streams. The effect hatchery-reared steelhead spawning in the wild have on the long-term productivity and production of wild summer steelhead is unknown.

Two state hatcheries are located on the Dungeness River. The Dungeness Hatchery produces coho salmon yearlings for release into the Dungeness River and supports other small cooperative enhancement projects in the immediate area. The Hurd Creek Hatchery produces juvenile and yearling fall chinook salmon for release into the Elwha River and supports a captive broodstock program for a Dungeness chinook salmon rebuilding project.

The impact these hatchery programs have on Dungeness wild summer steelhead is unknown.

STRAIT OF JUAN DE FUCA -- ELWHA SUMMER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild summer steelhead in the Elwha River have been classified as a distinct stock based on the geographic isolation of the spawning population. Summer steelhead are distinct from wild winter steelhead in the Elwha River based on run timing. No system-specific information is available, but run timing is assumed to be from May through October. Spawn timing is unknown.

No information is available regarding the genetic composition of the wild summer steelhead stock.

STOCK STATUS

The status of the stock is designated as Depressed based on the difference between the current abundance and that at historic levels. Due to the presence of two dams which block access to the majority of spawning and rearing habitat in the drainage, the Elwha River has a very limited anadromous fish rearing and spawning area (approximately 4.8 miles).

FACTORS AFFECTING PRODUCTION

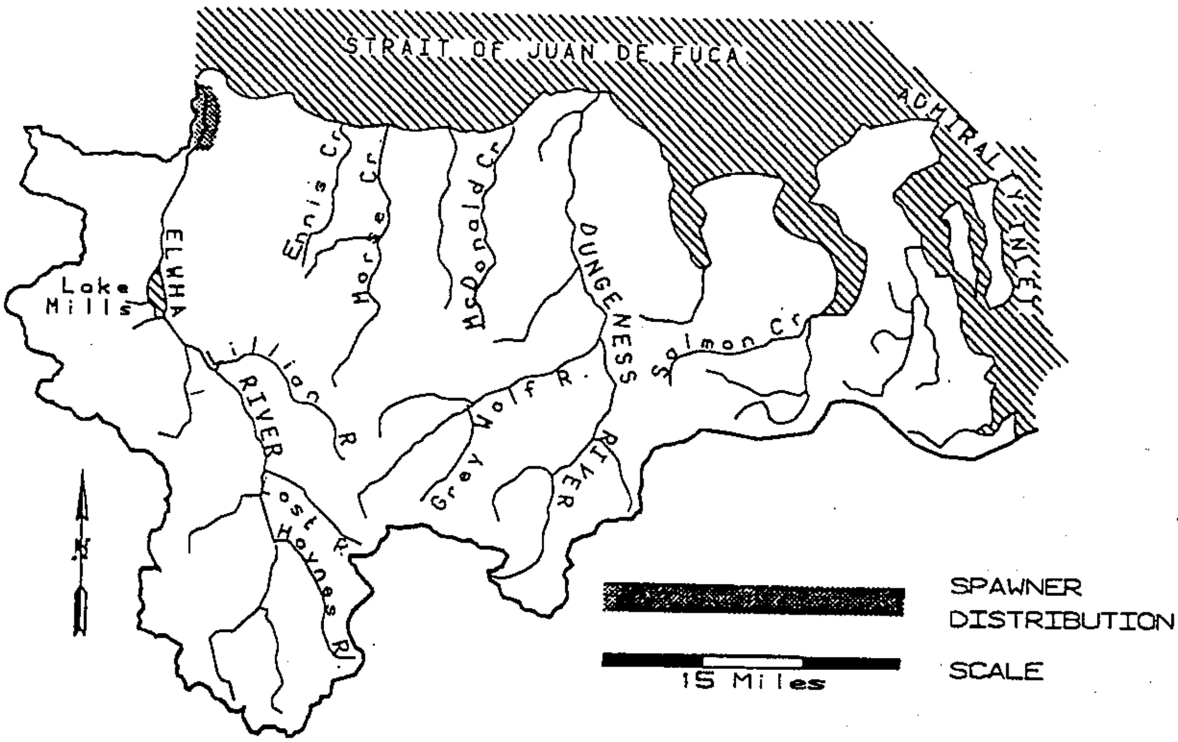
Habitat -- Two dams on the Elwha River limit access of anadromous stocks to the upper watershed, significantly limit gravel recruitment to the lower watershed necessary for spawning, and can alter stream temperatures. This river is especially vulnerable to the gill parasite *Dermocystidium* when drought conditions exist to create warm water temperatures. Warm water is the result of thermal stratification upstream of the dams followed by spills from the upper warmer water layers in the lakes created by the dams. During drought years, prespawning mortality among natural chinook salmon spawners has been as high as 70 percent of returning adults (1992). Although unquantified, high prespawning mortality of summer steelhead also occurs.

Harvest Management -- Treaty net fisheries occur from December through February, a limited tribal hook-and-line fishery occurs throughout the season, and incidental harvest of wild steelhead may occur in some years. Incidental mortalities are also presumed to occur in terminal and pre-terminal areas during the harvest of other species. The non-treaty sport fishery occurs from June through April 15 and has been managed with wild steelhead release regulations in the Elwha River since 1992 and in all marine areas since 1993, although some hook-and-release mortality of wild summer steelhead may occur.

STOCK DEFINITION PROFILE for Elwha Summer Steelhead

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													
RIVER ENTRY													NO
SPAWNING													UNK

BIOLOGICAL CHARACTERISTICS

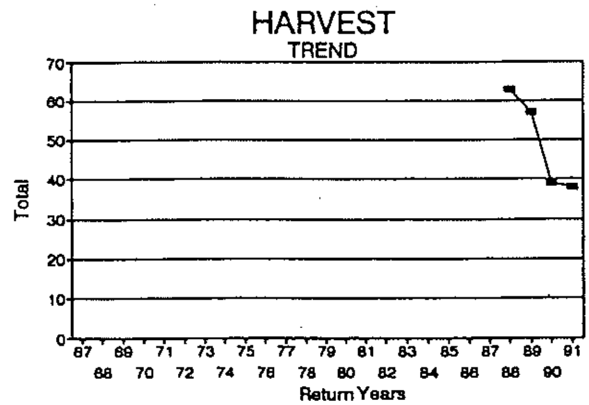
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Elwha Summer Steelhead

STOCK ASSESSMENT

DATA QUALITY-----> Fair

Return Years	HARVEST Total			
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88	63			
89	57			
90	39			
91	38			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Chronically Low

Hatchery -- While hatchery steelhead smolts have been stocked in this and nearby streams, the effect on the long-term productivity and production of the wild stock of hatchery-reared fish spawning in the wild is unknown.

STRAIT OF JUAN DE FUCA -- DISCOVERY BAY WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in Discovery Bay tributaries, including Snow Creek and Salmon Creek, are native and have been designated a distinct stock on the basis of the geographic isolation of the spawning population.

Little is known about the genetic composition of the stock. Run timing (December through early May) and spawn timing (February through mid-May) are similar to those of other wild winter steelhead stocks in the Strait of Juan de Fuca and Hood Canal areas.

The Washington Department of Wildlife has operated fish traps located at RM 0.8 on Snow Creek since 1977 and has monitored the wild winter steelhead adult and juvenile populations in Snow Creek. Steelhead adults of hatchery origin which have strayed into Snow Creek and been captured at the trap have not been released upstream. Information on life history of wild winter steelhead in Snow Creek reported below is taken from Johnson and Cooper (1992) and WDFW files.

Wild adult winter steelhead have entered Snow Creek as early as the first week in December. Numbers of adults entering Snow Creek increase beginning the first week in February with fifty percent of the run entering the creek by the second week in March. Upstream migration of adult winter steelhead ends by the first week in May.

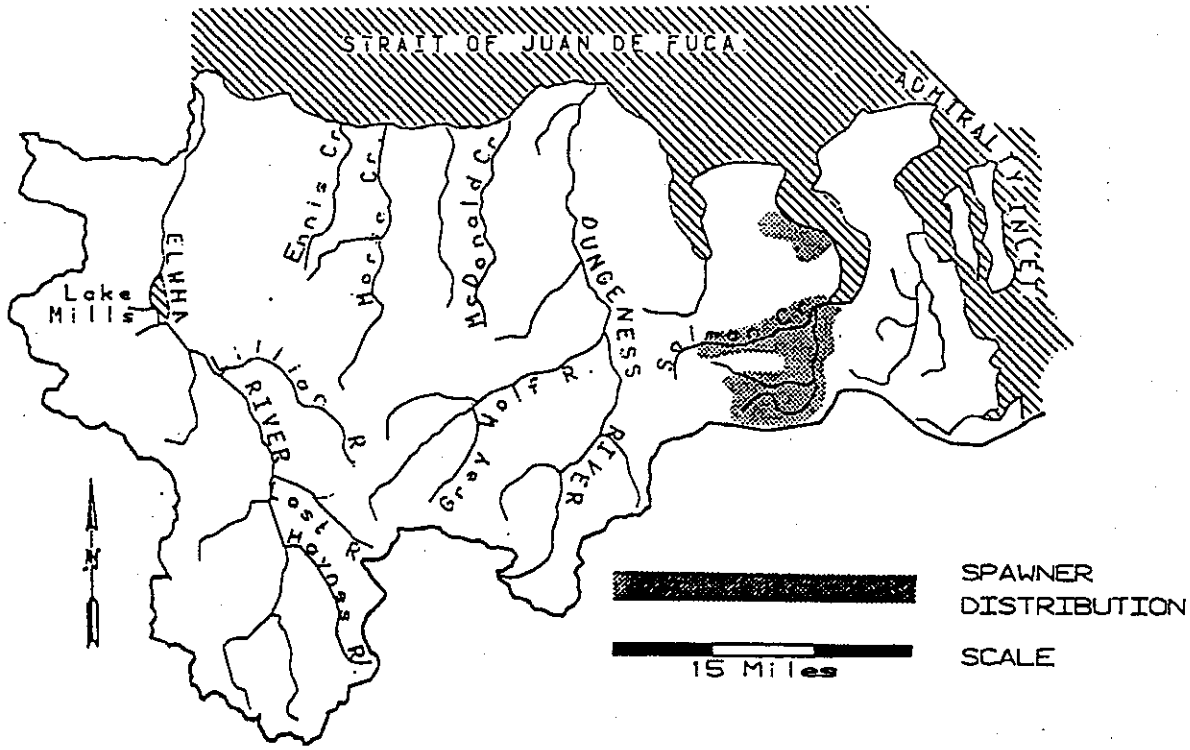
Wild female winter steelhead average 669 mm in length (range 410 mm to 855 mm), 3,323 g in weight (range 625g to 6,825 g), with an average fecundity of 3,275 eggs per female. Of the total number of adult female winter steelhead in Snow Creek, 0.5 percent spent nearly one year in saltwater prior to returning to spawn (1-salts), 76 percent spent nearly two years in saltwater (2-salts), 9 percent spent nearly 3 years in saltwater (3-salts) and 14.5 percent returned to spawn more than one time (repeat spawners).

Wild male winter steelhead average 670 mm in length (range 373 mm to 882 mm) and 3,119 g in weight (range 525 g to 7,550 g). Of the total number of adult male winter steelhead in Snow Creek, 9 percent spent nearly one year in saltwater prior to returning to spawn (1-salts), 78 percent spent nearly two years in saltwater (2-salts), 4 percent spent nearly 3 years in saltwater (3-salts) and 9 percent returned to spawn more than one time (repeat spawners).

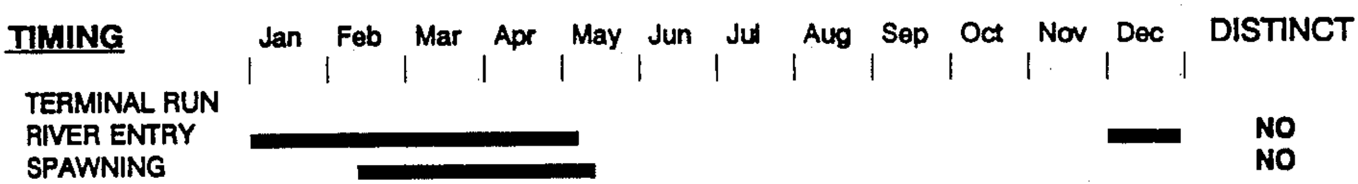
The sex ratio for winter steelhead in Snow Creek has averaged 1.07 females per male.

STOCK DEFINITION PROFILE for Discovery Bay Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Discovery Bay Winter Steelhead

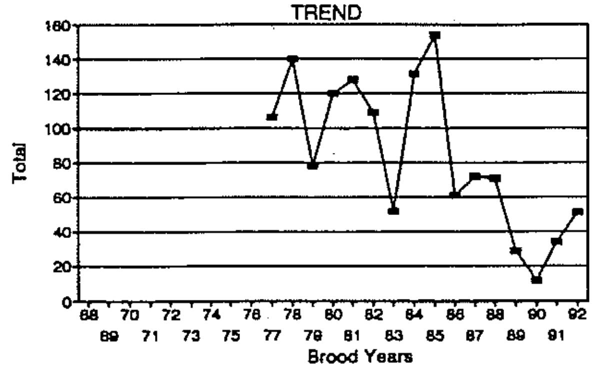
STOCK ASSESSMENT

Snow Cr

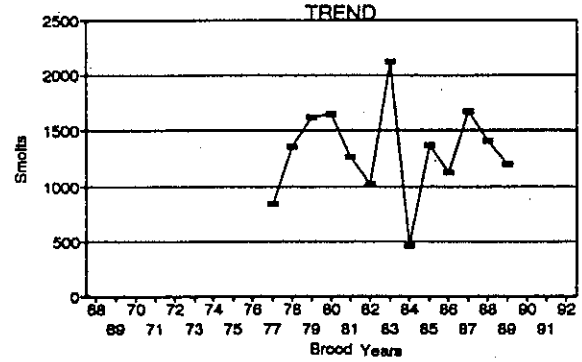
DATA QUALITY-----> Excellent

Brood Years	RUNSIZE Total	JUVENILE Smolts	SURVIVAL Smolt/egg	SURVIVAL Smolt/fem.
68				
69				
70				
71				
72				
73				
74				
75				
76				
77	106	847	0.6	21.7
78	140	1357	1.4	42.4
79	78	1621	2.7	95.4
80	120	1644	1.3	45.7
81	128	1263	1.0	32.4
82	109	1021	1.1	36.5
83	52	2122	3.6	111.7
84	131	460	1.4	41.8
85	154	1372	1.2	40.4
86	61	1122	1.7	56.1
87	72	1669	1.9	59.6
88	71	1411	2.5	87.3
89	29	1198	3.2	98.1
90	12			
91	34			
92	51			

RUNSIZE
TREND

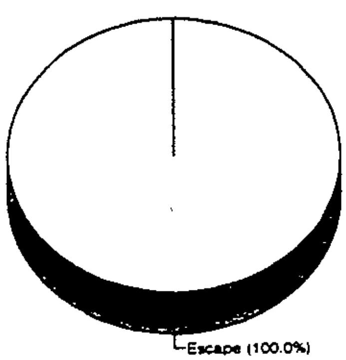


JUVENILE
TREND



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.



NO SPORT OR TRIBAL FISHERY
100 % ESCAPEMENT

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Short-Term Severe Decline

Wild winter steelhead redds were first observed in Snow Creek during the first week in February with fifty percent of the total number being constructed by the first week in April. Redd construction is typically completed by the second week in May. The number of redds per kilometer in Snow Creek has averaged 4.7 $\pm$ 1.3. The number of redds per female in Snow Creek has averaged 1.25. The average number of days from first date of entry to date of downstream migration for winter steelhead adults was 60 $\pm$ 6 days. Steelhead egg densities upstream of the Snow Creek weir have ranged from 29 to 279 eggs per 100 m^2 since 1978.

The number of days from egg deposition to first emergence of winter steelhead fry from the gravel in Snow Creek averaged 62 days with 50 percent of fry emergence occurring by 71 days. Temperature units to first emergence ranged from 417 to 872 and averaged 590. Emergent winter steelhead fry average 30 mm in length and 0.21 g in weight.

During August, winter steelhead age 0+ average 58 mm in length and 2.5 g in weight with an average density of 43 $\pm$ 17 fish/100 m^2. During October, winter steelhead age 0+ average 70 mm in length and 4.6 g in weight with an average density of 32 $\pm$ 13 fish/100 m^2.

During August, winter steelhead age 1+ average 116 mm in length and 18 g in weight with an average density of 13 $\pm$ 1 fish/100 m^2. During October, winter steelhead age 1+ average 121 mm in length and 20 g in weight with an average density of 11 $\pm$ 0.05 fish/100 m^2.

Winter steelhead smolt emigration from the stream to Discovery Bay generally begins during the first week in April and ends by the second week in June. Fifty percent of the total smolt migration has occurred by May 10, plus or minus four days. The total number of smolts by brood year produced upstream of the Snow Creek weir has ranged from 460 to 2,122 with an estimated additional 148 smolts produced downstream of the weir. Average age composition of winter steelhead smolts for the 1978 to 1992 outmigration years was 9.8 percent age 1, 84.5 percent age 2, and 6.7 percent age 3. Mean length and mean weight was 139 mm and 26 g for age 1 smolts, 164 mm and 41g for age 2 smolts, and 195 mm and 66 g for age 3 smolts.

Average condition factor, K, a measure of relative fatness, has been 0.91 for winter steelhead smolts. Winter steelhead smolt density has ranged from 1.08 to 3.93 smolts/100 m^2 and averaged 2.66 smolts/100 m^2. Biomass of winter steelhead smolts has ranged from 42 to 146 g/100$m^2$and averaged 107 g/100m^2.

For the brood years 1977 through 1989, the range in survival rates between the various juvenile life history stages of winter steelhead in Snow Creek have been (1) 0.67 percent to 3.64 percent survival from egg to smolt, (2) 21.5 percent to 69.9 percent survival from fall fry to parr, (3) 4.6 percent to 14.3 percent survival from fall fry to smolt, and (4) 12.5 percent to 49.5 percent survival from parr to smolt. Production in Snow Creek has ranged from 22 to 112 steelhead smolts per female spawner. Wild winter steelhead smolt-to-adult survival rate averaged 6.3 percent ± 1.8 percent and ranged from 2.2 percent to 10.7 percent, excluding repeat spawners.

STOCK STATUS

The status of the stock has been designated as Depressed because of a short-term severe decline in wild winter steelhead run size in Snow Creek. Total run size (which includes the estimated number of winter steelhead spawning downstream of the trap) has fluctuated from a low of 12 adults in 1989-90 to a high of 154 adults in 1984-85. Two of the lowest run sizes occurred during the 1990 and 1991 brood years.

A short-term decline in abundance is often difficult to distinguish from the normal fluctuation in abundance of all naturally produced stocks of fish. This stock has been rated as Depressed since it is important to identify declining stocks as early as possible.

FACTORS AFFECTING PRODUCTION

Habitat -- Snow Creek and Salmon Creek flow directly into Discovery Bay on the Strait of Juan de Fuca. Elevation ranges from sea level to 4,273 feet on Mt. Zion in Olympic National Park. Average rainfall in this watershed is 41 inches and average annual flow for the entire Snow Creek watershed is 22 cfs (WDFW data reported in Jones and Stokes Assoc. 1991).

Freshwater habitat has been impacted by land use (forest management) activities, but quantitative information is limited. Lower Salmon and Snow creeks have large deposits of fine sediment which likely decreases the quality of available spawning habitat. Forest road construction and the lack of road maintenance at a few locations and past clear-cutting of large areas have lead to increased runoff, flood frequency, and downstream erosion (Nelson et al. 1992).

Timber harvest levels increased during the 1980's in response to removal of blowdown timber and high prices. A timber sale unit of approximately 800 acres on private land in Snow Creek which was clear-cut during 1985-1987 triggered several minor slumps and one debris flow, and has increased downstream runoff and downstream erosion. Logging and road construction under past forest regulations has impacted riparian and wetland habitats in some locations. The stream corridor along most of the upper mainstem of Salmon Creek is wooded and remains in a fairly natural, undisturbed condition, with the exception of evidence of high peak flows. Clear-cutting of steep-walled ravines of Snow Creek tributaries has created slope failures and at least one debris slide injecting sediment into the mainstem of Snow Creek (Nelson et al. 1992). In addition, habitat composition, substrate composition and amount and distribution of large wood in the stream has likely changed as a result of changes in flow patterns.

Streamside habitats in the lower sections of Snow and Salmon creeks have been impacted by landuse activities. For example, Nelson et al. (1992) reported that 50 percent to 75 percent of the streambanks were bare and eroding along a section of Snow Creek even though an overstory canopy was present. Fencing of the stream corridors to reduce livestock access and use would probably improve the condition of both the stream banks and streamside vegetation and reduce a potential source of bacterial contamination. The lower section of Salmon Creek was fenced in 1993 in a cooperative effort between a local landowner and the Soil Conservation Service.

A short-term decline in abundance may additionally be due, in part, to recent changes in ocean survival of steelhead which has occurred over widespread areas in Washington, Oregon, and British Columbia (Cooper and Johnson 1992).

Harvest Management -- There are no recreational or commercial fisheries in the terminal areas of Snow and Salmon creeks or Discovery Bay. Sport fishing has been closed year-round in both the Snow and Salmon creek drainages, except Crocker Lake in the Snow Creek drainage is open to fishing all year for all species.

Hatchery -- Prior to 1991, no winter steelhead smolts of hatchery origin have been stocked in Snow Creek or Salmon Creek. In 1991, approximately 1,000 winter steelhead smolts were stocked in Snow Creek to document the extent of residualism and in-stream mortality of hatchery smolts. This experiment was repeated in 1992 and 1993. Steelhead adults returning from these hatchery smolts will be examined for tags and then will not be released into the stream.

STRAIT OF JUAN DE FUCA -- SEQUIM BAY WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in Sequim Bay tributaries, including Jimmycomelately, Johnson, and Gierin creeks, are native and have been classified as a distinct stock based on the geographic isolation of the spawning population.

No information is available regarding the genetic composition of the stock.

Run timing (December through May) and spawn timing (mid-February to early June) are similar to those of other wild winter steelhead stocks in the Strait of Juan de Fuca area.

STOCK STATUS

The status of the stock is Unknown. This stock is comprised of a historically small number of winter steelhead, but there is insufficient information to classify its status as either Healthy, Depressed or Critical.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified. The WDW observed five steelhead redds in Jimmycomelately Creek from RM 1.7 to the mouth and estimated spawner escapement at eight winter steelhead in 1980. The WDW operated a trap near the mouth and estimated 330 steelhead smolts, 283 cutthroat smolts, and 1,884 coho smolts outmigrated from Jimmycomelately Creek during spring, 1980.

Harvest information can not be used to assess stock status since there are no sport or treaty fisheries for steelhead on these streams.

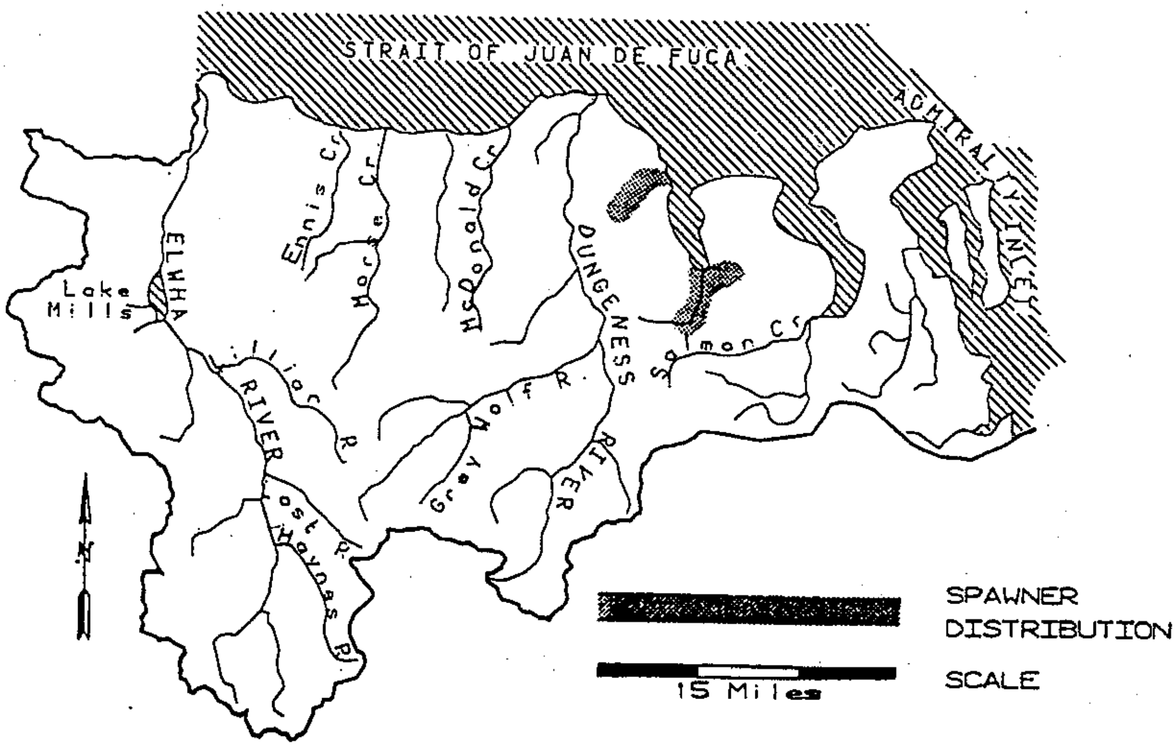
FACTORS AFFECTING PRODUCTION

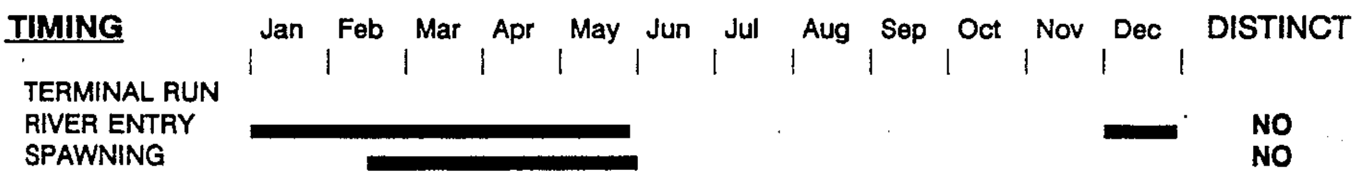
Habitat -- Natural production has been limited by flooding and sedimentation. Forest practices have impacted the freshwater and estuarine habitat, but quantitative data are unavailable. Access to spawning and rearing habitat in Jimmycomelately Creek has been reduced by the improper placement of culverts during road construction. A log rafting dump in the southwest corner of Sequim Bay has impacted the associated nearshore rearing area and deposited leachates on the bay floor. An irrigation ditch outfall has caused extensive erosion and sedimentation in Johnson Creek, degrading spawning and rearing habitat. A marina was built along the west shoreline of Sequim Bay in the 1980s. The effects this development has had on Sequim Bay winter steelhead are unknown. Agriculture has impacted the western Sequim Bay tributaries through the removal of riparian habitat and grazing in and along stream banks.

STOCK DEFINITION PROFILE for Sequim Bay Winter Steelhead

SPAWNER DISTRIBUTION

DISTINCT? - **YES**





BIOLOGICAL CHARACTERISTICS

DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Sequim Bay Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY-----> Poor

Return Years	ESCAPE Index total		JUVENILE Smolts	
	Jimmycomelately		Jimmycomelately	
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78			330	
79				
80	8			
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

Harvest Management -- There are no recreational or commercial fisheries in the terminal areas on this stock.

Hatchery -- Hatchery steelhead smolts have not been stocked in these streams. A private trout hatchery is located in the upper watershed of Jimmycomelately Creek and the impacts, if any, on the wild winter steelhead stock are unknown.

Two state hatcheries are located on the Dungeness River, immediately west of Sequim Bay. The Dungeness Hatchery produces coho salmon yearlings for release into the Dungeness River and supports other small cooperative enhancement projects in the immediate area. The Hurd Creek Hatchery produces juvenile and yearling fall chinook salmon for release into the Elwha River and supports a captive broodstock program for a Dungeness chinook salmon rebuilding project. The impact these hatchery programs have on wild winter steelhead in Sequim Bay tributaries is unknown.

STRAIT OF JUAN DE FUCA -- DUNGENESS WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Dungeness River, Gray Wolf River, and tributaries have been designated as a distinct stock based on the geographic isolation of the spawning population.

No information is available regarding the genetic composition of the stock.

Specific run timing is unknown, but is believed to be from December through May. Spawn timing (mid-February to early June) is similar to that of other wild winter steelhead stocks in the Strait of Juan de Fuca area.

STOCK STATUS

The status of the stock has been designated as Depressed based on wild steelhead spawner escapement.

Spawner escapement has ranged from 176 to 438 wild winter steelhead from 1988 to 1992. In all or nearly all years, this is lower than potential steelhead production based on available habitat. For example, using the WDFW methodology (Gibbons et al. 1985) a maximum sustained harvest (MSH) escapement objective for this stock would be 1,169 wild winter steelhead. This escapement objective and the method used to derive it have not been jointly agreed to by the WDFW and the treaty tribes.

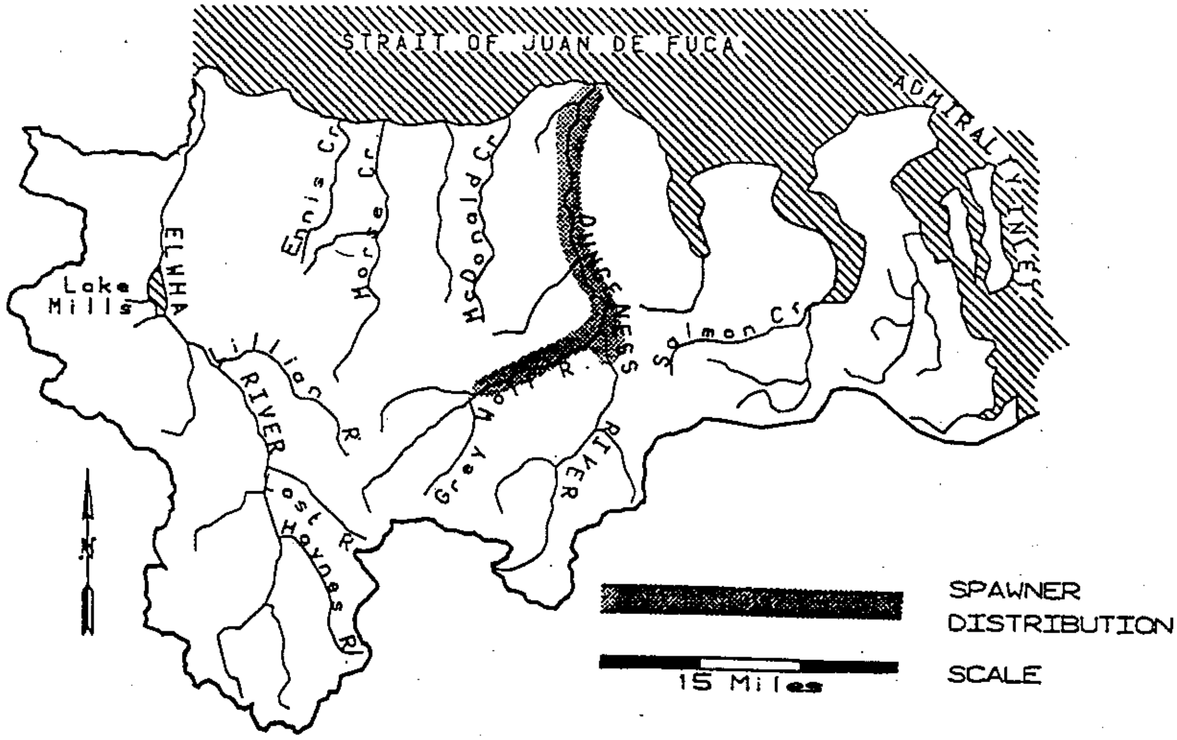
Sport harvest information is available since the early 1960s but wild winter steelhead were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 208, 209, 68, 52, 22, and 37 wild winter steelhead were harvested in the sport fishery during the 1986-87, 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 steelhead seasons, respectively. Sport harvest information for wild winter steelhead is available for only the early portion of the run (because the sport steelhead season closes on February 28) and cannot be used to assess the status of the wild stock. The lowest sport harvests have been recorded during the last few years, possibly indicating a short-term decline.

FACTORS AFFECTING PRODUCTION

Habitat -- The Dungeness watershed is uniquely located in a rain shadow created by the Olympic Mountains. This geographic feature limits the average annual precipitation in the lower ten miles of the river to less than 20 inches per year, though the upper watershed receives two to three times this amount (U.S. Department of Agriculture 1965). A significant portion of the water flow in the Dungeness River is provided by melting snow from the surrounding mountains, which varies from year to year.

STOCK DEFINITION PROFILE for Dungeness Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													
RIVER ENTRY													NO
SPAWNING													NO

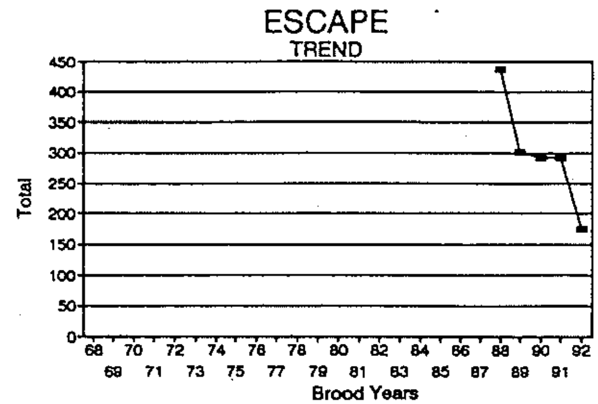
BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Dungeness Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY-----> Good

Brood Years	ESCAPE Total			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88	438			
89	302			
90	292			
91	292			
92	176			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Chronically Low

As a result, the amount of water available for fish production is somewhat limited compared to neighboring watersheds. In general, winter steelhead production in the Dungeness River has been affected by human activities, including removal of riparian vegetation for urban and agricultural development, forest practices in the upper watershed, flood control, water withdrawals for irrigation, and pollution of the river and estuary by urban and agricultural run-off.

Five irrigation withdrawals occur between river miles 6.8 and 11 and remove as much as 60 percent of the natural flow during critical low flow periods (August through October) which coincides with the juvenile rearing of winter steelhead. Erosion has caused extensive gravel aggradation and channel braiding in the river. These factors reduce the water depth, increase water temperature and velocity, and destabilize the bedload of the river. In addition, fine sediments reduce the quality of spawning habitat by smothering incubating eggs. Flood control measures, such as dikes, confine the river during high water events, exacerbating bedload instability and subjecting rearing fish to extreme conditions. In combination, these production bottlenecks adversely impact fish production by impeding both upstream and downstream migration of anadromous salmonids, reducing the quality and quantity of spawning and rearing habitat, and killing incubating eggs in the unstable bedload during high water flows.

A short-term decline in abundance may additionally be due, in part, to recent changes in ocean survival of steelhead which has occurred over widespread areas in Washington, Oregon, and British Columbia (Cooper and Johnson 1992).

Harvest Management -- It is assumed that low numbers of winter steelhead are incidentally harvested in preterminal Canadian and U.S. fisheries. Commercial treaty net fisheries occur in the Dungeness River, downstream of Highway 101, from December through February and a limited treaty hook-and-line subsistence fishery occurs from early December through early April. Incidental harvest of wild winter steelhead in these treaty fisheries may occur in some years. The non-treaty sport fishery in the Dungeness River is directed at hatchery winter steelhead from December through February and some harvest of wild winter steelhead occurs. The non-treaty sport fishery has been managed with wild steelhead release regulations in the Dungeness River and all marine areas since 1993 to protect wild winter steelhead from sport harvest, although some hook-and-release mortality of wild winter steelhead may occur.

Hatchery -- Hatchery winter steelhead smolts have been stocked in the Dungeness River and nearby streams. The effect hatchery-reared steelhead spawning in the wild have on the long-term productivity and production of wild winter steelhead is unknown.

Two state hatcheries are located on the Dungeness River. The Dungeness Hatchery produces coho salmon yearlings for release into the Dungeness River and supports other small cooperative enhancement projects in the immediate area. The Hurd Creek

Hatchery produces juvenile and yearling fall chinook salmon for release into the Elwha River and supports a captive brood stock program for a Dungeness chinook salmon rebuilding project. The impact these hatchery programs have on Dungeness wild winter steelhead is unknown.

STRAIT OF JUAN DE FUCA -- MORSE CREEK / INDEPENDENTS WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in Morse, Siebert, and McDonald creeks have been classified as a distinct stock based on the geographic isolation of the spawning population.

No information is available regarding the genetic composition of the stock.

Run timing (December through May) and spawn timing (mid-February to early June) are similar to those of other wild winter steelhead stocks in the Strait of Juan de Fuca area.

STOCK STATUS

The status of the stock is designated as Depressed based upon escapement of wild winter steelhead in Morse Creek.

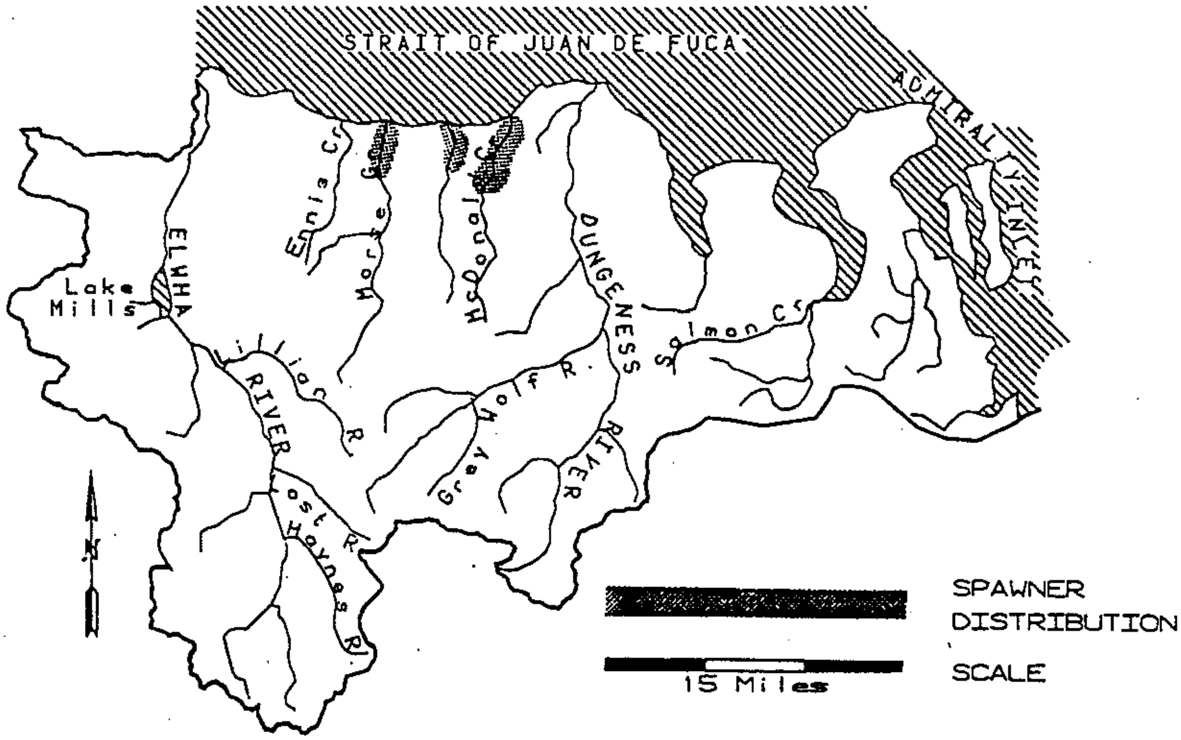
Spawner escapement ranged from 60 to 145 wild winter steelhead in Morse Creek between 1984 and 1992. In several of the eight years surveyed, this appears to be lower than the escapement needed to utilize the available habitat. For example, using the WDFW methodology (Gibbons et al. 1985) a maximum sustained harvest (MSH) escapement objective for Morse Creek would be 120 wild winter steelhead. This escapement objective and the method used to derive it have not been jointly agreed to by the WDFW and the treaty tribes. In addition, two of the lowest spawner escapements of wild winter steelhead in Morse Creek have been recorded during the last five years, possibly indicating a short-term decline.

The WDW conducted spawner surveys on Siebert Creek and McDonald Creek during the 1979-80 through 1985-86 seasons. Spawner escapement in Siebert Creek (from RM 4.2 to the mouth) was estimated at 125, 74, 72, 58, 37, 18, and 30 wild winter steelhead and spawner escapement in McDonald Creek (RM 5.4 to the mouth) was estimated at 286, 325, 288, 173, 130, 136, and 64 wild winter steelhead during the 1979-80, 1981-82, 1982-83, 1983-84, 1984-85, and 1985-86 seasons, respectively.

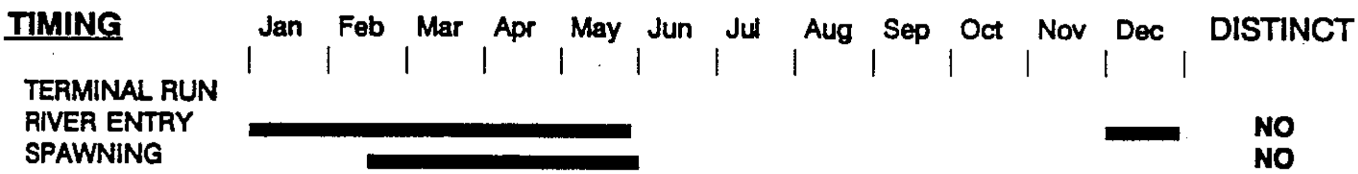
Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 55, 27, 39, 26, 12, and 22 wild winter steelhead were harvested in the sport fishery on Morse Creek during the 1986-87, 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 steelhead seasons, respectively; from 0 to 4 wild winter steelhead were harvested annually in Siebert or McDonald creeks. Sport harvest information on wild winter steelhead is available for only the early portion of the run (because the sport steelhead season closes on February 28) and cannot be used to assess the status of the wild stock.

STOCK DEFINITION PROFILE for Morse Cr/Independents Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING



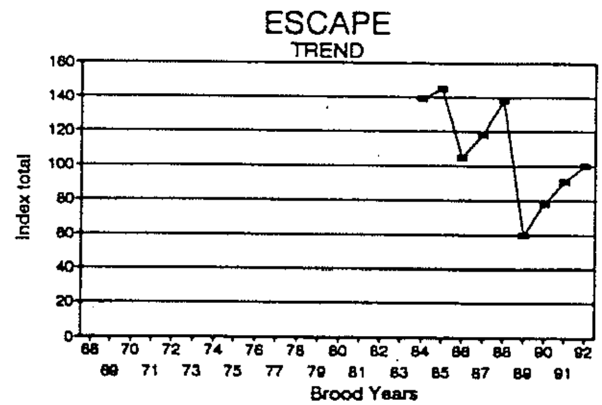
BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Morse Cr/Independents Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY------> Good

Brood Years	ESCAPE Index total Morse Cr	ESCAPE Index total Siebert Cr	ESCAPE Index total McDonald Cr	
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80		125	286	
81		74	325	
82		72	288	
83		58	173	
84	139	37	130	
85	145	18	136	
86	105	30	64	
87	118			
88	138			
89	60			
90	78			
91	91			
92	100			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN

Unresolved

PRODUCTION TYPE

Unresolved

STOCK DISTINCTION

Spawning Distribution

STOCK STATUS

Depressed

SCREENING CRITERIA

Short Term Severe Decline

FACTORS AFFECTING PRODUCTION

Habitat -- In Morse Creek, habitat has been severely impacted due to: (1) loss of estuarine environment resulting from dredging and filling of the nearshore area, (2) channelization of the lower river with rip rap and levees through the residential area, (3) loss of cover, (4) land slides from poor road construction, (5) low summer flow conditions above the hydro power facility, and (6) potential changes in the temperature regime due to operation of the hydro power facility. In the other two primary contributors to this stock, McDonald Creek and Siebert Creek, habitat has been impacted by agriculture, some logging, community growth, and upstream passage problems during low water conditions at the Highway 101 culverts. There are signs of scour and sediment aggradation in the lower 1.5 miles of Siebert Creek. There is limited gravel suitable for spawning, woody debris loadings are currently low, and the number of pools is low. Port Angeles Harbor streams have been heavily impacted by urban development.

A short-term decline in abundance may additionally be due, in part, to changes in ocean survival of steelhead which has occurred over widespread areas in Washington, Oregon, and British Columbia (Cooper and Johnson 1992).

Harvest Management -- In Morse Creek, treaty net fisheries occur from December through February, a limited treaty hook-and-line subsistence fishery occurs from early December through early April, and incidental harvest of wild winter steelhead may occur in some years. The non-treaty sport fishery is directed at hatchery winter steelhead from December through February and some harvest of wild winter steelhead occurs. Beginning with the 1994-95 season, wild steelhead release regulations are in effect to protect wild fish from sport harvest.

Hatchery -- While hatchery winter steelhead smolts have been stocked in Morse Creek and nearby streams, the effect on the long-term productivity and production of the wild stock hatchery-reared steelhead spawning in the wild is unknown.

STRAIT OF JUAN DE FUCA -- ELWHA WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Elwha River have been classified as a distinct stock based on the geographic isolation of the spawning population.

Little is known about the genetic composition of the wild winter steelhead stock downstream of the Elwha Dam. Genetic composition of hatchery winter steelhead is most similar to other Puget Sound hatchery winter steelhead stocks and resident rainbow trout upstream of the Elwha Dam appear to be most similar to wild coastal winter steelhead stocks rather than to either hatchery winter steelhead or other Washington wild resident rainbow populations (Reisenbichler 1990 and Phelps 1989).

Run timing (December through May) and spawn timing (mid-February to early June) are similar to other wild winter steelhead stocks in the Strait of Juan de Fuca area.

STOCK STATUS

The status of the stock is designated as Depressed based on the differences between the current abundance and that at historic levels. Due to the presence of two dams which block access to the majority of spawning and rearing habitat in the drainage, the Elwha River has a very limited anadromous fish rearing and spawning area (approximately 4.8 miles).

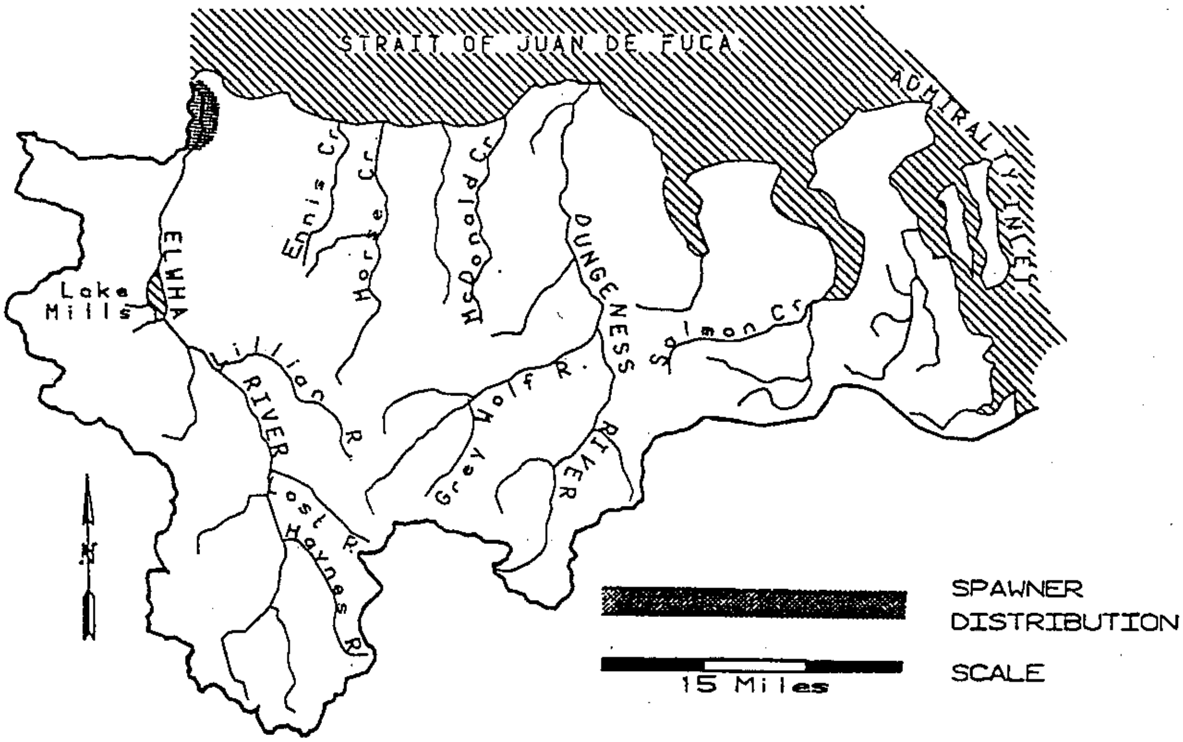
Run size and harvest of this stock are being maintained downstream of the lower dam, although the total harvest and total run size of wild and hatchery origin fish combined are exhibiting a moderate short-term decline. Total run size of hatchery and wild fish combined has ranged from 6,085 steelhead in 1984-85 to 998 steelhead in 1991-92. Estimated wild run size alone has ranged from 835 steelhead in 1984-85 to 148 steelhead in 1990-91 and also displays a short-term decline. The stock may still be considered in fair condition in its limited habitat. It should be cautioned that estimates of wild run size in the Elwha River are not based on post-season accounting of actual fish present incorporating escapement data but are derived from net catch data for pre-season planning purposes only.

FACTORS AFFECTING PRODUCTION

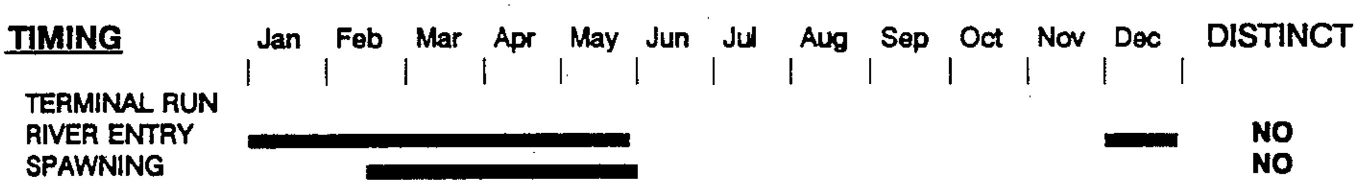
Habitat -- Two dams on the Elwha River not only limit access of anadromous stocks to the upper watershed but also significantly limit gravel recruitment to the lower watershed necessary for spawning.

STOCK DEFINITION PROFILE for Elwha Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING



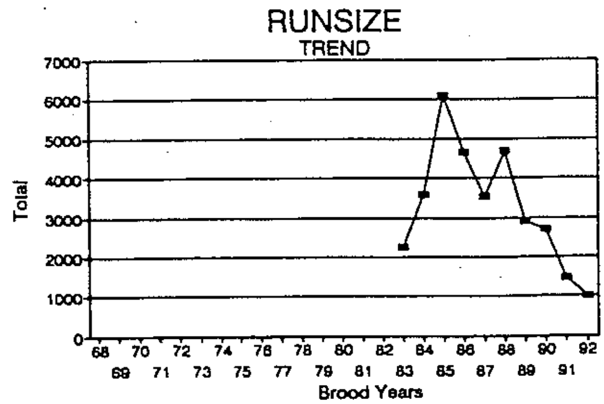
BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Elwha Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY------> Good

Brood Years	RUNSIZE Total		RUNSIZE Total	
	Hatchery + Wild		Est. Wild	
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83	2243		647	
84	3590		554	
85	6085		835	
86	4655		834	
87	3542		493	
88	4690		499	
89	2923		416	
90	2707		286	
91	1483		148	
92	998			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Mixed

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Depressed

SCREENING CRITERIA
Chronically Low

A short-term decline in abundance may additionally be due, in part, to changes in ocean survival of steelhead which has occurred over widespread areas in Washington, Oregon, and British Columbia (Cooper and Johnson 1992).

Harvest Management -- Treaty net fisheries occur from December through February, a limited tribal hook-and-line fishery occurs throughout the season, and incidental harvest of wild winter steelhead may occur in some years. The non-treaty sport fishery is directed primarily at hatchery winter steelhead from December through February and wild winter steelhead from March 1 through April 15.

Hatchery -- Marked and unmarked hatchery steelhead smolts from state and tribal facilities have been stocked, but the effect on the long-term productivity and production of the wild stock of hatchery-reared steelhead spawning in the wild is unknown. Some wild fish are included in hatchery programs in some years.

STRAIT OF JUAN DE FUCA -- SALT CREEK / INDEPENDENTS WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in Salt, Whiskey, Colville and Field creeks are native and have been designated as a distinct stock based on the geographic isolation of the spawning population.

No information is available regarding the genetic composition of the stock.

Run timing (December through May) and spawn timing (mid-February to early June) are similar to those of other wild winter steelhead stocks in the Strait of Juan de Fuca area.

STOCK STATUS

The status of the stock is Unknown. This stock is comprised of a historically small number of steelhead, but there is insufficient information to classify its status as either a Healthy, Depressed, or Critical stock.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified. After receiving training from WDW personnel, members of the Olympic Outdoor Sportsmen's Association conducted spawner surveys on Salt Creek and Colville Creek during the 1984-85 season. Spawner escapement in Salt Creek (from RM 6.0 to the mouth) was estimated by WDW at 253 wild winter steelhead. During one survey on Colville Creek in April 1985, 18 steelhead redds were observed between RM 2.5 and 1.0.

More information needs to be collected on this stock so that stock status can be determined. As a small stock, it could be especially vulnerable to any negative impacts.

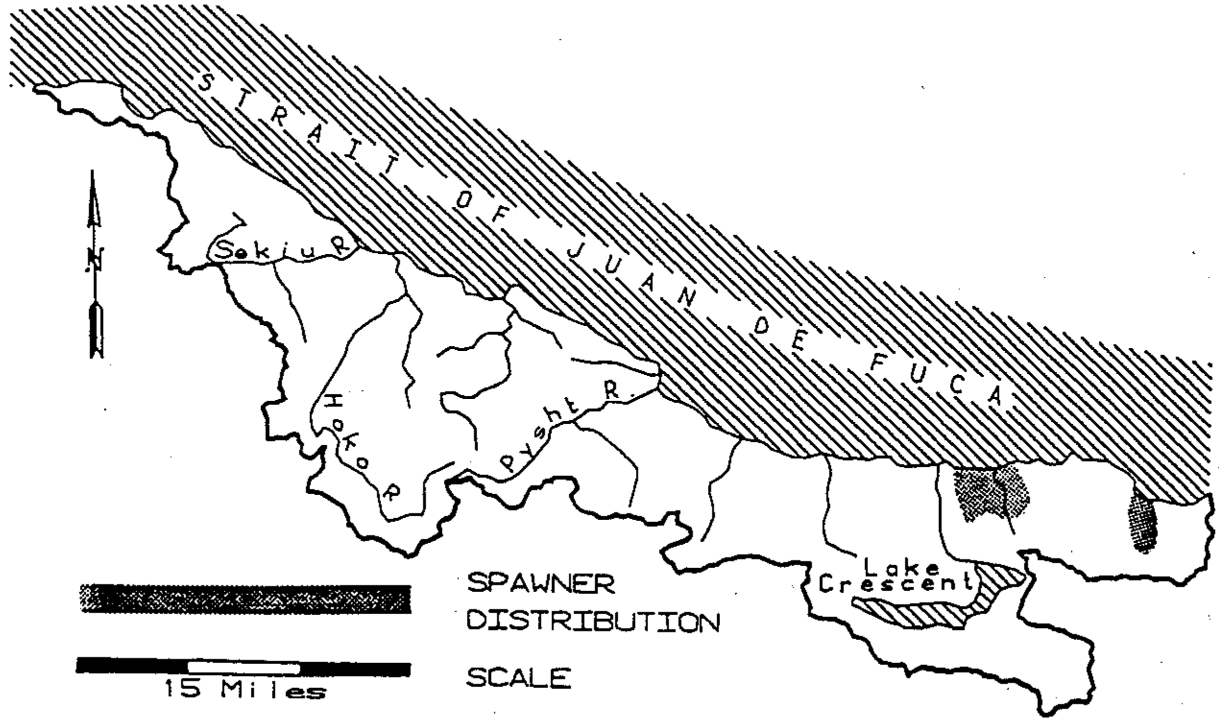
FACTORS AFFECTING PRODUCTION

Habitat -- Freshwater habitat has been impacted by land-use (forest management) activities. Salt Creek has not been studied extensively yet, however, the basin has some mass-wasting history.

Harvest Management -- There is no treaty fishery in terminal areas on this stock. There is no recreational steelhead season on Whiskey, Colville or Field creeks. In Salt Creek, the non-treaty sport fishery is directed at hatchery winter steelhead from December through February and some harvest of wild winter steelhead occurs.

STOCK DEFINITION PROFILE for Salt Creek/Independents Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN													
RIVER ENTRY													**NO**
SPAWNING													**NO**

BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Salt Creek/Independents Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY-----> Poor

Brood Years	ESCAPE Index total			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85	253			
86				
87				
88				
89				
90				
91				
92				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

Hatchery -- No hatchery steelhead smolts have been stocked in Whiskey, Colville or Field Creeks. While hatchery steelhead smolts have been stocked in Salt Creek and nearby streams, the effect on the long-term productivity and production of the wild stock of hatchery-reared steelhead spawning in the wild is unknown.

STRAIT OF JUAN DE FUCA -- LYRE WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Lyre River have been classified as a distinct stock based on the geographic isolation of the spawning population.

No information is available regarding the genetic composition of the stock.

Run timing (December through May) and spawn timing (mid-February to early June) are similar to those of other wild winter steelhead stocks in the Strait of Juan de Fuca area.

STOCK STATUS

The status of the stock is Unknown. This stock is comprised of a historically small number of steelhead, but there is insufficient information to classify its status as either a Healthy, Depressed, or Critical stock.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified.

Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 302, 154, 106, 82, 37, and 54 wild winter steelhead were harvested in the sport fishery during the 1986-87, 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 steelhead seasons, respectively. Sport harvest information of wild winter steelhead is available for only the early portion of the run (because the sport steelhead season closes on February 28) and cannot be used to assess the status of the wild stock.

More information needs to be collected on this stock so that stock status can be determined. As a small stock, it could be especially vulnerable to any negative impacts.

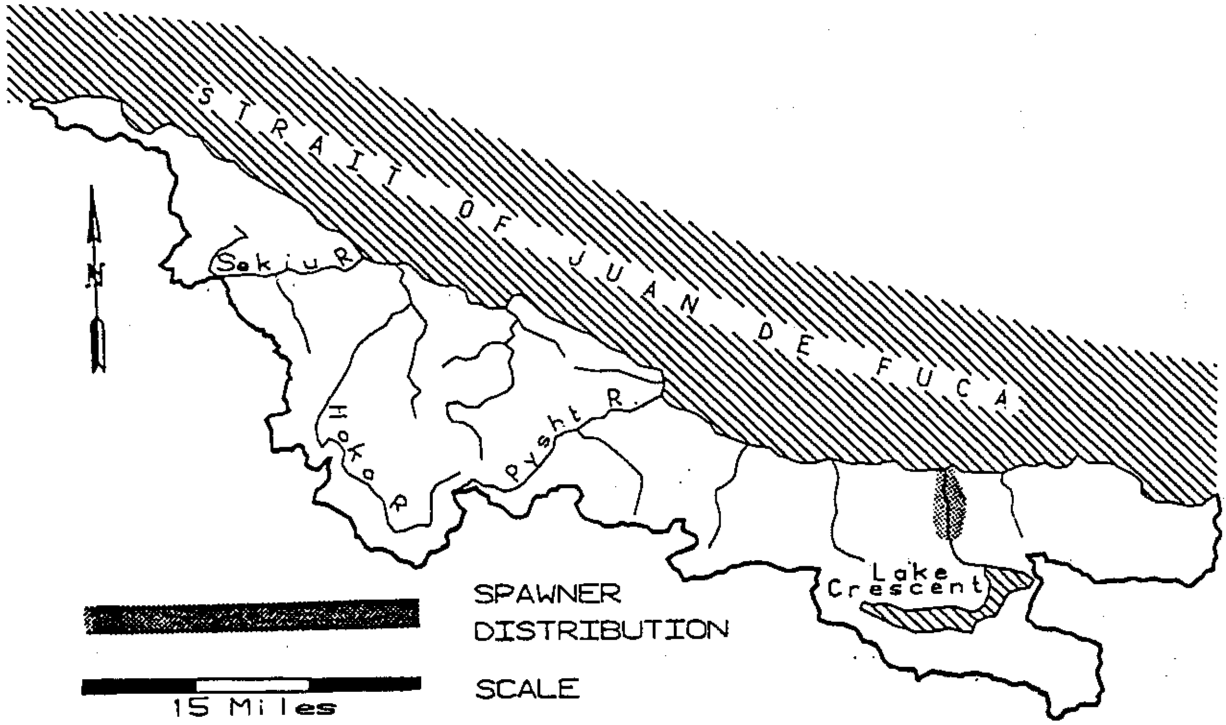
FACTORS AFFECTING PRODUCTION

Habitat -- Freshwater habitat has been impacted by land-use (forest management) activities, but quantitative data are limited.

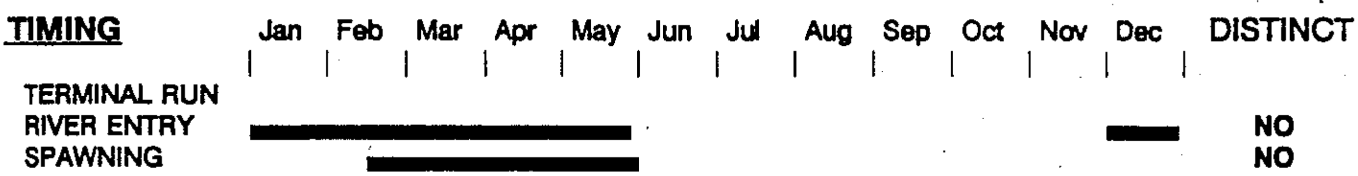
Harvest Management -- Treaty net fisheries occur from December through February, a limited treaty hook-and-line subsistence fishery occurs from early December through early April, and incidental harvest of wild winter steelhead may occur in some years. The non-treaty sport fishery is directed at hatchery winter steelhead from December through February, and some harvest of wild winter steelhead occurs.

STOCK DEFINITION PROFILE for Lyre Winter Steelhead

SPAWNER DISTRIBUTION
DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Lyre Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY-----> No Data

Brood Years	NO DATA			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

Hatchery -- While hatchery steelhead smolts have been stocked in this and nearby streams, the effect on the long-term productivity and production of the wild stock of hatchery-reared steelhead spawning in the wild is unknown.

STRAIT OF JUAN DE FUCA -- PYSHT / INDEPENDENTS WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in Pysht River, Deep Creek, East Twin River, and West Twin River have been classified as a distinct stock based on the geographic isolation of the spawning population.

No information is available regarding the genetic composition of the stock.

Run timing (December through May) and spawn timing (mid-February to early June) are similar to those of other wild winter steelhead stocks in the Strait of Juan de Fuca area.

STOCK STATUS

The status of the stock is designated as Healthy based upon spawner escapement of wild winter steelhead in the Pysht River.

Spawner escapement in the Pysht River has ranged from 200 to 445 wild winter steelhead during the 1984 through 1992 seasons. In most of the eight years surveyed, this appears to be higher than the escapement needed to seed the available habitat. For example, using the WDFW methodology (Gibbons et al. 1985) a maximum sustained harvest (MSH) escapement objective for the Pysht River would be 200 wild winter steelhead. This escapement objective and the method used to derive it have not been jointly agreed to by the WDFW and the treaty tribes.

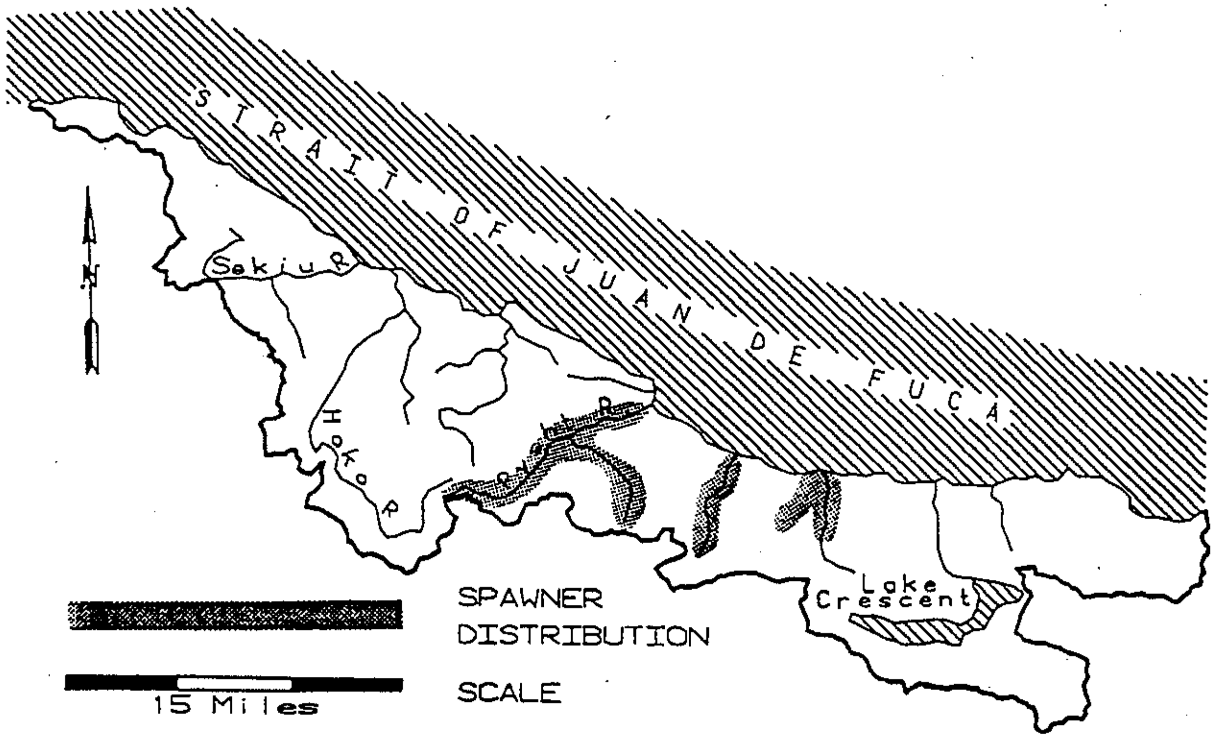
After receiving training from WDW personnel, members of the Olympic Outdoor Sportsmen's Association conducted spawner surveys on Deep Creek, East Twin River, and West Twin River during the 1984-85 season. Spawner escapement was estimated at 97 wild winter steelhead in Deep Creek (from RM 4.0 to the mouth), 128 wild winter steelhead in East Twin River (from RM 2.0 to the mouth), and 102 wild winter steelhead in West Twin River (from RM 3.5 to the mouth).

Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 228, 173, 149, 94, 47, and 153 wild winter steelhead were harvested in the sport fishery during the 1986-87, 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 steelhead seasons, respectively. Sport harvest information on wild winter steelhead is available for only the early portion of the run (because the sport steelhead season closes on February 28) and cannot be used to assess the status of the wild stock.

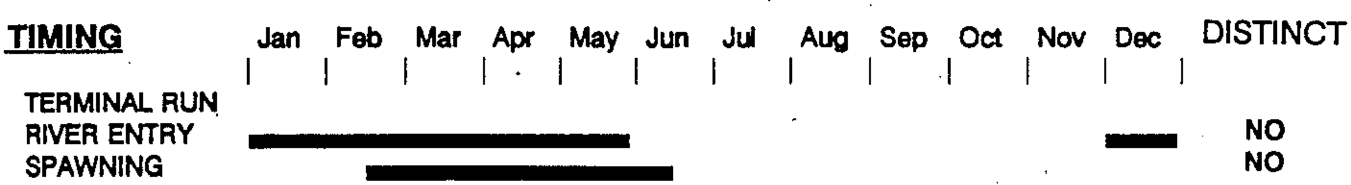
STOCK DEFINITION PROFILE for Pysht/Independents Winter Steelhead

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS

DISTINCT? - UNKNOWN

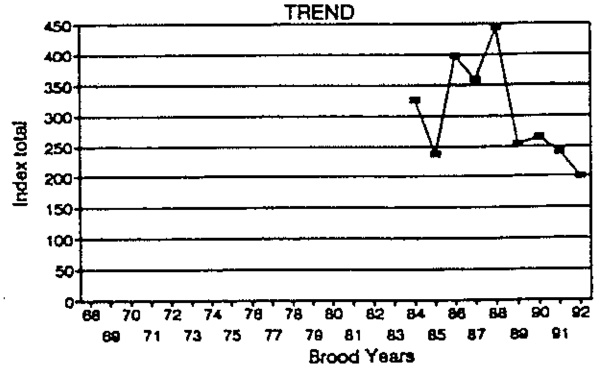
STOCK STATUS PROFILE for Pysht/Independents Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY-----> Good

Brood Years	ESCAPE Index total			
	Pysht			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84	326			
85	238			
86	398			
87	360			
88	445			
89	254			
90	265			
91	242			
92	200			

ESCAPE
TREND



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Healthy

SCREENING CRITERIA

FACTORS AFFECTING PRODUCTION

Habitat -- Freshwater habitat has been impacted by land-use (forest management) activities, although quantitative data are limited. The upper watersheds have been extensively logged. Rearing conditions within the Pysht River are largely adequate: the system has a high pool:riffle ratio, with adequate off-channel areas. Riparian vegetation has been extensively altered and is dominated by young stands of red alder. As a result, long-term recruitment of large woody debris is a serious problem. Elevated stream temperatures have been documented in Green Creek and the lower mainstem. Like other rivers in the Strait region, the lower mainstem is currently over-supplied with sediment. Tributaries such as Green Creek have huge volumes of sediment stored within the channel. This material is extremely erodible and contributes to persistent levels of fine sediments found in spawning gravel. Aggradation and scour of salmon redds has been documented and is a significant problem. This problem has contributed to the extirpation of chinook salmon from the basin. Although the Pysht River estuary is one of the largest estuaries in the Strait, it has been degraded by sedimentation, subsequent dredging, and some intentional filling.

Deep Creek is the most degraded basin in the western Strait. Numerous debris flows originating from poor road construction practices have impacted nearly every tributary. Additionally a large dam-break during the November 1990 flood event resulted in massive channel alterations in the lower five miles of the basin. This event, in combination with clear-cutting, triggered a large deep-seated landslide downstream of the East Fork. Channel conditions are presently not favorable for fish production. In the upper basin the channel has been scoured to bedrock. The scouring has reduced the amount of stream area usable by anadromous fish. The majority of large woody debris was tossed out of the channel. In the lower sections of Deep Creek, the channel has widened by two-to-three times, resulting in low pool:riffle ratio, pool filling and stream heating. Stream temperatures have been recorded approaching 70 degrees F in both the East Fork and the mainstem. Fine sediment levels in spawning gravel exceed 20 percent (McHenry et al. 1994).

The Twins have not been studied extensively yet; however, the basins have some mass-wasting history. There are indications that the East Twin has widened in response to aggradation. Riparian vegetation has been altered and is currently inadequate to meet long-term wood recruitment needs.

Harvest Management -- Treaty net fisheries occur in the Pysht River from December through February, a limited treaty hook-and-line subsistence fishery occurs from early December through early April, and incidental harvest of wild winter steelhead may occur in some years. The non-treaty sport fishery is directed at hatchery winter steelhead from December through February and some harvest of wild winter steelhead occurs. Both the sport fishery and tribal subsistence fishery in Deep Creek closed in 1991 after a massive landslide occurred in 1990.

Hatchery -- While hatchery steelhead smolts have been stocked in these and nearby streams, the effect on the long-term productivity and production of the wild stock of hatchery-reared steelhead spawning in the wild is unknown.

STRAIT OF JUAN DE FUCA -- CLALLAM WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Clallam River and tributaries have been classified as a distinct stock based on the geographic isolation of the spawning population.

No information is available regarding the genetic composition of the stock.

Run timing (December through May) and spawn timing (mid-February to early June) are probably similar to those of other wild winter steelhead stocks in the Strait of Juan de Fuca area.

STOCK STATUS

The status of the stock is Unknown.

Spawning escapement is not monitored for this stock nor has an escapement goal been identified.

Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 70, 23, 22, 19, 15, and 17 wild winter steelhead were harvested in the sport fishery during the 1986-87, 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 steelhead seasons, respectively. Sport harvest information on wild winter steelhead is available for only the early portion of the run (because the sport steelhead season closes on February 28) and cannot be used to assess the status of the wild stock.

More information needs to be collected on this stock so that stock status can be determined.

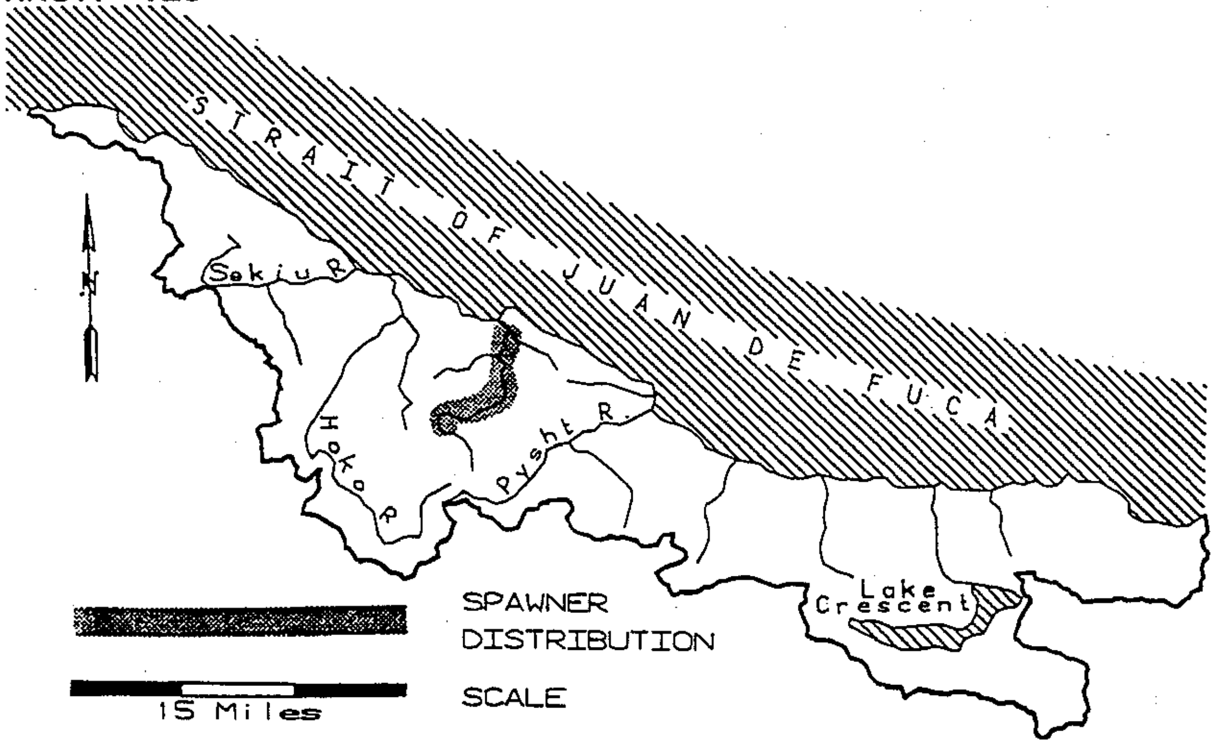
FACTORS AFFECTING PRODUCTION

Habitat -- Freshwater habitat has been impacted by land use (forest management) activities, but quantitative data is limited. The Clallam River suffers from problems similar to those seen in the Sekiu and Hoko basins which potentially exacerbated by urbanization and water withdrawals. Historic landsliding in the upper basin related to poor logging practices on Ellis Mountain has resulted in a scoured stream channel deficient in woody debris in the upper basin, and a sediment-rich-aggraded channel in the lower mainstem. Additionally, alteration of the riparian zone by logging and agricultural practices subject the mainstem to severe heating. Tribal surveys have documented water temperatures of between 63 and 70°F for the majority of the summer in 1992 and 1993.

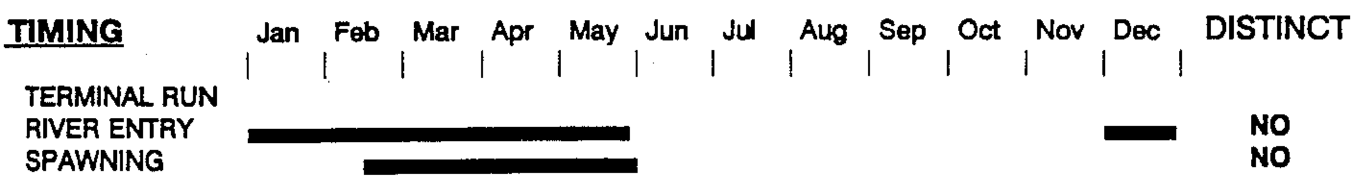
STOCK DEFINITION PROFILE for Clallam Winter Steelhead

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS

DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Clallam Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY------> No Data

Brood Years	NO DATA			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Unresolved

PRODUCTION TYPE
Unresolved

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

Large woody debris is uniformly depleted throughout the basin, and sediment levels of 14-22 percent fines in spawning gravels are considered high for the lower mainstem (McHenry et al. 1994).

Harvest Management -- Treaty net fisheries occur from December through February, a limited treaty hook-and-line subsistence fishery occurs from early December through early April, and incidental harvest of wild winter steelhead may occur in some years. The non-treaty sport fishery is directed at hatchery winter steelhead from December through February and some harvest of wild winter steelhead occurs.

Hatchery -- While hatchery steelhead smolts have been stocked in this and nearby streams, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

STRAIT OF JUAN DE FUCA -- HOKO WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Hoko River, Little Hoko River, and tributaries have been classified as a distinct stock based on the geographic isolation of the spawning population.

No information is available regarding the genetic composition of the stock.

Run-timing (November through May) and spawn-timing (mid-February to early June) are similar to other wild winter steelhead stocks in the Strait of Juan de Fuca area.

STOCK STATUS

The status of the stock is designated as Healthy based upon spawner escapement of wild winter steelhead.

Spawner escapement has ranged from 374 to 913 wild winter steelhead during the 1984 through 1992 seasons. In most of the years surveyed, this appears to be higher than the escapement needed to seed the available habitat at certain levels. For example, using the WDFW methodology (Gibbons et al. 1985) a maximum sustained harvest (MSH) escapement objective for the Hoko River would be 400 wild winter steelhead. This escapement objective and the method used to derive it have not been jointly agreed to between the WDFW and the treaty tribes.

Sport harvest information is available since the early 1960s but wild winter steelhead were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 198, 142, 115, 102, 44, and 84 wild winter steelhead were harvested in the sport fishery during the 1986-87, 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 steelhead seasons, respectively. Sport harvest information on wild winter steelhead is available for only the early portion of the run (because the sport harvest steelhead season closes on March 15) and cannot be used to assess the status of the wild stock.

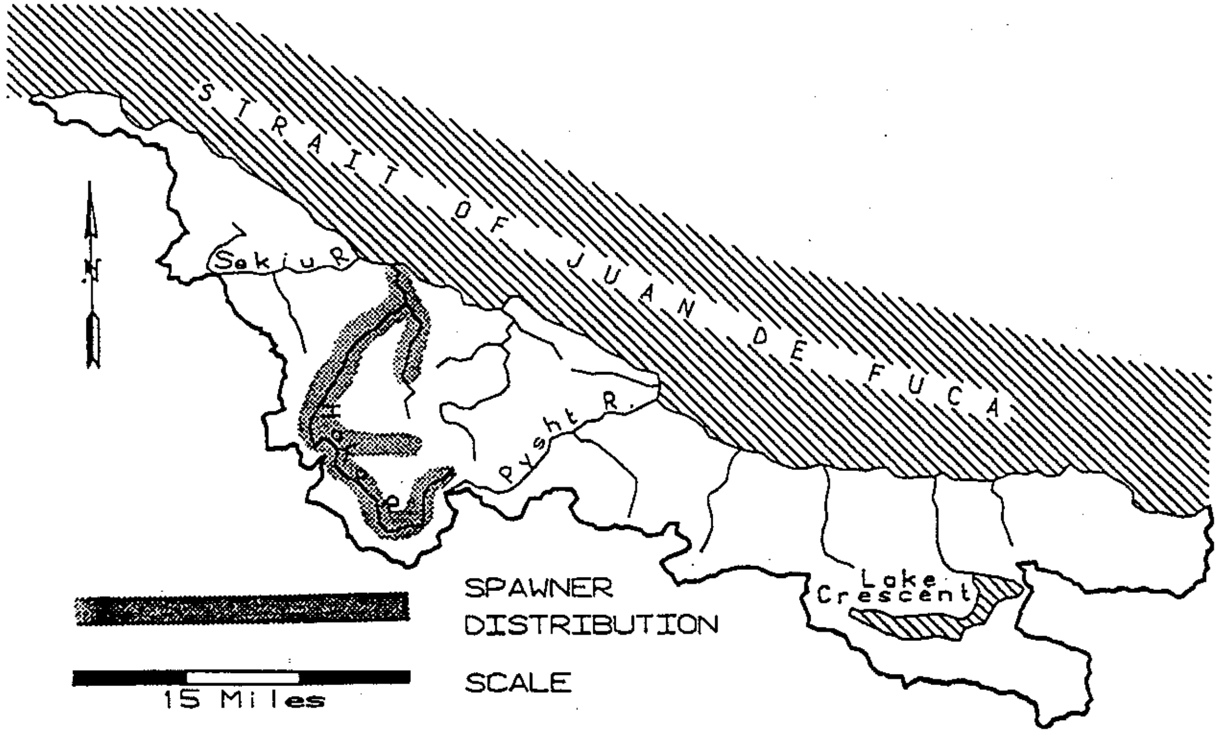
FACTORS AFFECTING PRODUCTION

Habitat -- The Hoko River drainage is managed for timber production and has been impacted by past logging practices. The drainage has experienced over 300 mass-wasting events over the past 50 years as shown through the aerial photograph record (Hoko Watershed Analysis 1994). Many of these events originated either in harvested areas on Ellis, Stolzenberg or Sekiu mountains or from poorly constructed and maintained roads.

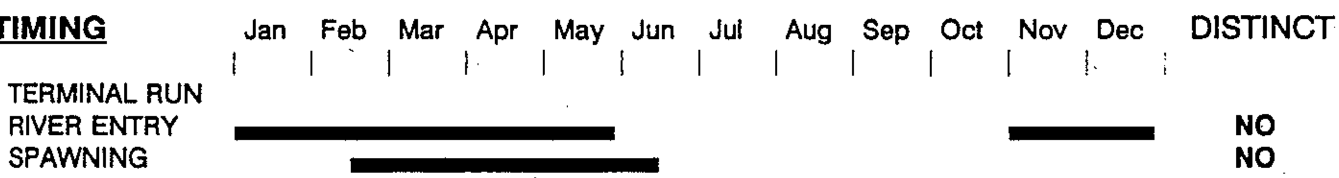
STOCK DEFINITION PROFILE for Hoko Winter Steelhead

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS

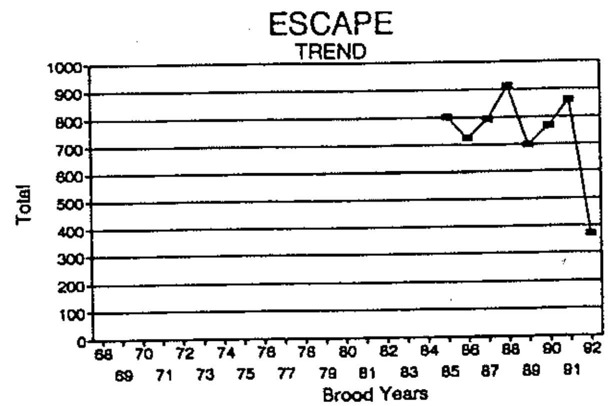
DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Hoko Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY------> Good

Brood Years	ESCAPE Total			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85	802			
86	726			
87	792			
88	913			
89	699			
90	770			
91	861			
92	374			



AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Healthy

SCREENING CRITERIA

Virtually the entire drainage was originally harvested to the streambank and much of the drainage is currently being harvested for the second time. Although aerial photographs reveal that most riparian areas were predominately large conifer prior to the first logging, 91 percent of the current riparian stands are now young red alder (Hoko Watershed Analysis 1994). Logjam removal and other instream wood removal was conducted throughout the drainage into the 1970s (Williams et al. 1975), including removal of all wood from the lower Little Hoko River in 1937 (John Cowan, long-time resident personal communication). The lower Little Hoko River subsequently downcut one to two meters, and the channel is now entrenched within its floodplain. The wood removal from within and adjacent to streams has led to a shortage of in-channel wood throughout the Hoko drainage. On average, only 0.66 pieces of large woody debris per channel width presently exist, and most of this is either small alder which rapidly decomposes or decaying residual old growth wood (Hoko Watershed Analysis 1994).

A substantial loss of coho and steelhead egg baskets in the 1990, 1991, and 1992 winters indicates that bedload scour and fill are significant and probably affect survival from egg deposition to fry emergence in many mainstem and tributary areas. Survival is also probably affected by the moderate to high level of fine sediments. A basin average of 14.27 percent fine sediments (< 0.85 mm) in seventeen coho and steelhead spawning areas throughout the basin was determined through McNeil core sampling efforts during 1991 (McHenry et al. 1994).

Instream temperatures are also a problem. A thermograph placed at RM 16.6 in 1985 recorded temperatures as high as 73.4 °F (Blum and DiDomenico 1985) and thermographs recorded peak temperatures of 67 °F in the lower mainstem during 1992 and 69 °F in the lower Little Hoko River during 1991 (McHenry et al. 1994).

The drainage also appears to be deficient in steelhead and coho salmon rearing habitat, with pools comprising less than 40 percent of the measured habitat areas (Hoko Watershed Analysis 1994).

Harvest Management -- Treaty net fisheries occur from December through February, a limited treaty hook-and-line subsistence fishery occurs from early December through early April, and incidental harvest of wild winter steelhead may occur in some years. The non-treaty sport fishery is directed at hatchery winter steelhead from December through March 15 and some harvest of wild winter steelhead occurs.

Hatchery -- A Makah tribal hatchery, located at RM 10.0, has been in operation since the early 1980s and continues to outplant steelhead taken from Hoko River broodstock. While hatchery steelhead smolts have been stocked in this and nearby streams, the effect on the long-term productivity and production of the wild stock by hatchery-reared steelhead spawning in the wild is unknown.

STRAIT OF JUAN DE FUCA -- SEKIU WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Sekiu River and tributaries are designated as a distinct stock based on the geographic isolation of the spawning population. Run-timing (December through May) and spawn-timing (mid-February to early June) are similar to other wild winter steelhead stocks in the Strait of Juan de Fuca area.

No information is available regarding the genetic composition of the stock.

STOCK STATUS

The status of the stock is Unknown. This stock is comprised of a historically small number of steelhead, but there is insufficient information to classify its status as either Healthy, Depressed, or Critical.

No spawner escapement goal has been identified for this stock. Tribal surveys indicate that the Sekiu River mainstem, South Fork, and Sunnybrook Creek have had a decrease in spawning activity since the late 1980s while the decline in the North Fork has been less pronounced.

Sport harvest information is available since the early 1960s, but wild winter steelhead catches were not reported separately on steelhead permit cards until the 1986-87 winter steelhead season. An estimated 47, 22, 21, 6, 2, and 8 wild winter steelhead were harvested in the sport fishery during the 1986-87, 1987-88, 1988-89, 1989-90, 1990-91, and 1991-92 steelhead seasons, respectively. Sport harvest information on wild winter steelhead is available for only the early portion of the run (because the sport steelhead season closes on February 28) and cannot be used to assess the status of the wild stock.

More information needs to be collected on this stock so that stock status can be determined. As a small stock, it could be especially vulnerable to any negative impacts.

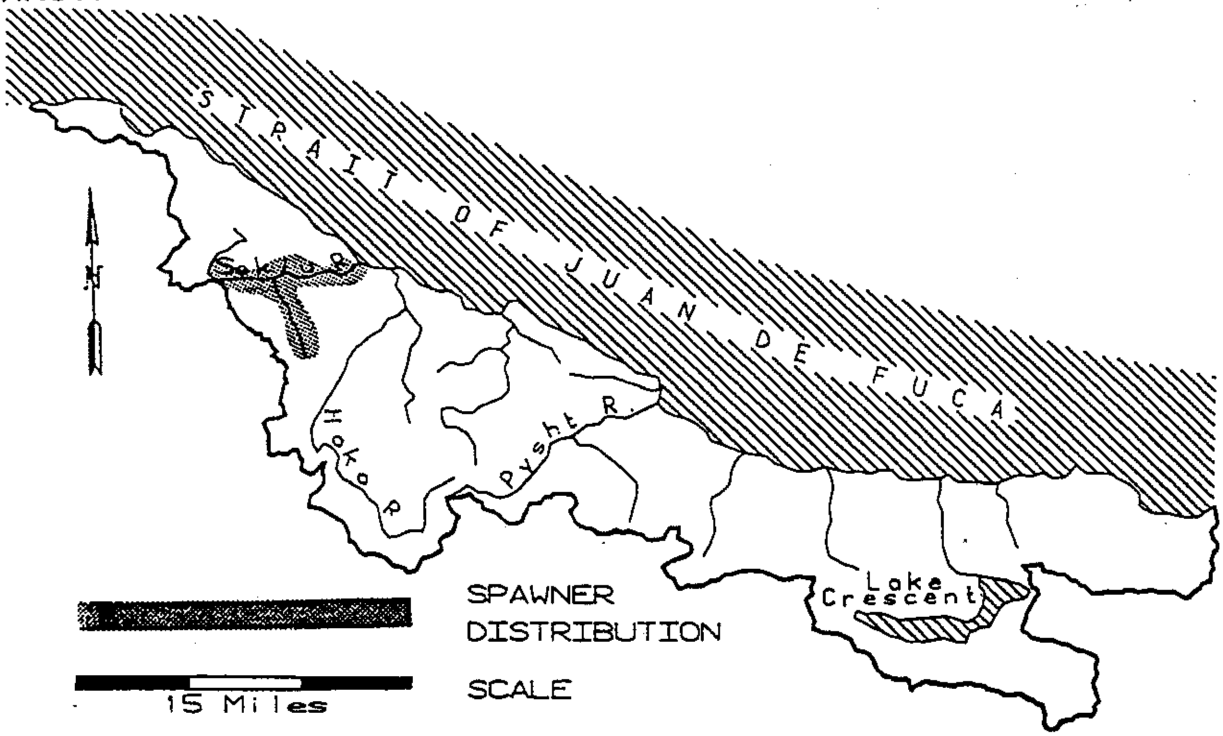
FACTORS AFFECTING PRODUCTION

Habitat -- The Sekiu watershed has been severely impacted by forest practices. Timber harvesting started along the North Fork in the early 1940s and along the mainstem in the late 1940s. The steeper areas of the South Fork and Carpenter Creek were harvested later. By the late 1980s virtually the entire watershed, including the riparian areas, was harvested. During that period the drainage was heavily roaded using substandard practices. Road densities are currently high, and landsliding has been frequent in many areas including Sekiu Mountain. The main haul route was constructed essentially in the flood plain of the Sekiu River. This road has constrained

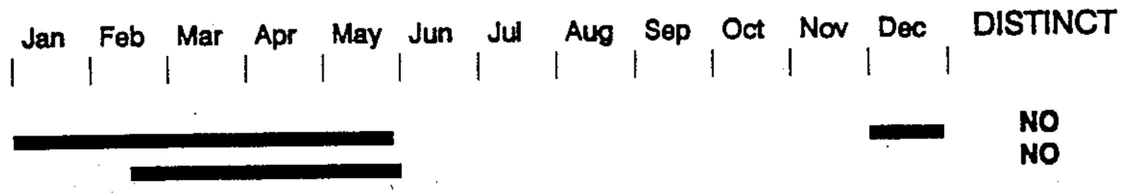
STOCK DEFINITION PROFILE for Sekiu Winter Steelhead

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING



BIOLOGICAL CHARACTERISTICS

DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Sekiu Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY-----> No Data

Brood Years	NO DATA			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

the channel and reduced off-channel rearing areas and until recently represented a chronic source of sediment input into the Sekiu River. Substantial road improvement, including hauling in harder rock, has reduced sediment input.

The geology of the Sekiu basin is predominantly marine-origin, fine-grained, poorly consolidated bedrock which is susceptible to ravel mass wasting and shallow rapid failure mass wasting. This rock also rapidly breaks back down to the parent fine sediment material when used for road surfacing and experiencing wet-weather haul or when being transported by streams. The sediment output to channels has increased substantially due to road-related debris torrents and other failures from the 1970s through 1990, especially from roads in the steeper areas including Sekiu Mountain and the adjoining ridge which swings northwestward draining into the South Fork, the lower North Fork, and into Sunnybrook Creek from Sooes Peak. Although recent improvements have been seen for perhaps 50 percent of the road network, and more improvements are planned, road maintenance has generally been insufficient to adequately protect wild salmonids for at least the past 20 years. Abandoned railroad grade fills have also failed in the North Fork. Carpenter Creek is currently transporting a high bedload and the lower section presently goes subsurface annually.

In-stream salvage has been substantial, consequently there is very little large woody debris in the drainage network. Without the in-stream wood, some moderate gradient, moderately confined channels (including the South Fork) no longer retain spawning gravels. The last logjams on the mainstem were removed in the 1970s (Mike Dukes, Makah Forestry Enterprises, personal communication). While some areas are now deficient in spawning gravels, other lower gradient areas are storing the transported bedloads and appear to be experiencing channel instability problems. The lower mainstem goes subsurface in some years (Mike Dukes, Makah Forestry Enterprises, personal communication).

An apparent result of the wood removal from within and adjacent to the streams and the increased sediment delivery to these streams is a reduced number of pools and reduced pool volume, channel instability in the form of bedload scour and fill, and high fine sediment levels in the spawning gravels. The basin averaged 15.79 percent fine sediments (<0.85 mm) from nine sampling areas in 1991 (McHenry et al. 1994). Temperatures are also a concern or this drainage. A thermograph placed downstream of the forks confluence recorded a peak temperature of 74.3° F and was 69.8° F or warmer for a portion of 20 days during July, 1985 (Blum and DeDomenico 1985).

Harvest Management -- Treaty net fisheries and a limited tribal hook-and-line fishery occur from December through February and incidental harvest of wild winter steelhead may occur in some years. The non-treaty sport fishery is directed at hatchery winter steelhead from December through February and some harvest of wild winter steelhead occurs.

Hatchery -- While hatchery winter steelhead smolts have been stocked in this and nearby streams, the effect on the long-term productivity and production of the wild stock of hatchery-reared steelhead spawning in the wild is unknown. Recently, hatchery smolts stocked have originated from Hoko River brood stock collected at the Makah Hatchery on the Hoko River.

STRAIT OF JUAN DE FUCA -- SAIL WINTER STEELHEAD

STOCK DEFINITION AND ORIGIN

Wild winter steelhead in the Sail River, Village Creek and Agency Creek are designated as a distinct stock based on the geographic isolation of the spawning population. Run timing (December through May) and spawn timing (mid-February to early June) are similar to other wild winter steelhead stocks in the Strait of Juan de Fuca area.

No information is available regarding the genetic composition of the stock.

STOCK STATUS

The status of the stock is Unknown. This stock is comprised of a historically small number of steelhead, but there is insufficient information to classify its status as either Healthy, Depressed, or Critical.

No spawner escapement goal has been identified for this stock. A small sport fishery takes place on the Makah Reservation, but data from that fishery are not available.

More information needs to be collected on this stock so that stock status can be determined. As a small stock, it could be especially vulnerable to any negative impacts.

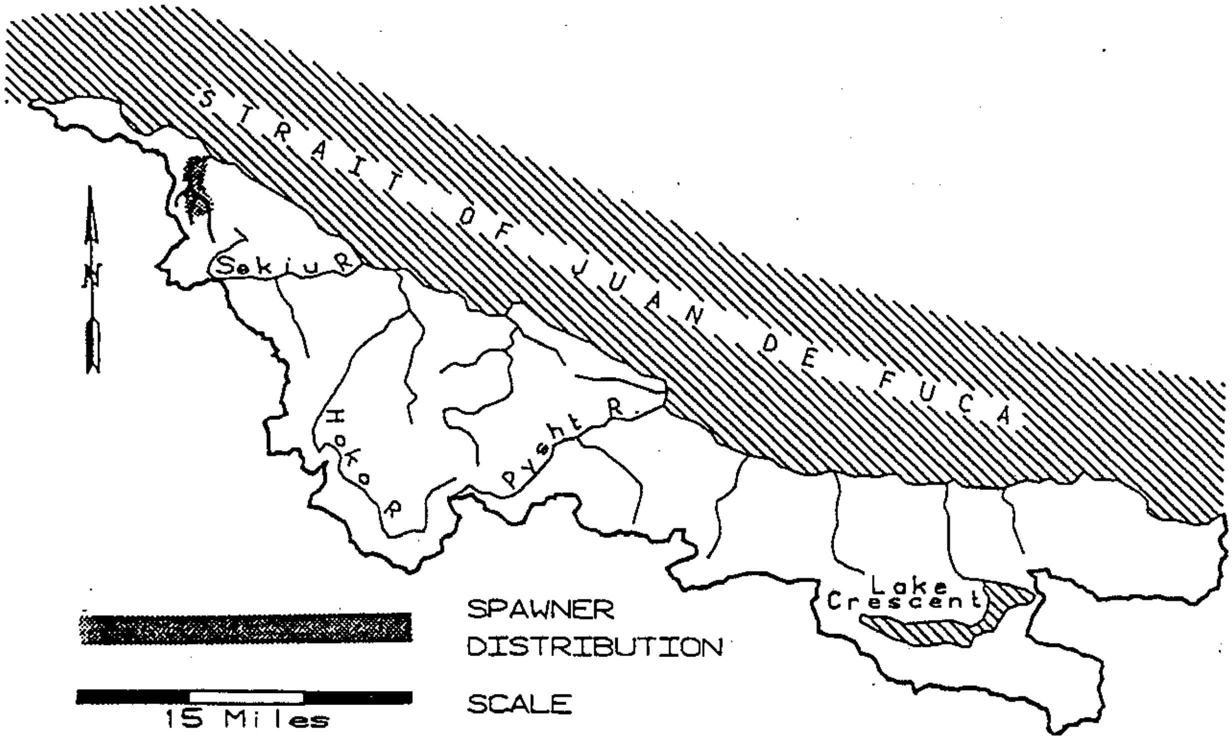
FACTORS AFFECTING PRODUCTION

Habitat -- Freshwater habitat in the Sail River drainage has been impacted by land-use activities including early timber harvesting of the entire watershed, and the former earthen impoundment of one of the major low-gradient tributaries. The dam site continues to contribute sediment and presents passage problems to fish destined for spawning habitat upstream. During early timber harvesting, logs appear to have been yarded through and across the river, as was common for that era. Older railroad grade fills also from the first rotation of timber harvesting still have the potential to contribute sediment to the river. Consistent with the entire outer Strait streams, there is a lack of high quality rock for road surfacing, and there is potential for creating fine sediments from wet-weather timber hauling. The present watershed consists of mature and maturing second growth timber, with some recent clear-cutting. The fish-bearing portions of the drainage are quite deficient in large wood. Wood was actively removed from the lower river channel as recently as the early 1980s (Chad Bowechop, Makah Planning Council, personal communication). Without this wood, the moderately confined and moderate gradient mainstem is lacking in spawning gravels since most are transported through. Portions of the channel are confined by bedrock, and there are numerous small slope failures on the sideslopes down to the river. The estuary has had a history of wood clearing and dredging for storing logs from the railroad log dump, and more recently for the small sport fishing resort.

STOCK DEFINITION PROFILE for Sail Winter Steelhead

SPAWNER DISTRIBUTION

DISTINCT? - **YES**



TIMING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DISTINCT
TERMINAL RUN RIVER ENTRY													NO
SPAWNING													NO

BIOLOGICAL CHARACTERISTICS

DISTINCT? - UNKNOWN

STOCK STATUS PROFILE for Sail Winter Steelhead

STOCK ASSESSMENT

DATA QUALITY------> No Data

Brood Years	NO DATA			
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				

AVERAGE RUNSIZE DISTRIBUTION

DATA NOT AVAILABLE.

STOCK SUMMARY

STOCK ORIGIN
Native

PRODUCTION TYPE
Wild

STOCK DISTINCTION
Spawning Distribution

STOCK STATUS
Unknown

SCREENING CRITERIA

Harvest Management -- Treaty net fisheries occur in Sail Bay in some years from December through February, a limited treaty hook-and-line subsistence fishery occurs from early December through early April, and incidental harvest of wild winter steelhead may occur in some years. A small sport fishery takes place on the Makah Reservation, but data from that fishery are not available.

Hatchery -- While hatchery winter steelhead smolts or fry have been stocked in these and nearby streams, the effect on the long-term productivity and production of the wild stock of hatchery-reared steelhead spawning in the wild is unknown. From 1984 through 1988, steelhead fry from the Sooes Hatchery were stocked in the Sail River, Agency Creek and Village Creek. Hoko brood stock is currently used to stock these streams.

LITERATURE CITED

Ames, J. and D.E. Phinney. 1977. 1977 Puget Sound summer-fall chinook methodology: escapement estimates and goals, run size forecasts and in-season run size updates. Washington Department of Fisheries Technical Report 29. 71 pp.

Blum, J. and T. DiDomenico. 1985. Water resources study. An evaluation of habitat for estimation of juvenile coho in Makah streams. Unpublished report. Makah Tribe.

Cooper, R. and T. H. Johnson. 1992. Trends in steelhead abundance in Washington and along the Pacific Coast of North America. Washington Department of Wildlife. Fisheries Management Division. Report # 92-20. 90 pp.

Gibbons, R.G., P.K. J. Hahn and T.H. Johnson. 1985. Methodology for determining MSH steelhead spawning escapement requirements. Washington State Game Department. Fisheries Management Division. Report #85-11. 39 pp.

Hoko Watershed Analysis. 1994. Study in progress.

Johnson, T. H. and R. Cooper. 1992. Snow Creek anadromous fish research-annual performance report July 1, 1990 to June 30, 1991. Washington Department of Wildlife. Fisheries Management Division. Report #92-5. 57 pp.

Jones and Stokes Associates. 1991. Watershed characteristics and conditions inventory-Pysht River and Snow Creek watersheds. Prepared for the Washington Department of Natural Resources, Forest Regulation and Assistance. 66 pp plus appendices.

McHenry, M. L., D. C. Morrill, and E. Currence. 1994. Spawning gravel quality, watershed characteristics and early life history survival of coho salmon and steelhead in five north Olympic Peninsula watersheds. Lower Elwha S'Klallam Tribe and Makah Tribe Report. Funded by the Department of Ecology Centennial Clean Water Fund and Section 205J Clean Water Act. 60 pp plus appendices.

Nelson, T., L. Adkins, M. Hoover, J. Heller, B. McIntosh, and T. Granger. 1992. The Discovery Bay watershed - Jefferson and Clallam Counties Washington. Prepared for Discovery Bay Watershed Management Committee by request of Jefferson County, Washington. 181 pp plus appendices.

Pacific Salmon Commission. 1990. 1989-1990 Fifth Annual Report. Pacific Salmon Commission. Vancouver, B.C. 112 pp. plus appendices.

Pacific Salmon Commission Joint Interceptions Committee. 1991 Second Report on the Parties' Estimates of Salmon Interceptions. Pacific Salmon Commission. Vancouver, B.C. 36 pp. plus appendices.

U.S. Department of Agriculture. 1965. Mean Annual Precipitation, 1930-57, State of Washington. Portland, Oregon, U.S. Soil Conservation Service Map M-4430.

Washington Department of Fisheries, Washington Department of Wildlife and Western Washington Treaty Indian Tribes. 1993. 1992 Washington State Salmon and Steelhead Stock Inventory. Olympia, WA. 212 pp.

Williams, R.W., R.M. Laramie and J.J. Ames. 1975. A Catalog of Washington Streams. Vol. 1. Puget Sound Region. Washington Department of Fisheries. Olympia, WA.

GLOSSARY

ALLELE -- One of two or more alternative forms of a gene.

ANADROMOUS FISH -- Species that are hatched in freshwater, mature in saltwater, and return to freshwater to spawn.

COMPOSITE STOCK -- A stock sustained by both wild and artificial production.

CRITICAL STOCK -- A stock of fish experiencing production levels that are so low that permanent damage to the stock is likely or has already occurred.

CULTURED STOCK -- A stock that depends upon spawning, incubation, hatching, or rearing in a hatchery or other artificial production facility.

DENDROGRAM -- A graphic summary of the genetic relationships among populations. The horizontal distance at which the stock branches connect indicates the degree of similarity/dissimilarity. The longer the distance at which the branch points connect, the greater the average genetic differences among stocks.

DEPRESSED STOCK -- A stock of fish whose production is below expected levels based on available habitat and natural variations in survival rates, but above the level where permanent damage to the stock is likely.

ELECTROPHORESIS -- A process whereby charged molecules (such as enzymes and other proteins) are separated in an electric field.

ENDANGERED SPECIES ACT (ESA) -- A 1973 Act of Congress that mandated that endangered and threatened species of fish, wildlife, and plants be protected and restored.

ESCAPEMENT -- Those fish that have survived all fisheries and will make up a spawning population.

ESCAPEMENT FLOOR -- The lower bound of an escapement range.

ESCAPEMENT GOAL -- A predetermined biologically-derived number of salmonids that are not harvested and will be the parent spawners for a wild or hatchery stock of fish.

ESCAPEMENT OBJECTIVE -- A predetermined number of salmonids that varies from the escapement goal and are not harvested and will be the parent spawners for a wild or hatchery stock of fish.

EXTINCT STOCK -- A stock of fish that is no longer present in its original range, or as a distinct stock elsewhere. Individuals of the same species may be observed in very low numbers, consistent with straying from other stocks.

FISHERY -- The act, process, or occupation of attempting to catch fish, which may be retained or released.

FRY -- Young salmonids that have emerged from the gravel and are up to one month of age or any cultured salmonid from hatching through fourteen days after being ponded.

GENE -- A specific unit of genetic material (DNA) that encodes the information for a single genetic trait.

GENE POOL -- The total variety and proportions of alleles within a population.

GENETIC DISTANCE -- A statistical measure that summarizes the detectable genetic differentiation among collections or stocks based on allele frequency differences across all gene loci screened. There are a variety of different genetic distance statistics in the published literature (e.g., Nei, Rogers, Cavalli-Sforza & Edwards), each with its strengths and weaknesses.

GENETIC STOCK IDENTIFICATION (GSI) -- A method that can be used to characterize populations of organisms based on the genetic profiles of individuals. The GSI process consists of a series of steps: (1) collect selected tissues from a representative sample of individuals from the population(s) under investigation; (2) develop genetic profiles for the individuals in each population by conducting starch-gel electrophoresis and histochemical staining using tissue extracts; (3) characterize each population by aggregating the individual genetic profiles and computing allele frequency distributions; and (4) conduct statistical tests using the allele counts characterizing each population to identify significantly different populations.

GENOME -- The total genetic composition of an individual. The complete genetic information possessed by an organism.

HABITAT -- An area that supplies food, water, shelter and a space necessary for a particular animal's existence.

HARVEST -- Fish that are caught and retained in a fishery (consumptive harvest).

HARVEST RATE -- The proportion of a returning run or total population of salmonids that is taken by fisheries, usually expressed as a catch-to-escapement ratio.

HATCHERY PRODUCTION -- The spawning, incubation, hatching or rearing of fish in a hatchery or other artificial production facility (e.g., spawning channels, egg incubation boxes, or pens).

HEALTHY STOCK -- A stock of fish experiencing production levels consistent with its available habitat and within the natural variations in survival for the stock.

HYBRIDIZATION -- The interbreeding of fish from two or more different stocks.

LOCUS (LOCI) -- The site of a specific gene on a chromosome. Often used to refer to a gene and its alleles.

MAXIMUM SUSTAINED HARVEST (MSH) -- The maximum number of fish of a management unit that can be harvested on a sustained basis, measured as the number of fish that would enter fresh water to spawn in the absence of fishing after accounting for natural mortality. MSH is intended to mean maximum sustained harvest to Washington fisheries.

MIXED STOCK -- A stock whose individuals originated from commingled native and non-native parents, and/or by mating between native and non-native fish (hybridization); or a previously native stock that has undergone substantial genetic alteration.

MIXED STOCK FISHERIES -- Any fishery that catches fish that represent a number of commingled stocks.

NATIVE STOCK -- An indigenous stock of fish that has not been substantially impacted by genetic interactions with non-native stocks or by other factors, and is still present in all or part of its original range. In limited cases, a native stock may also exist outside of its original habitat (e.g. captive brood stock programs).

NET PEN -- A fish-rearing enclosure used in lakes and marine areas.

NMFS -- National Marine Fisheries Service.

NON-NATIVE STOCK -- A stock that has become established outside of its original range.

OFF-STATION RELEASES -- Releases of juvenile hatchery-reared fish into streams or lakes at some distance from the hatchery where they were reared.

ON-STATION RELEASES -- Releases of juvenile hatchery-reared fish from hatchery facilities.

PARR -- A juvenile salmon or steelhead during the freshwater residence phase of its life cycle.

PNPTC (POINT NO POINT TREATY COUNCIL) -- A tribal fishery organization representing the Skokomish, Port Gamble S'Klallam, Jamestown S'Klallam and Lower Elwha S'Klallam tribes.

PRETERMINAL AREA -- A fishing area containing mixed stocks of salmon or steelhead.

PRODUCTION TYPE -- The method of spawning and rearing that produced the fish that constitute a stock.

PRODUCTIVITY -- A measure of the capacity of a biological system. Also used as a measure of the efficiency with which a biological system converts energy into growth and production.

REMOTE SITE INCUBATOR -- A lightweight, dark-colored poly barrel incubator that employs plastic substrate (hatching medium), and can be sized to accommodate 5,000 to 125,000 eggs per incubator. They are used for incubating chum salmon eggs.

RIPARIAN HABITAT -- The aquatic and terrestrial habitat adjacent to streams, lakes, estuaries, or other waterways.

RM -- River mile.

RUN -- The sum of stocks of a single salmonid species which migrates to a particular region, river, or stream of origin at a particular season.

SALMONID -- Any member of the taxonomic family Salmonidae, which includes all species of salmon, trout, and char. SASSI deals only with the Pacific salmon (chinook, chum, coho, pink, and sockeye) and with steelhead trout.

SASSI -- Salmon and Steelhead Stock Inventory.

SMOLT -- A juvenile salmonid that is silvery with distinct parr marks and is undergoing the physiological change to migrate from fresh to salt water.

SPAWNING POPULATION -- Synonymous with the term stock.

STOCK -- The fish spawning in a particular lake or stream(s) at a particular season, which fish to a substantial degree do not interbreed with any group spawning in a different place, or in the same place at a different season.

STOCK ORIGIN --The genetic history of a stock.

STOCK STATUS -- The current condition of a stock, which may be based on escapement, run-size, survival, or fitness level.

SUPPLEMENTATION -- The release and management of artificially propagated fish in streams with the intent to increase or establish wild fish populations while minimizing associated genetic and ecological risks.

TERMINAL AREA -- A fishing area where a salmonid stock or run has separated from other stocks/runs.

TREATY TRIBE -- Any Indian tribe recognized by the United States government, with usual and accustomed fishing grounds, whose fishing rights were reserved under a treaty and have been affirmed by a federal court.

TREND -- The directional change in a time series data set.

UNKNOWN STOCK -- This description is applied to stocks where there is insufficient information to identify stock origin or stock status with confidence.

USFWS -- U.S. Fish and Wildlife Service.

WATERSHED -- A basin including all water and land areas that drain to a common body of water.

WILD STEELHEAD RELEASE (WSR) -- A hook-and-line fishery that requires wild steelhead (defined by not having fin clips) to be released. Hatchery steelhead (defined by having fin clips) may be retained.

WDF -- Washington Department of Fisheries.

WDFW -- Washington Department of Fish and Wildlife.

WDW -- Washington Department of Wildlife.

WILD STOCK -- A stock that is sustained by natural spawning and rearing in the natural habitat, regardless of parentage (includes native).

Washington Department
of Fish and Wildlife