REVIEW OF THE CHINOOK EXPLOITATION RATE INDICATOR STOCK PROGRAM FOR THE WASHINGTON COAST AND PUGET SOUND

by

James B. Scott
Biometrician
Northwest Indian Fisheries Commission

Sandra D. Moore
Fish Biologist
Department of Fisheries

Richard A. Moore
Fish Biologist
Department of Fisheries

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ABSTRACT

The Chinook Exploitation Indicator Stock program was initiated in 1985 to evaluate the effectiveness of management measures prescribed by the Pacific Salmon Commission (PSC). In the program, juveniles from each indicator stock are tagged annually with coded-wire-tags (CWT) and subsequent recoveries in fisheries are used to infer fishery harvest rates, brood exploitation rates, and other statistics. Since this indicator stock program provides the only direct means to evaluate the effectiveness of PSC management actions upon exploitation rates, it is imperative that the program be developed and maintained in a manner that assures this objective is achieved. To this end, the Chinook Technical Committee (CTC) recommended in 1990 that "Indicator stock programs should be reviewed to determine if representation of production regions and stock types is adequate and if tagging levels for the indicator stocks are sufficient." This report reviews Washington coastal and Puget Sound indicator stocks as a response to that request.

Recognizing the importance of the indicator stock program, in 1985 the Washington Department of Fisheries (WDF), the Northwest Indian Fisheries Commission (NWIFC), and the U.S. Fish and Wildlife Service (USFWS) instituted a comprehensive tagging program in Washington State. Exploitation indicator stocks, and associated natural stocks, were established by the CTC in 1987. Since 1985, WDF and NWIFC have spent in excess of $390,000 annually tagging chinook exploitation rate indicator stocks.

Serious problems exist with the program that severely hamper the ability of technical staff to evaluate compliance with the objectives of the PST. Currently, only 4 of the 27 stocks considered in this report are providing data of the quality required for the fishery harvest rate index. Problems identified generally fall into 1 of the following 3 categories:

(1) Estimates of the escapement of tagged fish are lacking, are unreliable, or have not been provided to PSMFC;

(2) Survival of tagged fish has been poor or tagging levels have been too low to provide sufficient fishery recoveries; and

(3) Budget cutbacks have reduced agency ability to maintain both adequate tagging and high quality escapement sampling programs.

In the report, 17 stocks are identified as candidates for future PSC tagging. Of these, 11 are recommended on a probationary basis (i.e., contingent on program modifications). It is hoped that funds saved by discontinuing some of the current tagging programs could be reallocated to improve the remaining programs.

Since the tagging of representative stocks is a regional rather than an agency need, we recommend the creation of an interagency committee to address the concerns and recommendations of this report.

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1.0 INTRODUCTION

The Chinook Exploitation Indicator Stock program was initiated in 1985 to evaluate the effectiveness of management measures prescribed by the Pacific Salmon Commission (PSC). In the program, juveniles from each indicator stock are tagged annually with coded-wire-tags (CWT) and subsequent recoveries in fisheries are used to infer fishery harvest rates, brood exploitation rates, and other statistics described below (Chinook Technical Committee, 1990). Since the Exploitation Indicator Stock program provides the only direct means to evaluate the effectiveness of PSC management actions upon exploitation rates, it is imperative that the program be developed and maintained in a manner that assures this objective is achieved. To this end, the Chinook Technical Committee (CTC) recommended in 1990 that "Indicator stock programs should be reviewed to determine if representation of production regions and stock types is adequate and if tagging levels for the indicator stocks are sufficient" (Chinook Technical Committee, 1990). This report, in response to that request, reviews the Washington coastal and Puget Sound chinook indicator stocks.

In 1987, the CTC identified two sets of indicator stocks, one for monitoring changes in spawning escapements and the other for monitoring changes in fishery harvest rates and stock exploitation rates (Chinook Technical Committee, 1987). It was recognized that, in order to assess stock status, it is necessary to have both sets of indicator stocks. The indicator stocks identified by the CTC and those currently used for the exploitation rate analysis are shown in Tables 1-4. In some cases, because of data limitations, the stocks originally identified by the CTC are not currently included in the yearly CTC stock evaluation. Of these two sets of stocks, only the exploitation rate indicator stocks are tagged with CWT's and only these tagged stocks will be considered in this report.

Several criteria were considered when stocks were initially selected for inclusion in the Exploitation Indicator Stock program (Morishima, 1986):

(1) In aggregate, indicator stocks should represent all major regions and racial types that are of interest to the PSC;

(2) The stock must be sufficiently abundant and easily tagged so that the agency responsible can make a long-term commitment for tagging the stock;

(3) The agency responsible for tagging the stock must make a commitment to sample and estimate the escapement of tagged fish and report the results to the Pacific State Marine Fisheries Commission (PSMFC) in a timely manner;

(4) Reliable estimates of catch and escapement must be available.

The exploitation indicator stocks may be used for a variety of analyses depending upon the type of data that are available. The following statistics were reported in the 1989 Annual Report of the CTC (Chinook Technical Committee, 1990):

Fishery Harvest Rate Index:	Estimates the annual harvest rate in a fishery relative to the average harvest rate in the years 1979-1982;
Brood Exploitation Rate:	Estimates the proportion of the initial cohort that is harvested;
Stock Harvest Rate Index:	Estimates the proportion of a stock that is harvested within a year;
Fishery Contribution:	Estimates the total contribution to a fishery of the stock that the indicator represents;
Survival Rate Index:	Estimates the survival of each brood;
Catch Distribution:	Estimates the proportion of the total catch (or mortality) of a stock that occurs in each fishery.

Several of the analyses conducted by the CTC are indices that rely upon data collected from 1979-1982. For example, only indicator stocks with tag recoveries during this time period can be used in the calculation of fishery and stock harvest rate indices. With the exception of the survival rate and catch distribution statistics, the analyses also require accurate escapement estimates, reported as the total return of each CWT group to all escapement strata, including both on-station returns and strays to natural spawning areas.

A summary of the different analyses for which each indicator stock can currently be used is shown in Appendix Tables 1-41. All analyses assume that observed changes in the statistics reflect changes occurring in the fisheries and not changes in the characteristics of the stock that is tagged. Rearing conditions that affect survival and distribution, such as the size at release and time of release, should remain consistent from year to year.

Given the needs of the CTC analysis, this review of the Washington coastal and Puget Sound exploitation indicator stock program included assessment of the following questions:

(1) Are all stock types adequately represented by an exploitation indicator stock?

(2) Have target tagging levels been achieved and do the target tagging levels need to be modified?

(3) Has the tagging program had consistent broodstock, time of release, and size at release?

(4) Have escapement estimates been reported and, if so, how accurate are the estimates?

(5) What number of stocks would need to be tagged to achieve a desired level of precision for the fishery harvest rate index?

2.0 METHODS

2.1 MINIMUM TAGGING LEVELS

Tag codes and recovery data for Puget Sound and Washington coastal chinook stocks used in the 1990 Annual Report were obtained from the CTC. The Pacific States Marine Fisheries Commission (PSMFC) provided information on the source of broodstock, size at release, and time of release for tag groups through the 1988 brood year. Information on procedures used to estimate escapement were typically obtained directly from each agency. Specific sources are provided within stock specific sections of the text.

Target tagging levels were obtained from unpublished documents of the Washington Department of Fisheries and the Northwest Indian Fisheries Commission. In general, consistent with recommendations from a workshop on the Pacific Salmon Treaty CWT-Indicator Stock program (Morishima, 1986), interim tagging targets of 200,000 for fingerling releases and 150,000 for yearling releases (except for some spring yearling stocks that are tagged at higher levels) have been established. The suitability of this target was assessed by asking two questions:

(1) Will the target tagging level produce sufficient recoveries in fisheries of interest?

(2) Will the target tagging level produce a sufficiently large tagged age 2 cohort?

2.1.1 TAGGING LEVELS BASED ON CTC SELECTION CRITERIA

The CTC has developed two criteria to determine which indicator stocks, age classes, and brood years should be used to estimate the harvest rate index for each fishery. The first criterion is used to select a set of stocks and age classes for each fishery for which, on average, the estimated recoveries can be expected to be of sufficient precision. Within this set of stocks and age classes, the second criterion is used to select the particular brood years that had sufficient recoveries. Using historical data, both methods can be used to determine appropriate tagging levels.

Criterion 1. A stock and age class is selected for use in a fishery harvest rate index if at least an average of 35 total adult equivalent mortalities (catch plus incidental mortality

expressed in adult equivalents) occur in the fishery on an annual basis (Chinook Technical Committee, 1989). This criterion was established based upon the relationship between the number of observed recoveries and the variance of the observed recoveries developed by de Libero (1986). The CTC states that the "criterion approximately corresponds to a minimum of a 30% coefficient of variation about the estimated recoveries of multiple tag codes released from a single location...assuming a 20% sampling rate" (Chinook Technical Committee, 1989). The coefficient is approximate for a number of reasons, including: (1) sampling rates in fisheries vary substantially, (2) the CTC recoveries are in terms of adult equivalents, and (3) the CTC recoveries are total estimated mortality rather than estimated recoveries.

One method to compute a target tagging level would be to divide 35 by the average total adult equivalent contribution rate for a fishery of interest. However, tagging levels set using this method would not guarantee sufficient recoveries since random variation might drive the average below the 35 recovery criteria. To guard against this possibility, 35 was divided by the lower end of a 70% confidence interval for the median. The median was selected rather than an average because the median is less sensitive to distributions with heavy tails and it allows the computation of confidence intervals without distributional assumptions. A nonparametric confidence interval was computed using binomial probabilities (Conover, 1980). This procedure should insure that the average number of recoveries will be greater than 35 unless the average is substantially lower than the observed median contribution rate.

Criterion 2. Specific brood years are selected from the set of stock and ages classes identified by criterion 1 by checking the cohort size against a minimum acceptable level. A brood year is selected if the cohort size multiplied by the average exploitation rate for total adult equivalent mortality is greater than 17.5, (i.e., greater than 17.5 estimated total adult equivalent mortality CWT recoveries).

A target tagging level was computed using this criterion by dividing 17.5 by the product of the average total adult equivalent exploitation rate for a fishery and the lower end of a 95% confidence interval for the survival rate. The confidence interval was computed using the procedures discussed for criterion 1.

Minimum tagging levels will need to be re-visited when the PSC Working Group on Mark Recovery Statistics publishes its findings on the variances associated with CWT recoveries. At that time these criteria may be replaced with more appropriate criteria.

2.1.2 TAGGING LEVELS FOR SUFFICIENT AGE 2 COHORT SIZE

Hankin (1990) has conducted simulation studies indicating that estimates of fishery exploitation rates are unreliable (coefficient of variation of greater than 10%) if the estimated age 2 tagged cohort size is less than 500 fish. To utilize this criterion, survival rates were first computed for each stock using the methods and parameter values of

Hankin (1990). A minimum target tagging level was then computed by dividing 500 by the lower end of a 95% confidence interval for the median survival rate.

2.1.3 ASSUMPTIONS

Both methods for computing target tagging levels assume the following:

(1) Observed survival rates are indicative of survival rates that will be observed in the future;

(2) Fishery sampling rates will not be modified;

(3) The observed pattern of exploitation is indicative of future exploitation rates;

(4) The current level of fishery and temporal stratification (annual) will not be modified.

Since many questions remain regarding the variance of estimated recoveries, the tagging levels computed using the procedures described above are recommended for implementation only if they exceed the current target tagging level.

2.2 PRECISION OF FISHERY HARVEST RATE INDICES

The fishery harvest rate indices are used to measure the relative change in harvest rates of major PSC chinook fisheries in response to management actions and are also important indicators of the progress of the PSC chinook rebuilding program. The index is estimated by combining individual estimates from a number of stock and age classes. Stock/age sample sizes for each index vary among years and fisheries, but are generally small, ranging from a high of 22 in the west coast Vancouver Island (WCVI) troll fishery to a low of 1 in the Strait of Georgia troll fishery. Because of the importance of these indices and the generally small sample sizes that generate them, we wished to evaluate their precision. We attempted to do this by asking the following questions:

(1) What are the lower confidence limits for the indices by year and fishery?

(2) What sample size of stocks in each year would have been required to achieve lower confidence limits that are 5%, 10%, or 15% of the index?

(3) What sample size of stocks would have been required to achieve lower confidence limits that are 5%, 10%, or 15% of the index for 90% of the past 12 years.

We attempted to calculate confidence limits using both parametric (t-distribution; Sokal and Rohlf, 1981) and nonparametric (confidence interval for a quantile; Conover, 1980) techniques.

3.0 RESULTS

3.1 TAGGING LEVELS REQUIRED

Minimum tagging levels based on each of the criteria and associated stock specific data are presented in Appendix Tables 1-41. The recommended tagging levels drawn from this analysis are summarized in Table 5. In general, the selection of the recommended tagging level involved consideration of the fisheries in which the stock was harvested, the number of other stocks providing data for those fisheries, and the overall quality of the tagging program for the stock. For example, only 6 stocks are currently used to estimate the fishery harvest rate index for the Alaska troll fishery, but 12 stocks are used for the WCVI troll fishery. Hence, it would be more likely that an increase in the tagging level would be recommended for a stock that has the potential to be used in the Alaska troll fishery index than a stock that might be used in the index for the WCVI troll fishery.

3.2 NUMBER OF STOCKS REQUIRED

Unfortunately, the methods described to compute the necessary number of stocks proved inappropriate for analyzing the data. The data violate the key assumptions of parametric statistics, since the individual stock estimates of the relative harvest rates are not independent and are not normally distributed (the distribution is bimodal for some fisheries). The quantile test, although free of assumptions about distribution, could not be used either, since the fishery index represents an unknown quantile. Further, this test does not allow one to extrapolate to different sample sizes.

We believe it is important to quantify the precision of the fishery index, since this statistic plays a key role both in PSC negotiations and in the bilateral assessment of the chinook rebuilding program. Attempts to find an appropriate analytical technique are ongoing.

In the interim, an attempt was made to identify those stocks that might be used for various indices if certain data became available. Results of this assessment are summarized in Table 6, which shows the average number of CWT recoveries for each indicator stock in ocean fisheries of interest to the PSC. Those stocks currently used in the calculation of fishery indices are indicated in bold, while footnotes indicate stocks that might be used for the index if: (1) tagging levels were increased; (2) accurate escapement estimates could be developed; or (3) base period tagging data could be generated from a similar stock or by updating the base period. Detailed, stock specific data used to develop this summary table are shown in the Appendix Tables. Note that no Washington coastal or Puget Sound stocks are currently available to monitor harvest rate trends in the troll fisheries of Alaska or North/Central British Columbia (NCBC).

3.3 REVIEW OF INDICATOR STOCKS

Exploitation rate indicator stocks have been established for natural chinook stocks in Puget Sound and along the Washington coast. Exceptions to this rule, including a number of stocks initially selected for inclusion as exploitation rate indicator stocks that are no longer tagged, are discussed below and summarized in Tables 1-4. These tables include two types of exploitation rate indicator stocks, one type is used to represent and monitor corresponding natural stocks, and the other type is used to measure harvest rates in fisheries and does not necessarily represent any natural stock. The sections below provide a description of these exploitation rate indicator stocks, their intended uses, and stock specific comments on the PSC tagging programs. The locations of hatcheries and rivers in Puget Sound and along the Washington coast are provided in Figure 1.

Serious problems exist with the PSC indicator stock program. Although currently there are 31 Puget Sound and Washington coastal chinook stocks tagged as part of the program, only 4 are providing data of sufficient quality to be used for the fishery harvest rate index. Many stocks can not be used because escapement data are either unavailable or of poor quality. We recognize that it is very costly both to tag stocks and to collect good quality escapement estimates. It would take a substantial increase in funding to gather data of sufficient quality for all 31 indicator stocks. Given budget limitations, such increased funding may be unrealistic. If such funding is not available, we would recommend working towards the goal of developing an indicator stock program that includes fewer stocks with higher quality data, especially escapement data. It is hoped that the funds saved by tagging fewer stocks could be used to help implement higher quality escapement estimation programs for the remaining stocks. However, even with a reduced number of stocks, a good quality indicator stock program is likely to require increased funding.

In the assessment presented below, we have tried to take the first step towards this goal. We have attempted to evaluate the existing programs and identify those that are not currently providing information that is useful to the CTC. In each case, we identify the existing problems, as well as some assessment of whether or not the problems might feasibly be solved. The overall intent is to identify the most likely candidates for a future high quality, streamlined, cost-effective, indicator stock program.

3.3.1 SPRING FINGERLING AND YEARLING & FINGERLING

NOOKSACK RIVER SPRING YEARLING

The Nooksack River spring stock is harvested primarily in the Strait of Georgia sport fishery. The purposes of the exploitation indicator stocks in this river are to: (1) monitor exploitation rates in fisheries in the Strait of Georgia, and (2) evaluate the effect of the rebuilding program on the Nooksack River natural spring stock.

Indicator Stocks: When the indicator stock program was initiated, it was believed that fish from the north and south forks of the Nooksack River might have different catch distributions. To evaluate this hypothesis, tagging was initiated at both the Skookum Creek Hatchery on the south fork and at the Nooksack Hatchery on the north fork. The two indicator stocks differ in the source of the broodstock and in the duration of rearing. Spring chinook from the Nooksack Hatchery are released as yearlings while the Skookum Creek indicator stock is a fingerling release. These rearing methods may affect distribution and contribution patterns of the stocks. Attempting to determine if differences exist is difficult with the current data because of the limited number of recoveries. However, preliminary cluster analysis indicates that the catch distributions of the Skookum Creek and Nooksack Hatchery fish are similar.

Nooksack Hatchery. The Nooksack Hatchery provides the indicator stock for production of spring yearlings from this region. Tagging was initiated with the 1981 brood and has continued since that time with the exception of the 1983 and the 1985 broods. Since the stock was not tagged during the base period, it cannot currently be used for the analysis of fishery harvest rate indices. However, the stock can be used to monitor brood exploitation rates.

At the Nooksack Hatchery, spring chinook are defined as all fish that arrive on or before September 1 and spawn before September 10, as well as all tagged spring fish that arrive or spawn after those dates. All other chinook are assumed to be falls. Few fall chinook arrive before the cutoff, so the separation probably works fairly well for springs. However, since springs continue to return during the fall time period, it is possible that some untagged springs are mistaken for falls and, therefore, some genetic mixing is taking place over time. Escapement counts are made at the hatchery rack. Because of the need to separate the spring and fall stocks, spring fingerling production has also been tagged.

The quality of Nooksack escapement data has not been fully assessed, but straying is likely to be a problem. There are plans for cooperative stream surveys by WDF, the Lummi Tribe, the Nooksack Tribe, and the U.S. Forest Service, in 1992 (B. Tweit, pers. comm.). If accurate estimates of CWT escapement can be obtained from such surveys, the quality of future escapement data would be improved.

If the base period for the fishery indices is updated, this stock might be used to measure harvest rate indices in the Strait of Georgia sport fishery. Contribution rates to this fishery and the cohort survival rates indicate that the current target tagging level of 200,000 should be sufficient. However, because of the small sample size and variability in exploitation rates, the CTC cohort criterion indicates that a tagging level of 500,000 fish is required. This level is not recommended until several additional years of data have been evaluated.

For the exploitation pattern of tagged fish to represent natural production, it is important that the characteristics of the tagged fish that are released are similar to naturally

produced smolts. Studies designed to compare the size and outmigration timing of tagged and natural smolts have not been conducted.

Skookum Creek Hatchery. The Skookum Creek Hatchery, located approximately 50 miles upstream, relies upon broodstock collected from the South Fork of the Nooksack River to provide fish for tagging. Adults apparently do not return well to the facility because: (1) a number of excellent holding areas exist between the mouth of the river and the hatchery where fish are removed by poachers, fisheries, or natural predators, and (2) the small hatchery outfall provides little attraction, resulting in a high stray rate to adjacent spawning areas.

The return of hatchery and natural origin fish to the south fork is typically small (< 1,000 fish), and collecting sufficient broodstock has often been difficult. For this reason, the number of tagged fish has often been insufficient. For example, only 3,200 fish were tagged from the 1987 brood. Further, the program has not had consistent time of release and size at release.

The lack of return to the hatchery has also made it difficult to estimate the escapement of tagged fish. Preliminary estimates have been computed by multiplying the total escapement to the south fork (estimated from redd counts) by the proportion of recovered carcasses with a particular tag code. The preliminary estimates have not been reported to the PSMFC.

Survival rates for fish released from this facility have been low. Given the poor survival rates, the target tagging level would need to be increased to approximately 300,000 to ensure an adequate cohort size.

Recommendations: Development of an effective exploitation indicator stock for the Nooksack spring stock is desirable because: (1) the stock is one of the three most abundant spring stocks in Puget Sound, (2) numerous regulations have been adopted in Puget Sound fisheries to reduce exploitation on the stock, and (3) the stock has the potential to provide useful information on fisheries in Georgia Strait. Neither the Skookum Creek Hatchery or the Nooksack Hatchery stock are currently providing data of the quality required by the CTC, but the Nooksack Hatchery appears to have fewer problems associated with it.

Continued PSC tagging of the Nooksack Hatchery stock should be considered, on a probationary basis, while efforts are undertaken to solve the problems identified with this program. Studies should be initiated to determine if straying is a problem. If it is, a comprehensive sampling program will be needed in streams where straying occurs to ensure that high quality escapement data can be consistently provided. Because this stock is used as an indicator of the wild stock, studies should be undertaken to determine if the characteristics of tagged fish are similar to the natural fish. The current objective of tagging 200,000 fish should be maintained. Tagging of spring fingerlings should also

continue, to ensure adequate stock separation and compare harvest distribution data between fingerlings and yearlings. If fingerling harvest distribution data are available, less expensive tagging methods could be considered for fingerlings, such as the use of blank tags.

The Skookum Creek program is currently providing data of little value to the CTC. Discontinuing PSC tagging should be considered. Since preliminary cluster analysis indicates that the harvest distributions of the Nooksack and Skookum stocks are similar, discontinuing tagging should not harm the indicator stock program. If tagging were continued, steps would need to be taken to ensure the following: (1) escapement estimates of sufficient precision can be made on an annual basis; (2) enough fish can be tagged to achieve a minimally acceptable cohort size on a continuing basis, and (3) time of release and size at release can be standardized.

SKAGIT RIVER SPRING YEARLING

The purposes of the exploitation indicator stock at the Skagit Hatchery are to: (1) monitor exploitation rates in the Strait of Georgia sport fishery, and (2) provide estimates of exploitation rates that can be to used to evaluate the effect of the rebuilding program on the Skagit River natural spring stock. The status of the natural spring stock has been assessed as Indeterminate by the CTC and designated as "Overfished" by the Pacific Fisheries Management Council (PFMC). The Skagit Spring stock is harvested primarily in the Strait of Georgia sport fishery and in Puget Sound sport and net fisheries.

Indicator Stock: The Skagit Hatchery spring stock was originally designated as the exploitation rate indicator stock for the natural stock of spring salmon in the Skagit River. Tagging was initiated with the 1981 brood, but was temporarily suspended for the 1988 and 1989 broods because of fiscal limitations, poor returns to the hatchery in prior years, and concerns that broodstock collection in years of low hatchery return was negatively impacting the natural spring stock. The stock cannot be currently used for the fishery harvest rate analysis since it was not tagged during the base period, although useful information can be obtained from the time series of brood exploitation rates.

Prior to 1988, all spring chinook were tagged and the spring stock was kept separate at the hatchery by reading tags before spawning and only using tagged spring fish for broodstock. Due to the loss of tagging for the 1988 and 1989 broods, however, a timing criterion had to be used in 1991 to separate the returning adult spring chinook from other stocks. Because of this, some contamination of the broodstock may have occurred.

Skagit escapement counts are made at the hatchery rack. There is some straying, primarily due to low flow in the stream leading to the hatchery. Enhancements made to the facility in 1989 have reduced the stray rate (B. Hayman, pers. comm.). Most straying that does occur is in the lower Cascade. In 1989 and 1990 there was carcass sampling of Cascade fish for age and CWT. Prior to that time, no organized effort was made to collect tags in the river (B. Graeber, pers. comm.).

This stock might be used to monitor harvest rates in the Strait of Georgia sport fishery and the area 8-13 Puget Sound sport fishery if the base period for the exploitation rate analysis were updated. The contribution rate and survival rate data indicate that the current target tagging level of 150,000 would be sufficient.

Recommendations: An exploitation rate indicator stock for the Skagit spring stock would be valuable since: (1) the stock is the most abundant natural spring stock in Puget Sound, (2) numerous regulations have been adopted in Puget Sound fisheries to reduce exploitation on the stock, and (3) the stock has the potential to provide useful information on fisheries in Georgia Strait. However, modification of the program will be required if the indicator stock is to provide useful data to the CTC. Modification should include: (1) development of sufficiently precise and accurate estimates of the total escapement of CWT fish (including fish that stray to natural spawning areas), and (2) verification that the characteristics of the tagged fish (e.g., age, time, and size at release) are similar to those of the natural stock. Continued efforts should be made to achieve the annual tagging target of 150,000. However, natural broodstock should not be collected as long as the natural stock remains depressed. Continued PSC tagging of this stock should be considered, on a probationary basis, as the existing problems are solved.

WHITE RIVER SPRING YEARLING (HUPP SPRINGS)

The primary purpose of this exploitation indicator stock is to provide estimates of exploitation rates that can be to used to evaluate the effect of the rebuilding program on the White River spring stock.

Indicator Stock: This stock remains severely depressed (natural run of < 100 fish) and is the focus of extensive enhancement and management activities. A captive broodstock program is maintained at the Squaxin Island net pens, and hatchery production of the White River stock occurs at the Minter Creek and Hupp Springs Hatchery facilities. Efforts are also underway to produce fish from a new hatchery on the White River. Outplanting to the river will occur as production increases. Only production from the Minter Creek and Hupp Springs facilities is tagged as part of the indicator stock program.

Tagging of the White River spring indicator stock has occurred since the 1974 brood with the exception of the 1976 and 1977 broods. The 1974 and 1975 broods were released into the White River, so escapement estimates are not available. Later broods were released from either the Minter Creek or Hupp Springs Hatchery. Escapement estimates at both facilities are made at the hatchery rack. Studies have demonstrated that straying is not a significant problem for this stock (B. Graeber, pers. comm.).

Although there is considerable (~80%) overlap in run timing of the spring and fall stocks, currently, 100% of the production of the White River spring fingerling and yearling stock at Hupp Springs is tagged. Since all tags are read prior to spawning and only tagged springs are used for broodstock, risk of broodstock contamination is minimized.

Recommendations: Because there is a good time series of data for the Hupp Springs stock and because reliable escapement estimates are available, we believe that this stock is good candidate for continued PSC indicator tagging. Ideally, the current practice of tagging 100% of the spring production released at Hupp Springs should be maintained so that returning spring and fall adults can be differentiated and harvest distributions of spring fingerlings and yearlings can be compared. To reduce costs, however, less expensive tagging methods (such as the use of blank tags) could be considered for fingerlings, if fingerling harvest distribution data are available. To further reduce costs, tagging fingerlings at <100% could be considered as long as only tagged fish are used for broodstock. High quality escapement data should continue to be provided to PSMFC. Evaluation of the new program on the White River should occur after several years of production. If tagging, recoveries, and escapement data are adequate, consideration should be given to initiating PSC tagging at this facility.

QUILCENE HATCHERY SPRING YEARLING

The purpose of this indicator stock is to monitor fishery harvest rate indices in the Puget Sound sport fishery.

Indicator Stock: Broodstock for the Quilcene spring yearling program has been obtained from stocks outside the Hood Canal region, primarily the Nooksack River and the Cowlitz River. The lack of base period data currently precludes use of the stock in the analysis of fishery harvest rate indices. Poor contribution rates further limit the utility of this indicator stock. The limited (and variable) recovery data available indicate that a minimum of 674,000 fish would need to be tagged to achieve the desired cohort size.

Recognizing the poor survival rates for this stock, a six year evaluation program has been initiated. An additional stock (Soleduck) will be released from the facility to determine if the primary problem is with the stock or the facility. If poor survival continues, spring chinook production may be abandoned at this facility (R. Comstock, pers. comm.).

Recommendations: At current contribution levels, this stock has little value for monitoring harvest rates in Puget Sound fisheries. Tagging for PSC purposes should be discontinued.

HOOD CANAL SPRING YEARLING

A spring yearling program has recently initiated at Hood Canal hatchery.

Recommendation: Evaluation of this program should occur after several years of production.

3.3.2 SUMMER AND SPRING/SUMMER FINGERLING

NORTH WASHINGTON COAST SPRING/SUMMER AND SUMMER

The primary purpose of this exploitation indicator stock is to provide estimates of exploitation rates that can be used to evaluate the effect of the rebuilding program on natural stocks of summer or spring/summer chinook from the Quillayute, Hoh, and Queets Rivers.

Indicator Stock: The Quillayute stock represents natural production of summer stocks from rivers on the north Washington coast.

Quillayute Broodstock Program. Broodstock for this program is collected from the Bogachiel and Soleduck rivers by pulling a gillnet through suspected holding locations. Since spring chinook are also present in the river at this time, the fish collected are likely a mixture of spring and summer type fish (S. Meadows, pers. comm.). The spring chinook found in the Quillayute are made up of several stocks, most from outside the Quillayute watershed. Because of the mixed origin of fish in the Quillayute program, it is questionable if progeny from the broodstock are representative of natural spring/summer production from the coastal rivers (S. Chitwood, memo to G. Morishima).

After capture, the netted fish are held at the Soleduck Hatchery until spawning. The fish are subsequently incubated, reared, and tagged at the Lonesome Creek Hatchery and moved to the Bear Spring Ponds for final rearing before release in the Soleduck River. The broodstock collection program has been in place since 1987; tagging of the 1985 and 1986 broods relied upon fish that returned to the hatchery.

Difficulties in achieving the interim target of 200,000 tagged fish have been caused by problems collecting sufficient broodstock and by unanticipated mortalities.

The very limited data collected to this time indicate that the target tagging level may not achieve sufficient recoveries. Approximately 300,000 tagged fish would be required to achieve sufficient recoveries in the Alaska troll fishery. The survival rate of the one complete brood (1985) was low. If this survival rate is maintained in future broods, the target tagging level would need to be increased to at least 225,000 to achieve a sufficient cohort size. This stock also has the potential to be used as an indicator for the NCBC fishery, although the data are currently insufficient to indicate a necessary tagging level.

If the program is designed to monitor exploitation rates on a natural stock, it is important that the characteristics of the fish that are released are similar to those of the wild fish. Studies have not been conducted to assess if the size and release time of tagged Quillayute fish correspond to those of the Quillayute, Hoh, and Queets natural stocks.

Escapement estimates for the tagged Quillayute fish have not been completed. Developing sufficiently precise and accurate measures of escapement may be difficult

since very few carcasses are recovered. Although the gillnet fishery might be used to estimate the proportion tagged, gillnets are generally size selective, and the data collected have indicated that the proportion of tagged fish in the gillnet fishery and in broodstock are not the same (S. Meadows, pers. comm.). Given these problems, it is unclear that escapement estimates of sufficient quality could be obtained for this stock.

Recommendations: The utility of this stock is currently limited due to insufficient tag recoveries, the absence of estimates of escapement for tagged fish, and concerns that the stock is not representative of the natural stock. Discontinuing PSC tagging should be considered. If tagging were to continue, the following would be needed:

(1) Point and variance estimates of the escapement would need to be computed. The variance could then be used to determine if the estimated escapements are sufficiently precise to be used in the exploitation rate analysis. If the estimates are not sufficiently precise, tagging of the stock should be discontinued.

(2) If escapement estimates are found to be usable, then the target tagging level for the stock could be re-evaluated.

(3) Studies would need to be initiated to compare the size and outmigration timing of natural and tagged fish.

3.3.3 FALL FINGERLING

NOOKSACK/SAMISH FALL

The primary purpose of the exploitation rate indicator stocks within this region is to monitor harvest rate indices in the WCVI troll and GS sport fisheries.

Indicator Stocks: The fall fingerling stock from this region is represented by the Lummi and Samish indicator stocks. Both stocks are reared and tagged at hatcheries within the region.

Samish Hatchery. The Samish Hatchery stock contributes well to Canadian fisheries and is one of only four of the current indicator stocks with adequate data for use in the fishery exploitation rate analysis. The stock has been tagged intermittently since brood year 1974. Contribution rates for brood years through 1979 were significantly higher than for brood years 1985 and 1986. However, the current target tagging level of 200,000 is still sufficient to achieve adequate recoveries in the WCVI troll fishery, the Strait of Georgia sport and troll fishery, and in North Puget Sound sport and net fisheries.

Escapement counts for the Samish stock are made at the hatchery rack. In recent years, estimates have been improved by implementation of a carcass sampling program below the hatchery. Carcasses are sampled for age and CWT. Based upon these samples, an estimated 20% of the hatchery stock spawns below the rack (B. Graeber, pers. comm.).

Lummi Bay Hatchery. Tagged fish have been released from Lummi Bay Hatchery since brood year 1975 with the exception of brood years 1982 through 1984. Recoveries of tagged fish in the Nooksack River indicate that straying may be a problem. As shown in the table below, which compares 1989 recoveries in Area 7B and the Nooksack River, inriver recoveries are substantially lower than those in the adjacent marine area.

Tag Code	Nooksack River		Area 7B	
	Observed	Estimated	Observed	Estimated
211902	1	3	10	38
212232	8	36	161	664
212235	1	4	27	119

Concern over the possibility that escapement may be underestimated has precluded use of this stock in either fishery or brood exploitation rate analyses. If the escapement data are accurate, then data from the Lummi and Samish stocks might be combined; cluster analysis of catch distributions of the two stocks appear similar. Combination of the Lummi and Samish recoveries would result in a substantial improvement of the time series of data for this region.

Eggs for this program have generally come from the Samish Hatchery. However, when a limited number of eggs are available at the Samish Hatchery, the Green River Hatchery has been used as an alternative source. This most recently occurred in the 1988 brood year.

This stock contributes significantly to the WCVI troll fishery, the Strait of Georgia sport and troll fisheries, and Washington Areas 5-7 sport fisheries. The current tagging level of 200,000 would provide adequate recoveries in these fisheries and assure an adequate cohort size.

Recommendations: The Samish stock appears to be a good candidate for continued PSC indicator tagging. Efforts should be made to improve escapement estimates for this stock. Emphasis should be placed on maintaining high quality below rack escapement estimates, and the escapement and sampling methodology should continue to be refined. Methods should be developed for adjusting data from prior years to remove any bias caused by straying.

In contrast to the Samish stock, escapement estimates for the Lummi Bay Hatchery appear to be of poor quality. As such, discontinuing PSC tagging should be considered. If tagging were to continue, the following would be necessary: (1) verification of escapement estimates, (2) improvement of escapement methodologies, and (3) CWT

sampling of strays in the Nooksack River. If adequate estimates of escapement can not be assured for this stock, data will not be useful to the CTC.

The similarity of the catch distribution of fish produced from the Samish Hatchery and the Lummi Bay Hatchery may provide an opportunity to improve the quality of the data from this region. If straying is not a problem at Lummi Bay Hatchery, tag groups released from the two facilities, in prior years, could be combined to increase the number or brood years in which tagging was conducted.

SKAGIT RIVER SUMMER/FALL

Indicator Stock: Despite the fact that the Skagit summer/fall stock is the largest natural stock in Puget Sound, no indicator stock currently exists for summer/fall production from this region. Initially, yearling production of summer/fall chinook from the Skagit Hatchery was to serve as the exploitation rate indicator stock. However, genetic stock identification analysis indicated that both the summer and fall stocks from the Skagit Hatchery were different from the Skagit natural stock. Tagging was only done for the 1971-78 and 1985 broods.

There are several reasons why it is important that an indicator stock be developed for this region. First, base period tagging data indicate that the natural Skagit summer/fall stock is heavily harvested in the Strait of Georgia sport fishery, a fishery for which there is currently a shortage of indicator stocks. Second, terminal runs for the Skagit River natural stock have declined in recent years, and the stock has been classified as Indeterminate by the CTC. In the absence of estimates of exploitation rates, it will be difficult to determine why terminal runs have declined.

Recommendation: The feasibility of developing an indicator stock for production of summer/fall chinook from the Skagit River should be investigated. Funding provided by Seattle City Light might allow for broodstock collection and tagging if such a program were developed. For such a program to be useful to the CTC, high quality escapement estimates would be needed. If escapement estimates can not be obtained, then a new tagging program should not be implemented. Also, since this stock would be used as a natural stock indicator, studies should be undertaken to ensure that the characteristics of tagged fish are similar to the natural fish.

SNOHOMISH REGION SUMMER/FALL

The primary purpose of the exploitation indicator stocks within this region is to provide estimates of exploitation rates that can be to used to evaluate the effect of the rebuilding program on the natural summer/fall chinook stock from the Snohomish Region. The Snohomish stock has been assessed as Probably Not Rebuilding by the Chinook Technical Committee and the PFMC has designated the stock as "Overfished."

Indicator Stocks: Two indicator stocks were originally designated to represent the production of Snohomish summer/fall fingerlings: Skykomish Hatchery summer and Tulalip Hatchery Fall.

Snohomish System. The Skykomish summer tagging project was dropped by WDF after the 1986 brood due to funding shortfalls, concerns about straying, and problems separating the summer and fall stocks at the hatchery. There are no indicator stocks to represent fall production from this region.

Tulalip Hatchery. Evaluation of the Tulalip Hatchery indicator stock is difficult since tagging was not initiated until the 1986 brood. Since the source of the broodstock has varied (Samish, mixed Puget Sound), the stock may not be representative of natural production from the region.

The accounting of escapement for this stock needs further evaluation. Escapement to the hatchery is minimal, since eggs are provided by other facilities. For example, only 1 escapement recovery was reported for the age 3 component of the 1986 brood. In large part, the small number of reported escapement may result from high harvest rates in Tulalip Bay. However, straying to the Snohomish and Stillaguamish Rivers may also be occurring.

Recommendations: In order to evaluate the reasons for the depressed status of this stock, it is important that an indicator stock be established for this region. However, substantial problems exist. Possible alternatives include:

(1) Resume tagging of summer chinook at Skykomish Hatchery. Efforts would be needed to address the straying problem associated with the previous tagging program and to develop methods for adequate stock separation.

(2) Develop an indigenous fall indicator stock for the Snohomish region. Either Snoqualmie or Sultan falls might be appropriate for broodstock. The current fall stock at Skykomish hatchery is of Green River origin and may not be useful for evaluating exploitation of the Snohomish stock.

For either alternative, studies should be undertaken to ensure that the characteristics of tagged fish are similar to the natural fish.

The Tulalip hatchery program is currently providing data of limited value to the CTC, due to problems with straying and broodstock source. Discontinuing PSC tagging should be considered. If the program continues, the following problems must be solved: (a) the lack of a consistent source of broodstock from within the region; and (b) questions regarding straying and the accuracy of the escapement estimates.

STILLAGUAMISH SUMMER/FALL

The primary purpose of the exploitation indicator stocks within this region is to provide estimates of exploitation rates that can be to used to evaluate the effect of the rebuilding program on natural stocks of summer/fall chinook from the Stillaguamish River. The Stillaguamish stock has been assessed as Indeterminate by the CTC and the PFMC has designated the stock as "Overfished."

Indicator Stock. The Stillaguamish indicator stock relies upon natural broodstock for tagging. Broodstock are collected from the river, spawned, and the fry reared at Stillaguamish Hatchery before tagging and release from the Fortson Pond.

Tagging levels have been below target, ranging from 23,904 to 127,910. The primary difficulty in achieving the target of 200,000 has been collecting sufficient broodstock. Collection of sufficient broodstock may have detrimental impacts on the natural stock in years of low abundance.

Estimates of the spawning escapement for this stock are difficult since the fingerlings are released off station and a limited number of adults return to the Stillaguamish Hatchery. Currently, total escapement to the river is estimated using aerial surveys. Some information on the proportion of tagged fish present is available from sampling of carcasses and from the broodstock collection program. However, no estimates of the escapement of tagged fish have been completed. For this stock to be used as an indicator for the region, escapement estimates would have to be improved. This would likely require implementation of a comprehensive CWT sampling program.

This stock was not tagged during the base period so it can not currently be used in the fishery harvest rate analysis. If escapement estimates were made, and if the base period were updated, the contribution rate data indicate that this stock could be used to monitor exploitation rates in the WCVI troll fishery and the Strait of Georgia sport fishery. The current target of 200,000 tagged fish would likely be sufficient to produce sufficient recoveries in each of these fisheries. The number of fish required to achieve a minimal cohort size is approximately 239,000.

Studies have not been conducted to assess if the size and release time of tagged Stillaguamish fish correspond to those of the Stillaguamish natural stock.

Recommendations: Development of an effective exploitation rate indicator stock for this the Stillaguamish stock should be given a high priority. The primary limitation at this time is the lack of estimates of the escapement of tagged fish. Data collected in prior years should be collated to determine if escapement can be estimated and if modifications are needed to obtain estimates of the desired precision and accuracy. Continued efforts should be made to achieve the annual tagging target of 200,000, as long as collection of broodstock does not harm the natural stock. Because this stock is used as an indicator of the wild stock, studies should be undertaken to determine if the

characteristics of tagged fish are similar to the natural fish. Continued PSC tagging of this stock should be considered, on a probationary basis, as the existing problems are solved.

GREEN RIVER FALL

The primary purpose of the Green River Hatchery exploitation indicator stock is to provide estimates of exploitation rates that can be to used to evaluate the effect of the rebuilding program on the natural stock of fall chinook salmon in the Green River.

Indicator Stock: The Green River Hatchery stock is one of only four of the current indicator stocks that can be used for all parts of the CTC assessment. This stock has been tagged intermittently since the 1974 brood.

The tagging target of 200,000 should provide adequate recoveries for this stock to be used to measure fishery harvest rate indices in the WCVI troll fishery, the Strait of Georgia sport fishery, and Puget Sound sport fisheries.

Recommendations: This stock appears to be a good candidate for continued PSC indicator tagging. For this program to provide useful data to the CTC, efforts should be made to solve existing problems. The comprehensive CWT sampling program in place since 1989 should be continued, so that stray rates of tagged hatchery fish can be quantified, and high quality hatchery escapement estimates can be consistently provided. Total hatchery escapement estimates, including strays, should be computed and reported to PSMFC. Because this stock is used as an indicator of the wild stock, studies should be undertaken to determine if the characteristics of tagged fish are similar to the natural fish.

MID-PUGET SOUND REGION

The primary purpose of the Grovers Creek Hatchery exploitation indicator stock is to monitor exploitation rates in PSC fisheries.

Indicator Stock: The Grovers Creek stock is used to represent production of fall fingerlings from the mid-Puget Sound Region. The Issaquah Hatchery stock was also originally included as an indicator stock for this region. However, due to budget limitations, WDF ceased tagging this stock after the 1987 brood.

Tagging has been conducted consistently at the Grovers Creek Hatchery since the 1981 brood. Since no tagging was conducted during the base period, analyses that require base period data can only be conducted if the stock is combined with other mid-Puget Sound stocks. The Grovers Creek stock is currently combined with the Green River stock for use in the fishery harvest rate index.

Escapement estimates for the stock appear good. The probability of straying is minimized by the shape of the bay, which tends to funnel fish toward the hatchery, and

the lack of other streams in the vicinity. Sampling for CWT's does occur in areas where straying is likely.

Contribution rates indicate that this stock could be used to monitor harvest rates in the WCVI troll fishery and Puget Sound sport fisheries. The current tagging target of 200,000 should provide sufficient recoveries in these fisheries and provide an adequate cohort size.

Recommendations: This stock appears to be a good candidate for continued PSC indicator tagging. The comprehensive CWT sampling program, currently in place, should be continued. High quality total hatchery escapement estimates, including strays, should be computed and reported to PSMFC.

SOUTH PUGET SOUND FALL

Exploitation rate indicator stocks within this region are used to monitor exploitation rates in PSC fisheries.

Indicator Stock: The Kalama Creek Hatchery is currently the only indicator stock for fall fingerling production from South Sound. Chinook from Percival Cove (Deschutes Complex) were initially established as an indicator stock; however, tagging was halted after brood year 1987 due to funding shortfalls.

Straying is believed to be a significant problem for adults returning to the Kalama Creek Hatchery (B. Graeber, pers. comm.). Limited hatchery escapement has been observed, particularly in brood years prior to 1985. Because of difficulties in achieving escapement goals, eggs for this program have come from a number of sources, including the Green River Hatchery, the Deschutes Complex, and McAllister Creek Hatchery.

The Kalama Creek Hatchery stock has been tagged continuously since the 1979 brood. The primary PSC ceiling fishery to which this stock contributes is the WCVI troll fishery. A target tagging level of 225,000 would be needed to provide adequate recoveries in this fishery. The stock might also provide sufficient recoveries in the north Puget Sound net fishery if the number of tagged fish was increased to this level.

Recommendations: The Kalama Creek Hatchery is the only remaining indicator for production of fall fingerlings from South Sound. As such, priority should be given to ensuring that this stock, or another South Sound stock, can be used in the exploitation rate analysis. Because of existing problems at Kalama Creek, the feasibility of moving the program to another facility should be evaluated. We recommend the following:

> Evaluate the advantages and disadvantages of moving the program to another facility. Alternatives include Clear Creek Hatchery, Coulter Creek Hatchery, and Percival Cove (Deschutes Complex).

If the program were to remain at Kalama Creek, the following would be necessary:

(1) A consistent source of broodstock would need to be used, preferably Kalama Creek, and time of release and size at release would need to be standardized.

(2) The similarity of Kalama Creek and the Percival Cove (Deschutes Complex) stock, or some other South Sound hatchery production, would need to be assessed. The utility of this stock for analysis of fishery and brood exploitation rates would be greatly enhanced if an alternative stock could be used to represent South Sound production during the base period.

(3) The stray rate would need to be assessed either by examining carcasses for tagged fish or sampling carcasses for marked otoliths. Exploitation rates on the Kalama Creek stock would need to be checked for consistency with other stocks from the region, as an additional check of the potential effect of straying.

(4) If the program remains at the Kalama Creek Hatchery, and the recommendations listed above are addressed, then the target tagging level should be increased to 225,000.

HOOD CANAL FALL

The exploitation rate indicator stock from this region is used to monitor exploitation rates in PSC fisheries.

Indicator Stock: Fall fingerling production from the Hood Canal region is represented by the George Adams Hatchery stock. Fingerling production from the George Adams Hatchery has been tagged intermittently since 1974 and continuously since 1985. Since tagging data from the base period are available, the stock can be used for all components of the exploitation rate analysis. The stock is primarily useful for analysis of changes in the harvest rate in the WCVI troll fishery. Tagging levels should be increased to 220,000 to provide adequate recoveries in WCVI troll and Puget Sound sport fisheries.

Escapement estimates for the George Adams stock are made at the hatchery rack. It is believed that most fish make it up Purdy Creek to the hatchery. Carcass counts and CWT sampling are done in Purdy Creek and in the Skokomish River (B. Graeber, pers. comm.).

Recommendation: This stock appears to be a good candidate for continued PSC indicator tagging. The target tagging level for this program should be increased to 220,000 fish. The comprehensive CWT sampling program, in place since 1988, should be continued, to ensure that high quality escapement estimates can be consistently provided. Total hatchery escapement estimates, including strays, should be computed and reported to PSMFC.

STRAIT OF JUAN DE FUCA TRIBUTARIES FALL

The primary purpose of the exploitation indicator stocks within this region is to provide estimates of exploitation rates that can be to used to evaluate the effect of the rebuilding program on natural chinook stocks in tributaries to the Strait of Juan de Fuca.

Indicator Stocks: Two indicator stocks currently exist to represent fall fingerling type production from tributaries to the Strait of Juan de Fuca. A hatchery stock is tagged at the Lower Elwha Hatchery and a wild broodstock collection/tagging project is conducted on the Hoko River.

Lower Elwha Hatchery. The indicator stock program at the Lower Elwha Hatchery was initiated when WDF terminated a similar tagging program at the Elwha Channel in 1988. Tagging data are available from either the Channel or the Hatchery beginning with the 1982 brood.

Estimating the escapement of tagged fish is difficult since the majority of adults do not return to the hatchery or the channel. Estimates of the total escapement to the river are obtained from float surveys, and carcasses are sampled for CWT. Currently, only observed returns to the hatchery plus total fish gaffed for broodstock are reported to PSMFC.

Survival rates for the stock at the Elwha Hatchery have declined since tagging was initiated and recommended tagging levels based on all brood years are likely too low given current survival. Even at historical survival rates (when survival was much higher), a tagging level of approximately 400,000 fish would be required to obtain a sufficient cohort size. It is hoped that efforts to improve future survival will be successful and lower tagging levels will provide sufficient recoveries.

Hoko River. A natural broodstock collection/tagging project has been conducted on the Hoko River since 1985. The number of fish tagged has been below the target of 200,000 (ranging from 110,572 to 199,740) due to difficulties in collecting sufficient broodstock. This may be less of a problem in the future if escapement of the stock continues to increase.

Since few of the adult tagged fish return to the hatchery, an estimate of the escapement of tagged fish to natural spawning areas is required. The total escapement to the system is based on redd counts and an estimated rate of 2.5 fish per redd. Carcasses are sampled for CWT's. Total escapement estimates are available but need to be calibrated for possible bias. Estimates at high escapement levels are believed to be more prone to underestimation due to limitations of the redd accounting methodology. Although no estimates of CWT escapement have yet been provided, the escapement of tagged fish could be estimated by multiplying the escapement to the system by the proportion of carcasses that have tags.

Stocks from the Juan de Fuca region have a more northerly distribution than other stocks from Puget Sound. Eventually, the Hoko River stock might be used to estimate fishery harvest rate indices in the Alaska, NCBC, and WCVI troll fisheries, and in the Washington Areas 5-7 sport fishery. With only three years of tag data available, it is difficult to evaluate the current target tagging level of 200,000. However, the data indicate that the target is marginally adequate, and may need to be increased as additional years of recovery data become available.

Recommendations: Development of an effective exploitation rate indicator stock for the Juan de Fuca region would be useful since these stocks contribute to Alaska and NCBC fisheries, fisheries that are poorly represented in the exploitation rate analysis. Biologists familiar with the Hoko and Elwha stocks believe that differences may exist between the stocks in age at maturity and catch distribution. However, preliminary analysis of the 1985 brood catch distribution indicated that the stocks were more similar to one another than to stocks from Puget Sound or the Washington Coast.

For these programs to provide useful data to the CTC, immediate efforts should be made to solve existing problems. For both stocks, sufficiently precise and accurate estimates of the escapement of tagged fish are essential. Further efforts should be made to achieve target tagging levels, as long as Hoko broodstock collection does not harm the natural stock. Tagging levels may also need to be increased; levels should be re-evaluated in a few years to determine if this is necessary. For the Elwha stock, time of release and size at release should be standardized. For the Hoko, studies should be implemented that compare the size and outmigration timing of tagged and natural smolts. Continued PSC tagging of both stocks should be considered, on a probationary basis, while existing problems are solved.

If problems with the Elwha program are solved and survival rates remain low, tagging levels will need to be increased to ensure sufficient recoveries. If the Elwha dams are removed and a wild stock restoration program is initiated, continued PSC tagging of this stock should be re-evaluated.

NORTH WASHINGTON COAST FALL

The primary purpose of the exploitation indicator stocks within this region is to provide estimates of exploitation rates that can be used to evaluate the effect of the rebuilding program on natural fall chinook stocks from the Quillayute, Hoh, and Queets Rivers.

Indicator Stocks: Natural stocks of fall chinook salmon along the north coast of Washington are represented by indicator stocks at the Makah National Fish Hatchery and the Quinault National Fish Hatchery, as well as the natural broodstock tagging program on the Queets River. Tagging at the Soleduck hatchery was discontinued after the 1987 brood.

Makah National Fish Hatchery. Tagging at the Makah National Fish Hatchery was initiated with the 1985 brood. Survival rates for this stock have been low, and contribution rates to all fisheries have been near zero. The U.S. Fish and Wildlife Service is investigating methods to increase survival rates, including releasing fish at a larger size; however, water availability may limit the success of these attempts (R. Comstock, pers. comm.). Fish appear to return well to the hatchery and escapement estimates are available.

Queets River. The Queets River project relies upon natural broodstock for tagging. Wild broodstock are captured in the Queets and Clearwater Rivers at or near the time of spawning. The adults are transferred to Shale Creek Pond, located on the Clearwater River. Here the adults are held and spawned. Eggs are incubated in quarantine at the Lake Quinault Hatchery. Certified, eyed eggs are transferred to the Quinault National Fish Hatchery for final incubation, rearing, and tagging. Fingerlings are transferred to Salmon River Pond, on the Queets River, for imprinting and are released at a time and size matching the naturally produced fish. Since 1985, the target of 200,000 tagged fish has been achieved only once. Unanticipated mortality during egg incubation and disease problems during rearing have kept the number of fish tagged below the target level.

Preliminary estimates of the escapement of tagged fish have been completed but not reported to the PSMFC. The escapement of tagged fish is estimated by multiplying the total estimated escapement (obtained from redd counts) by the proportion of carcasses that have a particular tag code. The variance of these estimates has not been computed.

The current tagging target of 200,000 would be sufficient to produce adequate recoveries of age 4 fish in the Alaska and NCBC troll fisheries. This target would also be sufficient to achieve a cohort size of at least 500 fish.

The characteristics of tagged and naturally produced fingerlings in the Queets River have been assessed (Quinault Department of Natural Resources, 1990). Naturally produced fingerlings sampled in the river had a similar size distribution to tagged fish reared in the hatchery, and the date of release for the tagged fish is specifically designed to coincide with the outmigration of the natural stock.

Quinault National Fish Hatchery. Tagging was initiated with the 1974 brood at the Quinault National Fish Hatchery and has occurred continuously since then, with the exception of the 1981 brood. This stock had tagging during the base period and has a hatchery at which to enumerate escapement; unfortunately, escapement estimates are currently of poor quality because of limited records and problems with enumerating fish that spawn in Cook Creek or the Quinault River.

The U.S. Fish and Wildlife Service is investigating questions about the escapement estimates. Preliminary surveys below the weir have found few chinook, suggesting that a high in-river harvest rate may be responsible for the low hatchery returns. However,

spawning survey work by the Quinault Indian Nation indicates that Cook Creek is heavily used by spawning chinook (S. Chitwood, memo to G. Morishima). Investigations are ongoing.

Contribution rates in prior years indicate that the current tagging target of 200,000 fish should produce sufficient recoveries in the Alaska troll fisheries.

Recommendations: An adequate exploitation rate indicator stock is currently lacking for natural production of fall stocks along the north coast of Washington. Development of an effective exploitation rate indicator stock for this region is desirable since these stocks are managed for natural production and they provide a significant portion of the catch in northern B.C. and Alaska. To rectify this problem, the following actions are recommended:

(1) Reinstating PSC tagging at the Soleduck Hatchery should be considered, if straying is found not to be a problem. Although this stock lacks base period data, it has a good time series of tagging. If needed, a comprehensive program to sample for CWT's should be implemented to ensure that high quality escapement data can be consistently provided.

(2) Alternatively, improvement of the Queets River program should be considered. For this stock to be useful to the CTC, immediate efforts would be needed to solve existing problems, including: (1) reporting escapement estimates for the Queets River tag groups to the PSMFC, and (2) computing the variance of the escapement estimates to determine if the estimated escapements are sufficiently precise to be used in the exploitation rate analysis.

Either Soleduck or Queets could be chosen for future PSC indicator stock tagging.

(3) As an alternative to (1) or (2), the possibility of using the Hoko stock as an indicator for both the Strait of Juan de Fuca and North coastal stocks should be investigated. If this stock is sufficiently representative, tagging of other North coastal stocks might be discontinued.

(4) Data for Quinault Fish Hatchery chinook are not useful without good quality escapement estimates. Old data should be collated and evaluated to determine if historical escapement estimates can be developed. If this is not possible, discontinuing PSC tagging should be considered. If tagging were continued and straying is a problem, then a comprehensive program to sample for CWT's would need to be instituted. Time of release and size at release would also need to be standardized.

(5) Poor survival is limiting the utility of the Makah Hatchery indicator stock program. Tagging for PSC purposes should be discontinued at least until survival rates increase.

GRAYS HARBOR FALL

The primary purpose of the exploitation indicator stocks within this region is to provide estimates of exploitation rates that can be to used to evaluate the effect of the rebuilding program on natural fall chinook stocks from tributaries to Grays Harbor.

Humptulips Hatchery. The Humptulips hatchery stock has been tagged since the 1982 brood. The lack of base period tagging data currently precludes use of this stock in the fishery harvest rate index analysis. Based upon contribution rates for this stock, the current tagging target of 200,000 would likely produce sufficient recoveries only of age 5 fish in the Alaska troll fishery.

Escapement estimates are made from fish returning to the hatchery rack and from spawning survey data. The hatchery is located on Stevens Creek, but the fish are reared mostly on Humptulips River water. This leads to a high stray rate for which there is currently insufficient accounting. Escapement appears to be underestimated since exploitation rates frequently exceed 90%.

Recommendations: This stock is currently not useful because of poor survival and the absence of high quality escapement estimates. Unless substantially improved escapement estimates can be developed, discontinuing PSC tagging should be considered.

WILLAPA BAY FALL

The primary purpose of an exploitation rate indicator stock within this region would be to measure exploitation rates in PSC fisheries.

Indicator Stock: Chinook from the Willapa Hatchery were selected and tagged as an indicator stock through brood year 1987. Tagging was discontinued due to funding limitations.

Recommendations: Straying of chinook between Willapa and Naselle hatcheries appears to be a considerable problem (L. Blankenship, pers. comm.). As such, additional tagging of the Willapa stock is not recommended.

3.3.4 FALL YEARLING AND ACCELERATED PRODUCTION

MID-PUGET SOUND FALL

Exploitation rate indicator stocks within this region are used to monitor exploitation rates in PSC fisheries.

Indicator Stocks: Icy Creek was originally identified as an indicator stock for this region, but PSC tagging was never implemented. The University of Washington Accelerated stock was tagged, although not for PSC purposes. A good time series of tagging data is available for this stock, including base period data, and the stock contributes well to the Strait of Georgia sport fishery. Although this stock is not representative of natural production, it is useful as a harvest rate indicator stock. Tagging was discontinued after the 1984 brood.

Recommendation: The University of Washington stock appears to be a good candidate for PSC indicator tagging if sufficient numbers can be tagged and if good estimates of CWT escapement can be provided. The potential for reinstating tagging of this stock should be evaluated.

SOUTH PUGET SOUND FALL YEARLING

Exploitation rate indicator stocks within this region are used to monitor exploitation rates in PSC fisheries.

Indicator Stock: The Percival Cove (Deschutes Complex) yearling stock was originally designated as the indicator stock for yearling production from the South Sound region. However, due to juvenile mortality problems, the majority of the production was transferred to the Squaxin Pens beginning with the 1986 brood. Tagging of fish from Percival Cove was dropped in 1987 and initiated with the 1986 brood at the Squaxin Pen site.

Insufficient recovery data are available to evaluate the utility of the Squaxin Pen stock for use as an indicator stock. However, the lack of a specific hatchery to attract returns suggests that straying is likely, and that escapement estimates may be of poor quality. Another problem is that base period data are not available for fish released from the Squaxin Pens.

Recommendations: Development of an effective exploitation rate indicator stock for South Sound yearling production is desirable, since the South Sound yearling stock provides one of the better measures of harvest rate indices in the south Puget Sound sport fishery. Unfortunately, the current program at Squaxin Pens will not provide useful data for the CTC until total hatchery escapement estimates are provided to PSMFC. When escapement data are available, the escapement rates for Percival Cove and Squaxin Pens stocks should be compared. If escapement data from Squaxin Pens are considered unreliable, consideration should be given to moving the program from Squaxin Pens back to Percival Cove. Continued PSC tagging at Squaxin Pens should be considered, on a probationary basis, while existing problems are solved.

HOOD CANAL FALL YEARLING

The exploitation rate indicator stock within this region is used to monitor exploitation rates in PSC fisheries.

Indicator Stock: The Hood Canal Hatchery stock was originally selected as an indicator stock. However, WDF ceased tagging after the 1986 brood. The stock was not tagged during the base period. In addition, recoveries in all fisheries were less than sufficient (with the exception of the Puget Sound sport fishery) for those groups that were tagged.

Recommendation: Removing the Hood Canal yearling stock from the indicator stock program does not jeopardize the analyses of the CTC.

4.0 DISCUSSION AND SUMMARY RECOMMENDATIONS

The primary purpose of the Exploitation Rate Indicator Stock program is to provide estimates of exploitation rates for representative stocks in PSC fisheries. A basic tenet of the PSC chinook rebuilding program is that catch ceilings for the major mixed stock fisheries, in conjunction with limitations on harvest in pass-through fisheries, will act to continually reduce harvest rates until the completion of rebuilding. The indicator stocks provide the only means to assess if the realized effects of management actions are consistent with this tenet.

Recognizing the importance of the indicator stock program, WDF, NWIFC, and USFWS instituted a comprehensive tagging program in 1985. Exploitation rate indicator stocks, and associated natural stocks, were formally established by the CTC in 1987. Since 1985, WDF and the NWIFC have spent in excess of $390,000 annually tagging chinook exploitation rate indicator stocks (NWIFC costs include rack sampling).

Serious problems exist with the program that severely hamper the ability of technical staff to evaluate compliance with the objectives of the PST. Currently, only 4 (Samish River, Green River, Grovers Creek, and George Adams) of the 27 stocks considered in this document are providing data of the quality required for the fishery harvest rate index. Problems identified generally fall into the following three categories:

(1) Estimates of the escapement of tagged fish are lacking, are of poor quality, or have not been provided to the PSMFC;

(2) Survival of tagged fish has been poor or tagging levels have been too low to provide sufficient fishery recoveries; and

(3) Budget cutbacks have reduced agency ability to maintain both adequate tagging and high quality escapement sampling programs.

It is important to note that a functional indicator stock does not currently exist for several major production regions, including the Skagit River, the Stillaguamish River, the Snohomish River, South Puget Sound yearling production, and all production from the Washington coast.

During the review process, it became evident that estimates of escapement of tagged fish were not reported to the PSMFC for a number of stocks. For the exploitation rate indicator stocks, estimates of the total escapement are required, including the estimated number of tagged fish that return to natural spawning areas. Expansion factors associated with recoveries from natural spawning areas were not reported for any stock. this lack of expansion factors can result in a substantial error in the estimates of exploitation rates for stocks with a significant return to natural spawning areas.

Estimating the expansion factor can be expensive, since it typically involves the use of crews to count fish in the river and collect CWT's from carcasses. Knowledge of the required precision of the estimates would facilitate improvements in the sample design and evaluation of the adequacy of the indicator stocks. We recommend that the Working Group on Mark Recovery Statistics, in conjunction with the CTC, develop methods to determine the appropriate level of precision and establish standards for escapement recoveries.

Tagging levels were evaluated for all stocks (Table 5). For some stocks, target tagging levels were found to be too low to provide sufficient recoveries. However, these stocks were generally not found to be good candidates for future PSC tagging. For several other stocks, target tagging levels have not been met routinely. If PSC tagging is continued for these stocks efforts should be made to meet the target levels, unless doing so risks harming the natural stock.

Since the tagging of representative stocks is a regional rather than an agency need, we recommend the creation of an interagency committee to address the concerns and recommendations of this report. In the above section, 17 stocks have been identified as candidates for future PSC indicator stock tagging (see Table 7 for complete list). Five of these stocks are currently providing useful information to the CTC. The remaining thirteen stocks should be considered probationary; tagging should be continued if appropriate modifications can be made to the programs.

Summary recommendations for all stocks are presented in Table 8. We have identified several PSC tagging programs that could be discontinued; it is hoped that the funds saved by discontinuing some of these programs could be reallocated to improve those programs that remain.

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Table 1. Natural Puget Sound and Washington coastal spring chinook stocks and associated escapement and exploitation indicator stocks.

NATURAL STOCK	ESCAPEMENT INDICATOR STOCK	EXPLOITATION INDICATOR STOCK
Nooksack spring	None 1/	Nooksack Hatchery Skookum Creek Hatchery
Skagit spring	Skagit spring	Skagit Hatchery
White River spring	None 1/	Hupp Springs Hatchery
None	None	Quilcene Hatchery 2/
Juan de Fuca Tributaries	None 1/	None
Grays Harbor spring	Grays Harbor spring	None

1/ Due to data limitations, this natural stock is not currently used as an escapement indicator stock.
2/ This stock is used as a harvest rate indicator stock an has no associated natural stock.

Table 2. Natural Washington coastal summer and spring/summer chinook stocks and associated escapement and exploitation indicator stocks.

NATURAL STOCK	ESCAPEMENT INDICATOR STOCK	EXPLOITATION INDICATOR STOCK
Quillayute summer	Quillayute summer	Quillayute Broodstock Program
Hoh spring/summer	Hoh spring/summer	Quillayute Broodstock Program
Queets spring/summer	Queets spring/summer	Quillayute Broodstock Program

Table 3. Natural Puget Sound and Washington coastal summer/fall and fall chinook stocks and associated escapement and exploitation indicator stocks.

NATURAL STOCK	ESCAPEMENT INDICATOR STOCK	EXPLOITATION INDICATOR STOCK
Nooksack/Samish Region 1/	None	Lummi Ponds Samish Hatchery
Skagit summer/fall	Skagit summer/fall	Skagit Hatchery 2/
Snohomish summer/fall	Snohomish summer/fall	Tulalip Hatchery Skykomish Hatchery 2/
Stillaguamish summer/fall	Stillaguamish summer/fall	Stillaguamish Broodstock Program
Green River Fall	Green River fall	Green River Hatchery
Mid-Puget Sound Region 1/	None	Green River Hatchery Grovers Creek Hatchery Issaquah Hatchery 3/
South Puget Sound Region 1/	None	Kalama Creek Deschutes Hatchery 3/
Hood Canal Region 1/	None	George Adams Hatchery
Juan de Fuca Tributaries	None 4/	Lower Elwha Hatchery Elwha Channel 3/ Hoko Broodstock Program
Queets fall	Queets fall	Soleduck Hatchery 3/ Queets Broodstock Program Makah Hatchery Quinault Hatchery
Quillayute fall	Quillayute fall	Soleduck Hatchery 3/ Queets Broodstock Program Makah Hatchery Quinault Hatchery
Hoh fall	Hoh fall	Soleduck Hatchery 3/ Queets Broodstock Program Makah Hatchery Quinault Hatchery
Grays Harbor fall	Grays Harbor fall	Humptulips Hatchery Satsop Hatchery 5/
Willapa Bay fall	None 4/	Willapa Bay Hatchery 3/

1/ This region is managed for hatchery chinook production.
2/ Tagging of this stock was discontinued because it was not representative of the natural stock.
3/ PSC tagging of this stock was discontinued.
4/ Due to data limitations, this natural stock is not currently used as an escapement indicator stock.
5/ Although recommended as an exploitation indicator stock by the CTC, this stock was never used.

Table 4. Natural Puget Sound fall yearling and accelerated chinook stocks and associated escapement and exploitation indicator stocks.

NATURAL STOCK	ESCAPEMENT INDICATOR STOCK	EXPLOITATION INDICATOR STOCK
Mid-Puget Sound Region 1/	None	U.W. Accelerated 2/ Icy Creek 3/
South Puget Sound Region 1/	None	Percival Cove Pens 4/ Squaxin Island Pens

1/ There are no natural fall yearling or accelerated chinook stocks.
2/ Tagging of this stock was discontinued.
3/ PSC tagging of this stock was discontinued.
4/ PSC tagging of this stock was moved to Squaxin Net Pens.

Table 5. Target, recommended, and recent year tagging levels for Puget Sound and Washington coastal exploitation indicator stocks.

Stock	Run Timing	Release Stage	Target Tagging Level	Recommended Tagging Level[1]	Average Tagging 86-88 Broods[2]
Nooksack Hatchery	spring	yearling	200,000	200,000	108,800
Skookum Creek Hatchery	spring	fingerling	200,000	200,000	55,500
Skagit Hatchery	spring	yearling	150,000	150,000	78,600
White River	spring	yearling	85,000	85,000	85,000
Quilcene Hatchery	spring	yearling	150,000	-	134,300
Quillayute River	summer	fingerling	200,000	200,000	133,500
Samish Hatchery	fall	fingerling	200,000	200,000	203,100
Lummi Bay Hatchery	fall	fingerling	200,000	-	190,700
Tulalip Hatchery	fall	fingerling	200,000	200,000	187,300
Stillaguamish River	sum/fall	fingerling	200,000	200,000	62,800
Green River Hatchery	fall	fingerling	200,000	200,000	208,100
Grovers Creek Hatchery	fall	fingerling	200,000	200,000	168,800
Kalama Creek Hatchery	fall	fingerling	200,000	225,000	194,500
George Adams Hatchery	fall	fingerling	200,000	220,000	205,100
Lower Elwha Hatchery/Channel	fall	fingerling	200,000	200,000	120,500
Hoko River	fall	fingerling	200,000	200,000	172,100
Makah Hatchery	fall	fingerling	200,000	-	165,600
Queets River	fall	fingerling	200,000	200,000	144,400
Quinault Hatchery	fall	fingerling	200,000	200,000	184,800
Humptulips Hatchery	fall	fingerling	200,000	200,000	205,800
Squaxin Pens	fall	yearling	150,000	150,000	141,300

[1] Recommended only if PSC tagging is continued.
[2] All broods not available for all stocks, see Appendix Tables for tagging history.

Table 6. Average number of estimated total adult equivalent mortality CWT recoveries for chinook indicator stocks in ocean fisheries with Pacific Salmon Commission ceilings. The stock/fishery combinations currently used for calculating fishery indices are indicated in bold. Stocks that might be used for the indices are footnoted. Averages are calculated by brood year, across all available brood years.

STOCK	Run Timing	Release Stage	Age at Recovery	SEAK Troll a/	NCBC Troll	WCVI Troll	GS Troll	GS Sport
Nooksack Hatchery	spring	yearling	3	1	2	3	10	78 c/d/
	spring	yearling	4	0	2	18	8	41 c/d/
Skookum Cr. Hatchery	spring	yearling	3	0	4	11	8	20
	spring	yearling	4	0	1	3	1	11
Skagit Hatchery	spring	yearling	3	0	1	3	0	22 c/d/
	spring	yearling	4	1	4	13	3	37 c/d/
White River	spring	yearling	3	0	0	2	0	2
	spring	yearling	4	0	1	4	1	4
Quilcene Hatchery	spring	yearling	3	0	0	1	0	5
	spring	yearling	4	0	2	17	0	4
Quillayute River	summer	fingerling	3	9	3	1	0	0
	summer	fingerling	4	10	6	4	0	0
Samish Hatchery	fall	fingerling	3	4	19	**240**	**85**	**252**
	fall	fingerling	4	0	43	**537**	**38**	**205**
Lummi Bay Hatchery	fall	fingerling	3	2	7	42 c/	16 c/	106 c/
	fall	fingerling	4	0	6	98 c/	9 c/	77 c/
Stillaguamish River	sum/fall	fingerling	3	3	5	15 c/d/	0	8 c/d/
	sum/fall	fingerling	4	0	0	5 c/d/	0	9 c/d/
Green River Hatchery	fall	fingerling	3	1	9	**115**	11	**74**
	fall	fingerling	4	0	15	**193**	9	**41**
Grovers Cr. Hatchery	fall	fingerling	3	1	4	**57**	2	**17**
	fall	fingerling	4	0	1	**84**	0	**12**
Kalama Hatchery	fall	fingerling	3	0	2	14 b/c/	3	8
	fall	fingerling	4	0	1	51 b/c/	0	8
George Adams Hatchery	fall	fingerling	3	1	9	**53** b/	3	21
	fall	fingerling	4	0	2	**78**	0	14

continued on next page

Table 6 continued.

STOCK	Run Timing	Release Stage	Age at Recovery	SEAK Troll a/	NCBC Troll	WCVI Troll	GS Troll	GS Sport
Lower Elwha Hatchery	fall	fingerling	3	42 c/d/	10 c/d/	24 c/d/	1	9
	fall	fingerling	4	18 c/d/	11 c/d/	33 c/d/	1	4
Hoko River	fall	fingerling	3	47 c/d/	11 c/d/	13 c/d/	0	2
	fall	fingerling	4	10 c/d/	25 c/d/	38 c/d/	0	2
Makah Hatchery	fall	fingerling	3	7	1	0	0	0
	fall	fingerling	4	6	3	2	0	0
Queets River	fall	fingerling	3	44 c/	13 c/	7	0	0
	fall	fingerling	4	32 c/	23 c/	12	0	0
Quinault Hatchery	fall	fingerling	3	56 c/	26	23	0	1
	fall	fingerling	4	35 c/	48	32	0	0
Humptulips Hatchery	fall	fingerling	3	28	3	3	0	1
	fall	fingerling	4	65 c/d/	15	9	0	0

a/ SEAK troll ages at recovery are 4 and 5 rather than 3 and 4.
b/ Stock might be used for the fishery index if tagging levels were increased.
c/ Stock might be used for the fishery index if escapement data were improved or made available.
d/ Stock might be used for the fishery index if base period data from a similar stock were available or if the base period were updated.

Table 7. Stocks considered to be the best candidates for future PSC indicator stock tagging.

STOCK	RELEASE STAGE	REGION	PROBATIONARY STOCK?
Nooksack Hatchery spring	yearling	Nooksack/Samish	YES
Skagit Hatchery spring	yearling	Skagit River	YES
White River spring	yearling	White River	NO
Samish Hatchery fall	fingerling	Nooksack/Samish	NO
Skagit Hatchery summer/fall	fingerling	Skagit River	YES
Skykomish Hatchery summer	fingerling	Snohomish Region	YES
Stillaguamish summer/fall	fingerling	Stillaguamish River	YES
Green River Hatchery fall	fingerling	Green River	NO
Grovers Creek Hatchery fall	fingerling	Mid-Puget Sound	NO
South Puget Sound fall	fingerling	South Puget Sound	YES
George Adams Hatchery fall	fingerling	Hood Canal	NO
Lower Elwha Hatchery fall	fingerling	Juan de Fuca	YES
Hoko River fall	fingerling	Juan de Fuca	YES
Soleduck Hatchery fall [1]	fingerling	Washington Coast	YES
Queets River fall [1]	fingerling	Washington Coast	YES
U. of W. fall [2]	accelerated	Mid-Puget Sound	YES
South Puget Sound fall	yearling	South Puget Sound	YES

[1] One of these two stocks could be chosen to represent Washington coastal production.
[2] This stock is not representative of natural production but could be used as a fishery harvest rate indicator.

Table 8. Summary of recommendations for Puget Sound and Washington Coastal chinook exploitation rate indicator stocks.

Stock	Consider Continuing PSC Tagging	Consider Establishing/ Resuming PSC Tagging	Consider Discontinuing PSC Tagging	IF TAGGING IS CONTINUED:				
				Improve/Provide Escapements	Achieve Target Tagging	Evaluate Straying	Evaluate Stock Characteristics	Standardize Size/ Time at Release
Nooksack/Samish Region								
Nooksack Hatchery spring	X				X	X	X	
Skookum Cr. Hatchery spring			X					
Samish Hatchery fall	X			X				
Lummi Bay Hatchery fall			X					
Skagit River								
Skagit Hatchery spring	X			X	X		X	
Skagit Hatchery summer/fall		X		X			X	
Snohomish River								
Skykomish Hatchery summer		X		X			X	
Tulalip Hatchery fall			X					
Stillaguamish River								
Stillaguamish summer/fall	X			X	X		X	
Mid-Puget Sound Region								
Green River Hatchery fall	X							
Grovers Creek Hatchery fall	X							
U. of W. fall		X						
South Puget Sound Region								
White River Spring	X							

continued on next page

Table 8 continued.

Stock	Consider Continuing PSC Tagging	Consider Establishing/ Resuming PSC Tagging	Consider Discontinuing PSC Tagging	IF TAGGING IS CONTINUED:				
				Improve/Provide Escapements	Achieve Target Tagging	Evaluate Straying	Evaluate Stock Characteristics	Standardize Size/ Time at Release
South Puget Sound Region cont.								
Kalama Creek fall fing. [1]	X					X		X
Squaxin Pens fall yearling [1]	X			X				
Hood Canal Region								
Quilcene Hatchery spring			X					
George Adams Hatchery fall	X							
Strait of Juan de Fuca Tributaries								
Lower Elwha Hatchery fall	X			X	X			X
Hoko River fall	X			X	X		X	
North Washington Coast Region								
Quillayute River summer			X					
Makah Hatchery fall			X					
Queets River fall [2]	X			X	X			
Quinault Hatchery fall			X					
Soleduck Hatchery fall [2]	X			X				
Grays Harbor Region								
Humptulips Hatchery fall			X					

[1] Consider moving this program to another facility.
[2] One of these two stocks could be chosen to represent Washington coastal production.

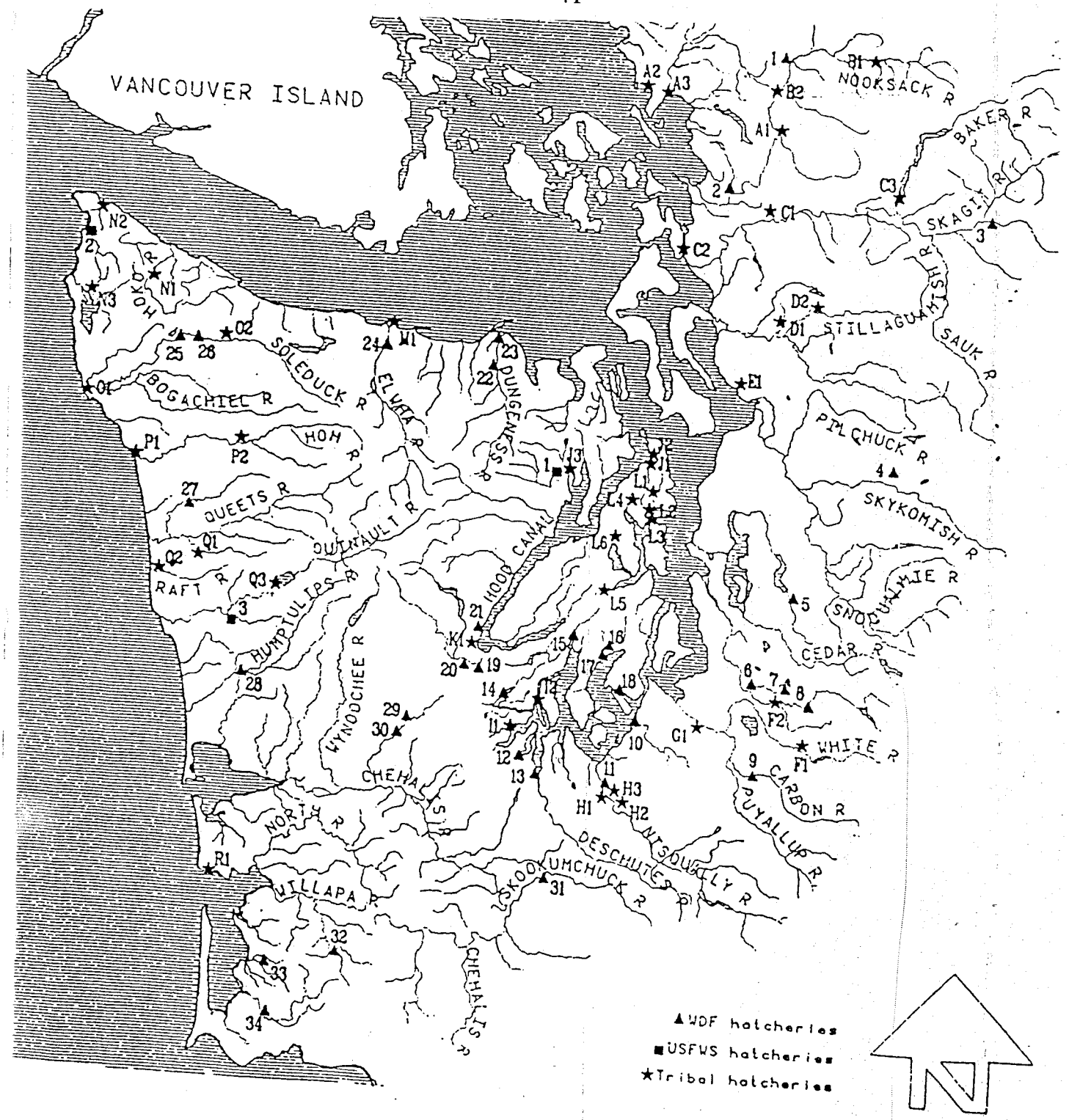

Figure 1. Location of hatcheries and river in Puget Sound and the Washington Coast (see key on following two pages).

WESTERN WASHINGTON SALMON HATCHERIES
Key To Hatcheries

Tribal Hatcheries

A. Lummi Tribe
- A1. Skookum Creek Hatchery
- A2. Lummi Bay Hatchery
- A3. Mamoya Pond

B. Nooksack Tribe
- B1. Dead Horse Creek Pond
- B2. Hutchinson Creek Channel

C. Skagit Systems Cooperative
- C1. Upper Skagit Tribal Hatchery
- C2. Swinomish Rearing Ponds
- C3. Lake Shannon Net Pens

D. Stillaguamish Tribe
- D1. Stillaguamish Tribal Hatchery
- D2. Johnson Creek Hatchery

E. Tulalip Tribe
- E1. Tulalip Salmon Hatchery

F. Muckleshoot Tribe
- F1. White River Hatchery
- F2. Keta Creek Hatchery

G. Puyallup Tribe
- G1. Puyallup Tribal Hatchery

H. Nisqually Tribe
- H1. Kalama Creek Hatchery
- H2. Schorno Springs
- H3. Nisqually Hatchery at Clear Creek

I. Squaxin Island Tribe
- I1. Elson Creek Hatchery
- I2. Squaxin Island Sea Pens

J. Port Gamble Tribe
- J1. Port Gamble Sea Pens
- J2. Little Boston Hatchery
- J3. Quilcene Bay Sea Pens

K. Skokomish Tribe
- K1. Enetai Hatchery

L. Suquamish Tribe
- L1. Grovers Creek Hatchery
- L2. Cowling Creek Hatchery
- L3. Agate Pass Sea Pens
- L4. Websters Hatchery
- L5. Gorst Rearing Pond
- L6. Clear Creek Hatchery

M. Lower Elwha Tribe
- M1. Lower Elwha Hatchery

N. Makah Tribe
- N1. Hoko River Hatchery
- N2. Educket Creek Hatchery
- N3. Umbrella Creek Hatchery

O. Quileute Tribe
- O1. Lonesome Creek Hatchery
- O2. Eagle Creek Pond

P. Hoh Tribe
- P1. Chalaat Creek Hatchery
- P2. Canyon Springs Pond

Q. Quinault Indian Nation
- Q1. Salmon River Pond
- Q2. Raft River Pond
- Q3. Quinault Lake Hatchery

R. Shoalwater Tribe
- R1. Newnonshish Hatchery

WDF Hatcheries

1. Nooksack Hatchery
2. Samish Hatchery
3. Skagit Hatchery
4. Skykomish Hatchery
5. Issaquah Hatchery
6. Green River Hatchery
7. Crisp Creek Pond
8. Icy Creek Pond
9. Puyallup Hatchery
10. Garrison Springs Hatchery
11. McAllister Creek Hatchery
12. Allison Springs
13. Deschutes Complex

WDF Hatcheries (cont.)

14. Johns Creek Hatchery
15. Coulter Creek Hatchery
16. Hupp Springs Rearing ponds
17. Minter Creek Hatchery
18. Fox Island Net Pens
19. George Adams Hatchery
20. McKernan Creek Hatchery
21. Hood Canal Hatchery
22. Dungeness Hatchery
23. Hurd Creek Hatchery
24. Elwha Channel
25. Soleduck Hatchery
26. Bear Springs 1 & 2 Ponds
27. Shale Creek Pond
28. Humptulips Hatchery
29. Satsop Springs Hatchery
30. Simpson Hatchery
31. Skookumchuck Ponds
32. Willapa Hatchery
33. Nemah Hatchery
34. Naselle Hatchery

USFWS Hatcheries

1. Quilcene National Fish Hatchery
2. Makah National Fish Hatchery
3. Quinault National Fish Hatchery

Appendix Table 1. Tagging history and use of the Nooksack Hatchery spring yearling stock.

Hatchery - Nooksack Hatchery
Brood Source - Return to hatchery
Agency - WDF
Release Type - Yearling
Base Period Tagging - No
Escapement Data - Escapement estimates are made at the hatchery rack. No sampling for CWT's is made in the river below the hatchery.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
_X_ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
__ Chinook Model

Comments - Both spring and fall chinook stocks are raised at Nooksack Hatchery. The stocks are kept separate through a combination of tagging and run timing. Estimates of brood exploitation rate may be biased by the absence of good escapement data.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
632411	81	Nooksack	Nooksack	Nooksack	83	4	4,725	53,332	
632546	82	Nooksack	Nooksack	Kendall	84	4	6,048	11,006	
633452	84	Nooksack	Nooksack	Kendall	86	4	7,087	52,274	
633453	84	Nooksack	Nooksack	Kendall	86	4	7,087	52,599	
633247	86	Nooksack	Nooksack	Kendall	88	4	5,670	29,209	
633248	86	Nooksack	Nooksack	Kendall	88	4	5,670	29,428	
633336	86	Nooksack	Nooksack	Kendall	88	4	5,670	29,214	
634962	87	Nooksack	Nooksack	Kendall	89	4	6,214	46,136	
635059	87	Nooksack	Nooksack	Kendall	89	4	6,214	45,680	
634422R3	88	Nooksack	Nooksack	Kendall	90	4	5,968	146,729	

Appendix Table 2. Estimated recoveries and contribution rates for the Nooksack Hatchery spring yearling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 63344

Brood Year	AK T-AGE 4 #	AK T-AGE 4 Rate	AK T-AGE 5 #	AK T-AGE 5 Rate	NCBC T-AGE 3 #	NCBC T-AGE 3 Rate	NCBC T-AGE 4 #	NCBC T-AGE 4 Rate	WCVI T-AGE 3 #	WCVI T-AGE 3 Rate	WCVI T-AGE 4 #	WCVI T-AGE 4 Rate	GS T-AGE 3 #	GS T-AGE 3 Rate	GS T-AGE 4 #	GS T-AGE 4 Rate	GS S-AGE 3 #	GS S-AGE 3 Rate	GS S-AGE 4 #	GS S-AGE 4 Rate	Survival Rate
81	4	0.00008	0	0.00000	11	0.00021	0	0.00000	8	0.00015	21	0.00039	22	0.00041	0	0.00000	93	0.00174	31	0.00058	0.01828
82	0	0.00000	0	0.00000	0	0.00000	0	0.00000	3	0.00027	0	0.00000	0	0.00000	0	0.00000	4	0.00036	7	0.00064	0.00789
84	0	0.00000	0	0.00000	1	0.00001	7	0.00007	6	0.00006	51	0.00049	26	0.00025	32	0.00031	293	0.00279	120	0.00114	0.02665
86	0	0.00000	-		0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	1	0.00001	5	0.00006	-
87	-		-		0	0.00000	-		0	0.00000	-		0	0.00000	-		5	0.00005	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	0	0.00000	0	0.00000	3	0.00006	11	0.00020	0	0.00000	0	0.00000	4	0.00036	19	0.00061	0.018284
Average	1	0.00002	0	0.00000	2	0.00004	2	0.00002	3	0.00010	18	0.00022	10	0.00013	8	0.00008	78	0.00098	41	0.00060	0.017610
SD	2	0.00004	0	0.00000	5	0.00009	4	0.00003	4	0.00012	24	0.00026	13	0.00019	16	0.00015	126	0.00124	54	0.00044	0.009398
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		NC		NC		611759		177773		NC		NC		96303		57505		
Lower 70%	NC		NC		NC		NC		611759		NC		NC		NC		96303		60214		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	21210832		NC		13777062		38624572		3519833		2292821		4988128		8449126		534007		449694		

Appendix Table 2. Estimated recoveries and contribution rates for the Nooksack Hatchery spring yearling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
81	0	0.00000	0	0.00000	29	0.00054	10	0.00019	0	0.00000	11	0.00021	3	0.00006	4	0.00008	0	0.00000	5	0.00009	0.01828
82	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00789
84	1	0.00001	8	0.00008	31	0.00030	12	0.00011	20	0.00019	66	0.00063	13	0.00012	2	0.00002	2	0.00002	2	0.00002	0.02665
86	0	0.00000	0	0.00000	0	0.00000	0	0.00000	2	0.00002	0	0.00000	0	0.00000	5	0.00006	3	0.00003	0	0.00000	-
87	0	0.00000	-		2	0.00002	-		0	0.00000	-		0	0.00000	-		9	0.00010	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	0	0.00000	5	0.00006	0	0.00000	6	0.00010	0	0.00000	3	0.00004	0	0.00000	1	0.00001	0.018284
Mean	0	0.00000	2	0.00002	12	0.00017	6	0.00008	4	0.00004	19	0.00021	3	0.00004	3	0.00004	1	0.00001	2	0.00003	0.017610
SD	0	0.00000	4	0.00004	16	0.00025	6	0.00009	9	0.00008	32	0.00030	6	0.00005	2	0.00003	1	0.00002	2	0.00004	0.009398
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		NC		611759		NC		339385		NC		921232		NC		3670555		
Lower 70%	NC		NC		NC		NC		NC		NC		NC		1835278		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	433940032		33796504		2883348		18725970		2691701		8136918		20356102		1152594		1387812		15076278		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 3. Tagging history and use of the Skookum Creek Hatchery spring fingerling stock.

Hatchery - Skookum Creek Hatchery
Brood Source - Broodstock collection program
Agency - Lummi Tribe
Release Type - Fingerling
Base Period Tagging - No

Escapement Data - There is limited return to the hatchery, because: (1) a number of good holding areas exist below the hatchery where fish are removed by poachers, fisheries, or natural predators, and (2) the hatchery outfall provides poor attraction. Escapement in the river is estimated from snorkel surveys, stream surveys, and the broodstock collection program.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
__ Brood Exploitation Rate Analysis
X Catch Distribution
X Survival
X Chinook Model

Comments - The utility of this stock is limited by the variable and often small number of fish tagged, as well as the poor quality of the escapement data.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
050837	80	Skookum	SF Nooksack	SF Nooksack	81	6	709	46,457	
051418	82	Skookum	SF Nooksack	SF Nooksack	83	6	1,513	20,377	
211617	83	Skookum	SF Nooksack	SF Nooksack	84	8	3,026	11,498	
211661	84	Skookum	SF Nooksack	SF Nooksack	85	8	1,815	51,000	
211932R4	85	Skookum	SF Nooksack	Skookum	86	7	668	52,383	
211937R4	85	Skookum	Skookum	SF Nooksack	86	8	966	53,751	
212231R4	86	Skookum	SF Nooksack	SF Nooksack	87	8	1,680	134,096	Release number imprecise
211810	87	Skookum	SF Nooksack	SF Nooksack	88	7	1,513	3,218	
211938R4	88	Skookum	Skookum	SF Nooksack	89	8	2,229	29,171	

Appendix Table 4. Estimated recoveries and contribution rates for the Skookum Creek Hatchery spring fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 294798

	AK T-AGE 4		AK T-AGE 5		NCBC T-AGE 3		NCBC T-AGE 4		WCVI T-AGE 3		WCVI T-AGE 4		GS T-AGE 3		GS T-AGE 4		GS S-AGE 3		GS S-AGE 4		Survival
Brood Year	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
80	0	0.00000	0	0.00000	17	0.00039	0	0.00000	38	0.00087	12	0.00028	27	0.00062	0	0.00000	41	0.00094	9	0.00021	0.01509
82	0	0.00000	0	0.00000	4	0.00020	4	0.00020	26	0.00128	0	0.00000	19	0.00093	0	0.00000	34	0.00167	22	0.00108	0.02838
83	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	4	0.00035	0	0.00000	7	0.00061	0.00426
84	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	9	0.00018	19	0.00037	0.00170
85	0	0.00000	0	0.00000	5	0.00005	0	0.00000	2	0.00002	4	0.00004	4	0.00004	0	0.00000	38	0.00036	6	0.00006	0.00210
86	0	0.00000		-	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	3	0.00002	-
Summary Statistics																					
Median	0	0.00000	0	0.00000	2	0.00002	0	0.00000	1	0.00001	0	0.00000	2	0.00002	0	0.00000	22	0.00027	8	0.00029	0.004262
Average	0	0.00000	0	0.00000	4	0.00011	1	0.00003	11	0.00036	3	0.00005	8	0.00027	1	0.00006	20	0.00052	11	0.00039	0.010307
SD	0	0.00000	0	0.00000	7	0.00016	2	0.00008	17	0.00057	5	0.00011	12	0.00041	2	0.00014	19	0.00066	8	0.00040	0.011486
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median		NC		NC		1485876		NC		3714690		NC		1857345		NC		130961		120859	
Lower 70%		NC		NC		NC		NC		NC		NC		NC		NC		198333		169377	
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%		NC		NC		2277555		NC		466291		1650069		575234		2582874		144424		235303	

Appendix Table 4. Estimated recoveries and contribution rates for the Skookum Creek Hatchery spring fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
80	0	0.00000	0	0.00000	4	0.00009	0	0.00000	14	0.00032	20	0.00046	15	0.00034	15	0.00034	0	0.00000	0	0.00000	0.01509
82	0	0.00000	0	0.00000	2	0.00010	0	0.00000	0	0.00000	0	0.00000	7	0.00034	2	0.00010	3	0.00015	0	0.00000	0.02838
83	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	5	0.00043	0	0.00000	2	0.00017	0	0.00000	0	0.00000	0.00426
84	0	0.00000	0	0.00000	4	0.00008	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00170
85	5	0.00005	0	0.00000	2	0.00002	0	0.00000	0	0.00000	0	0.00000	2	0.00002	5	0.00005	2	0.00002	0	0.00000	0.00210
86	1	0.00001	15	0.00012	0	0.00000	0	0.00000	4	0.00003	0	0.00000	2	0.00002	0	0.00000	0	0.00000	0	0.00000	-
Summary Statistics																					
Median	0	0.00000	0	0.00000	2	0.00005	0	0.00000	0	0.00000	0	0.00000	2	0.00002	2	0.00007	0	0.00000	0	0.00000	0.004262
Mean	1	0.00001	3	0.00002	2	0.00005	0	0.00000	3	0.00006	4	0.00015	4	0.00012	4	0.00011	1	0.00003	0	0.00000	0.010307
SD	2	0.00002	6	0.00005	2	0.00005	0	0.00000	6	0.00013	8	0.00023	6	0.00017	6	0.00013	1	0.00006	0	0.00000	0.011486
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		719606		NC		NC		NC		2041524		481894		NC		NC		
Lower 70%	NC		NC		1857345		NC		NC		NC		2266250		742938		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	1811314		732696		1575497		NC		3113989		275268640		860874		960486		3731108		NC		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 5. Tagging history and use of the Skagit Hatchery spring yearling stock.

Hatchery - Skagit
Brood Source - Return to hatchery
Agency - WDF
Release Type - Yearling
Base Period Tagging - No
Escapement Data - Escapement counts are made at the hatchery rack. In 1989 and 1990 there was carcass sampling in the Cascade River for age and CWT. Prior to that time, there was no effort to estimate straying below the hatchery.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
_X_ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
__ Chinook Model

Comments - In the past, the spring stock has always been separated by tagging; due to the loss of funding for tagging in 1988, a timing criterion was instituted in 1991 and may have led to some contamination of the spring broodstock. Estimates of brood exploitation rate may be biased by the absence of good escapement data.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
632606	82	Skagit	Clark, Buck	Clark	84	3	2,835	9,481	
632607	82	Skagit	Clark, Buck	Clark	84	3	3,489	58,453	
632608	83	Skagit	Skagit Tribs.	Clark	85	3	2,835	35,893	
633353	84	Skagit	Skagit Tribs.	Clark	86	3	3,489	13,324	
633354	84	Skagit	Skagit Tribs.	Clark	86	3	3,489	13,377	
633323	85	Skagit	Skagit Tribs.	Clark	87	4	3,489	47,521	
633314	86	Skagit	Skagit Tribs.	Clark	88	4	4,014	80,395	
634744	87	Skagit	Suiattle	Clark	89	4	4,775	25,725	
634902	87	Skagit	Clark	Clark	89	4	4,775	25,725	
635026	87	Skagit	Clark	Clark	89	4	4,775	25,379	

Appendix Table 6. Estimated recoveries and contribution rates for the Skagit Hatchery spring yearling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 117393

Brood Year	AK T-AGE 4		AK T-AGE 5		NCBC T-AGE 3		NCBC T-AGE 4		WCVI T-AGE 3		WCVI T-AGE 4		GS T-AGE 3		GS T-AGE 4		GS S-AGE 3		GS S-AGE 4		Survival
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
81	0	0.00000	4	0.00042	0	0.00000	0	0.00000	0	0.00000	8	0.00084	0	0.00000	0	0.00000	29	0.00306	14	0.00148	0.03209
82	0	0.00000	0	0.00000	0	0.00000	9	0.00015	1	0.00002	14	0.00024	0	0.00000	15	0.00026	23	0.00039	54	0.00092	0.01140
83	0	0.00000	0	0.00000	0	0.00000	3	0.00008	0	0.00000	0	0.00000	0	0.00000	0	0.00000	14	0.00039	0	0.00000	0.00426
84	0	0.00000	0	0.00000	3	0.00011	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	10	0.00037	6	0.00022	0.01153
85	0	0.00000	0	0.00000	1	0.00002	6	0.00013	15	0.00032	27	0.00057	3	0.00006	0	0.00000	53	0.00112	94	0.00198	0.05507
86	0	0.00000	-		0	0.00000	3	0.00004	3	0.00004	29	0.00036	0	0.00000	2	0.00002	24	0.00030	53	0.00066	-
87	-		-		0	0.00000	-		0	0.00000	-		18	0.00016	-		16	0.00014	-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	0	0.00000	3	0.00006	0	0.00000	11	0.00030	0	0.00000	0	0.00000	23	0.00039	34	0.00079	0.011530
Average	0	0.00000	1	0.00008	1	0.00002	4	0.00007	3	0.00005	13	0.00034	0	0.00001	3	0.00005	22	0.00080	37	0.00088	0.022869
SD	0	0.00000	2	0.00019	1	0.00004	4	0.00007	6	0.00012	13	0.00033	1	0.00002	6	0.00010	17	0.00105	36	0.00075	0.020785
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		NC		579003		NC		116622		NC		NC		89733		44218		
Lower 70%	NC		NC		NC		937942		NC		146133		NC		NC		93454		53091		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	NC		2093343		28259474		554165		1036417		112038		1005517		429902		34720		41553		

Appendix Table 6. Estimated recoveries and contribution rates for the Skagit Hatchery spring yearling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
81	0	0.00000	0	0.00000	7	0.00074	0	0.00000	3	0.00032	7	0.00074	0	0.00000	0	0.00000	2	0.00021	0	0.00000	0.03209
82	0	0.00000	0	0.00000	0	0.00000	0	0.00000	5	0.00009	2	0.00003	2	0.00003	11	0.00019	20	0.00034	0	0.00000	0.01140
83	0	0.00000	0	0.00000	5	0.00014	5	0.00014	0	0.00000	0	0.00000	2	0.00006	10	0.00028	0	0.00000	0	0.00000	0.00426
84	0	0.00000	0	0.00000	0	0.00000	0	0.00000	12	0.00045	17	0.00064	5	0.00019	7	0.00026	5	0.00019	0	0.00000	0.01153
85	12	0.00025	20	0.00042	46	0.00097	19	0.00040	78	0.00164	136	0.00286	5	0.00011	16	0.00034	59	0.00124	22	0.00046	0.05507
86	1	0.00001	12	0.00015	15	0.00019	3	0.00004	20	0.00025	7	0.00009	0	0.00000	14	0.00017	19	0.00024	13	0.00016	-
87	8	0.00007	-		0	0.00000	-		68	0.00059	-		7	0.00006	-		88	0.00077	-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	5	0.00014	2	0.00002	5	0.00025	7	0.00036	2	0.00003	11	0.00023	5	0.00021	0	0.00000	0.011530
Mean	2	0.00004	5	0.00010	10	0.00029	5	0.00010	17	0.00039	28	0.00073	2	0.00005	10	0.00021	15	0.00032	6	0.00010	0.022869
SD	4	0.00009	9	0.00017	17	0.00040	7	0.00016	28	0.00058	53	0.00109	2	0.00007	6	0.00012	21	0.00043	9	0.00019	0.020785
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		251251		1875883		140691		96718		1022927		155435		165918		NC		
Lower 70%	NC		NC		NC		NC		409171		401975		NC		185987		186907		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	1089531		521274		378485		229954		195497		114751		281783		67428		75601		478081		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 7. Tagging history and use of the White River spring yearling stock.

Hatchery - Hupp Springs
Brood Source - Return to hatchery and Squaxin Pens captive broodstock.
Agency - WDF
Release Type - Yearling
Base Period Tagging - Yes
Escapement Data - Escapement data for the 1974 and 1975 broods are not available because of the outplant to the White River.

Current Use of Data:
_X_ Fishery or Stock Harvest Rate Index
_X_ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
__ Chinook Model

Comments - This stock has limited tagging and recoveries during the base period.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
130208	74	Minter	White	White	76	2	3,311	8,285	
131010	75	Minter	White	White	77	2	3,780	40,174	
631834	78	Minter	White	Minter	80	3	2,268	4,199	
632047	79	Hupp Springs	White	Hupp	81	5	9.072	48,514	
632136	80	Hupp Springs	White	Hupp	82	5	5,040	19,486	
632341	81	Hupp Springs	White	Hupp	83	3	9,072	670	
632604	81	Hupp Springs	White	Hupp	83	3	9,072	36,527	
632853	82	Hupp Springs	White	Hupp	84	4	6,480	18,334	
633009	82	Hupp Springs	White	Hupp	84	4	6,480	2,730	
633049	83	Hupp Springs	White	Hupp	85	5	6,480	19,586	
633050	83	Hupp Springs	White	Hupp	85	5	6,480	16,985	
632508	84	Hupp Springs	White	Hupp	86	4	9,072	33,456	
633060	84	Hupp Springs	White	Hupp	86	4	9,072	7,630	
633108	84	Hupp Springs	White	Hupp	86	4	9,072	5,236	
633131	85	Hupp Springs	White	Hupp	87	5	5,670	24,258	
633648	85	Hupp Springs	White	Hupp	87	5	5,670	21,314	
633246	86	Hupp Springs	White	Hupp	88	4	7,316	28,766	
634145	86	Hupp Springs	White	Hupp	88	4	7,316	47,314	
634702	87	Hupp Springs	White	Hupp	89	4	9,072	40,720	
634704	87	Hupp Springs	White	Hupp	89	4	9,072	41,358	
630161R3	88	Hupp Springs	White	Hupp	90	4	5,040	43,882	
630162R3	88	Hupp Springs	White	Hupp	90	4	5,040	43,881	

Appendix Table 8. Estimated recoveries and contribution rates for the White River spring yearling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 99457

Brood Year	AK T-AGE 4 #	AK T-AGE 4 Rate	AK T-AGE 5 #	AK T-AGE 5 Rate	NCBC T-AGE 3 #	NCBC T-AGE 3 Rate	NCBC T-AGE 4 #	NCBC T-AGE 4 Rate	WCVI T-AGE 3 #	WCVI T-AGE 3 Rate	WCVI T-AGE 4 #	WCVI T-AGE 4 Rate	GS T-AGE 3 #	GS T-AGE 3 Rate	GS T-AGE 4 #	GS T-AGE 4 Rate	GS S-AGE 3 #	GS S-AGE 3 Rate	GS S-AGE 4 #	GS S-AGE 4 Rate	Survival Rate
78	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00024
79	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	1	0.00002	0	0.00000	0.00767
80	0	0.00000	0	0.00000	0	0.00000	9	0.00046	8	0.00041	7	0.00036	0	0.00000	8	0.00041	0	0.00000	0	0.00000	0.03080
81	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00503
82	0	0.00000	0	0.00000	0	0.00000	3	0.00014	0	0.00000	5	0.00024	0	0.00000	0	0.00000	0	0.00000	4	0.00019	0.08056
83	0	0.00000	0	0.00000	0	0.00000	0	0.00000	1	0.00003	0	0.00000	0	0.00000	0	0.00000	12	0.00033	4	0.00011	0.06540
84	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	11	0.00024	0.01088
85	0	0.00000	0	0.00000	0	0.00000	0	0.00000	6	0.00013	11	0.00024	0	0.00000	0	0.00000	10	0.00022	12	0.00026	0.10524
86	0	0.00000	-		0	0.00000	0	0.00000	1	0.00001	9	0.00012	0	0.00000	0	0.00000	0	0.00000	4	0.00005	-
87	-		-		0	0.00000	-		0	0.00000	-		0	0.00000	-		0	0.00000	-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	4	0.00005	0.020844
Average	0	0.00000	0	0.00000	0	0.00000	1	0.00007	2	0.00006	4	0.00011	0	0.00000	1	0.00005	2	0.00006	4	0.00009	0.034267
SD	0	0.00000	0	0.00000	0	0.00000	3	0.00016	3	0.00013	5	0.00014	0	0.00000	3	0.00014	5	0.00012	5	0.00011	0.037316
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		NC		NC		NC		NC		NC		NC		NC		665700		
Lower 70%	NC		NC		NC		NC		NC		NC		NC		NC		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	NC		NC		NC		1123169		909902		699754		NC		1408914		1505284		606334		

Appendix Table 8. Estimated recoveries and contribution rates for the White River spring yearling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
78	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00024
79	1	0.00002	3	0.00006	2	0.00004	0	0.00000	60	0.00124	11	0.00023	5	0.00010	0	0.00000	20	0.00041	42	0.00087	0.00767
80	0	0.00000	0	0.00000	4	0.00021	0	0.00000	6	0.00031	6	0.00031	0	0.00000	8	0.00041	68	0.00349	26	0.00133	0.03080
81	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	9	0.00024	13	0.00035	0.00503
82	0	0.00000	3	0.00014	0	0.00000	0	0.00000	93	0.00442	61	0.00290	17	0.00081	9	0.00043	180	0.00855	135	0.00641	0.08056
83	1	0.00003	15	0.00041	7	0.00019	11	0.00030	103	0.00282	18	0.00049	15	0.00041	10	0.00027	381	0.01042	159	0.00435	0.06540
84	0	0.00000	7	0.00015	2	0.00004	3	0.00006	12	0.00026	4	0.00009	0	0.00000	2	0.00004	49	0.00106	35	0.00076	0.01088
85	14	0.00031	43	0.00094	8	0.00018	4	0.00009	198	0.00434	24	0.00053	35	0.00077	35	0.00077	640	0.01404	202	0.00443	0.10524
86	1	0.00001	7	0.00009	1	0.00001	0	0.00000	92	0.00121	4	0.00005	0	0.00000	0	0.00000	66	0.00087	104	0.00137	-
87	0	0.00000		-	3	0.00004		-	59	0.00072		-	2	0.00002		-	90	0.00110		-	-
Summary Statistics																					
Median	0	0.00000	3	0.00009	2	0.00003	0	0.00000	36	0.00076	6	0.00023	0	0.00000	2	0.00004	58	0.00096	42	0.00133	0.020844
Mean	2	0.00004	9	0.00020	2	0.00007	2	0.00005	56	0.00146	14	0.00051	7	0.00021	7	0.00021	141	0.00391	80	0.00221	0.034267
SD	4	0.00010	14	0.00031	3	0.00009	4	0.00010	66	0.00177	19	0.00092	12	0.00033	11	0.00028	211	0.00517	72	0.00226	0.037316
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		380400		1287492		NC		46139		154363		NC		810635		36358		26231		
Lower 70%	NC		565997		2662800		NC		113668		405318		NC		NC		40345		40428		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	2090058		376526		368879		2176454		24306		248814		384823		499691		17510		27763		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 9. Tagging history and use of the Quilcene Hatchery spring yearling stock.

Hatchery - Quilcene National Fish Hatchery
Brood Source - Return to hatchery and non-local stocks
Agency - USFWS
Release Type - Yearling
Base Period Tagging - No
Escapement Data - Escapement counts are made at the hatchery rack.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
_X_ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
__ Chinook Model

Comments - Data for this stock are of limited value due to poor survivals.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
051033	81	Quilcene NFH	Cowlitz X SF Nooksack	Big Quilcene	83	5	3,815	28,442	
051347	82	Quilcene NFH	Cowlitz X Nooksack	Big Quilcene	84	3	4,729	18,972	
051348	82	Quilcene NFH	Cowlitz X SF Nooksack	Big Quilcene	84	3	3,632	24,820	
051452	83	Quilcene NFH	Cowlitz X Nooksack	Big Quilcene	85	5	4,451	26,974	
051453	83	Quilcene NFH	Cowlitz X SF Nooksack	Big Quilcene	85	5	2,624	25,737	
050832	85	Quilcene NFH	Big Quilcene	Big Quilcene	87	5	1,970	25,442	
051462	85	Quilcene NFH	Big Quilcene	Big Quilcene	87	5	1,970	27,606	
051748	85	Quilcene NFH	Big Quilcene	Big Quilcene	87	5	1,970	21,811	
051749	85	Quilcene NFH	Big Quilcene	Big Quilcene	87	5	1,970	20,694	
051750	85	Quilcene NFH	Big Quilcene	Big Quilcene	87	5	1,970	18,637	
051831	85	Quilcene NFH	Big Quilcene	Big Quilcene	87	5	1,970	22,951	
051832	85	Quilcene NFH	Big Quilcene	Big Quilcene	87	5	1,970	22,388	
051833	85	Quilcene NFH	Big Quilcene	Big Quilcene	87	5	1,970	22,862	
051911R3	86	Quilcene NFH	Big Quilcene	Big Quilcene	88	5	2,250	127,819	
051959R3	87	Quilcene NFH	Big Quilcene	Big Quilcene	89	5	2,640	47,434	
051961R3	87	Quilcene NFH	Big Quilcene	Big Quilcene	89	5	2,640	37,667	
051962R3	87	Quilcene NFH	Big Quilcene	Big Quilcene	89	5	2,639	17,545	
052121R3	88	Quilcene NFH	Big Quilcene	Big Quilcene	90	5	3,088	21,318	
052122R3	88	Quilcene NFH	Big Quilcene	Big Quilcene	90	5	3,088	20,628	
052125R3	88	Quilcene NFH	Big Quilcene	Big Quilcene	90	5	3,088	18,613	
052126R3	88	Quilcene NFH	Big Quilcene	Big Quilcene	90	5	3,088	19,227	
052128R3	88	Quilcene NFH	Big Quilcene	Big Quilcene	90	5	4,164	19,932	
052131R3	88	Quilcene NFH	Big Quilcene	Big Quilcene	90	5	4,164	20,038	
052132R3	88	Quilcene NFH	Big Quilcene	Big Quilcene	90	5	4,166	18,887	
052135R3	88	Quilcene NFH	Big Quilcene	Big Quilcene	90	5	4,165	14,433	
052150R3	88	Quilcene NFH	Big Quilcene	Big Quilcene	90	5	3,089	8,965	
052152R3	88	Quilcene NFH	Big Quilcene	Big Quilcene	90	5	4,165	10,415	

Appendix Table 10. Estimated recoveries and contribution rates for the Quilcene Hatchery spring yearling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 673723

Yr	Code	AK T-AGE 4 #	AK T-AGE 4 Rate	AK T-AGE 5 #	AK T-AGE 5 Rate	NCBC T-AGE 3 #	NCBC T-AGE 3 Rate	NCBC T-AGE 4 #	NCBC T-AGE 4 Rate	WCVI T-AGE 3 #	WCVI T-AGE 3 Rate	WCVI T-AGE 4 #	WCVI T-AGE 4 Rate	GS T-AGE 3 #	GS T-AGE 3 Rate	GS T-AGE 4 #	GS T-AGE 4 Rate	GS S-AGE 3 #	GS S-AGE 3 Rate	GS S-AGE 4 #	GS S-AGE 4 Rate	Survival Rate
	81	0	0.00000	0	0.00000	0	0.00000	0	0.00000	1	0.00004	27	0.00095	0	0.00000	0	0.00000	13	0.00046	0	0.00000	0.01284
	82	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00074
	83	0	0.00000	0	0.00000	0	0.00000	7	0.00013	0	0.00000	3	0.00006	0	0.00000	0	0.00000	4	0.00008	5	0.00009	0.00528
	85	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00106
	86	0	0.00000	-	-	0	0.00000	4	0.00003	6	0.00005	55	0.00043	0	0.00000	0	0.00000	13	0.00010	13	0.00010	-
	87	-	-	-	-	0	0.00000	-	-	7	0.00007	-	-	0	0.00000	-	-	8	0.00008	-	-	-
	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Summary Statistics																						
Median		0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	3	0.00006	0	0.00000	0	0.00000	2	0.00004	0	0.00000	0.003169
Average		0	0.00000	0	0.00000	0	0.00000	2	0.00003	1	0.00001	17	0.00029	0	0.00000	0	0.00000	5	0.00011	4	0.00004	0.004981
SD		0	0.00000	0	0.00000	0	0.00000	3	0.00006	2	0.00002	24	0.00041	0	0.00000	0	0.00000	6	0.00018	6	0.00005	0.005634
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of										35												
Median		NC		NC		NC		NC		NC		614962		NC		NC		922443		NC		
Lower 70%		NC		NC		NC		NC		NC		614962		NC		NC		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																						
Lower 95%		NC		NC		NC		10050923		2514620		1690634		NC		NC		988482		6224233		

Appendix Table 10. Estimated recoveries and contribution rates for the Quilcene Hatchery spring yearling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
81	0	0.00000	0	0.00000	2	0.00007	2	0.00007	3	0.00011	0	0.00000	3	0.00011	5	0.00018	3	0.00011	36	0.00127	0.01284
82	0	0.00000	0	0.00000	0	0.00000	0	0.00000	11	0.00025	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00074
83	0	0.00000	6	0.00011	2	0.00004	0	0.00000	2	0.00004	0	0.00000	4	0.00008	0	0.00000	32	0.00061	5	0.00009	0.00528
85	0	0.00000	1	0.00001	13	0.00007	0	0.00000	8	0.00004	0	0.00000	3	0.00002	0	0.00000	16	0.00009	5	0.00003	0.00106
86	4	0.00003	55	0.00043	2	0.00002	0	0.00000	9	0.00007	2	0.00002	0	0.00000	6	0.00005	11	0.00009	41	0.00032	-
87	0	0.00000	-		0	0.00000	-		0	0.00000	-		8	0.00008	-		9	0.00009	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	1	0.00001	2	0.00003	0	0.00000	6	0.00006	0	0.00000	2	0.00001	0	0.00000	7	0.00009	5	0.00009	0.003169
Mean	1	0.00001	12	0.00011	3	0.00003	0	0.00001	6	0.00008	0	0.00000	2	0.00003	2	0.00004	10	0.00015	17	0.00034	0.004981
SD	2	0.00001	24	0.00019	5	0.00003	1	0.00003	4	0.00009	1	0.00001	2	0.00005	3	0.00008	12	0.00023	19	0.00053	0.005634
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		6383685		1306217		NC		612563		NC		4255790		NC		402802		368977		
Lower 70%	NC		6383685		2236833		NC		797961		NC		NC		NC		406697		368977		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	21380880		2446546		493626		13795240		233577		15883802		1371753		12618305		385820		1178908		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 11. Tagging history and use of the Quillayute River summer fingerling stock.

Hatchery - Lonesome Creek
Brood Source - Broodstock collection program
Agency - Quileute
Release Type - Fingerling
Base Period Tagging - No
Escapement Data - Estimates of the escapement of tagged fish are currently unavailable.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
__ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
__ Chinook Model

Comments - Without escapement estimates, this stock can not be used for the fishery or brood harvest rate indices.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
211760	85	Eagle Creek	Quillayute	Quillayute	86	9	1,566	91,253	
212214R4	86	Eagle Creek	Quillayute	Quillayute	87	9	3,026	31,378	
212552R4	87	Lonesome Creek	Quillayute	Quillayute	88	10	3,631	171,465	Low tag retention
213135R4	88	Lonesome Creek	Quillayute	Quillayute	89	9	2,900	197,558	

Appendix Table 12. Estimated recoveries and contribution rates for the Quillayute River summer fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 225455

Brood Year	AK T-AGE 4 #	AK T-AGE 4 Rate	AK T-AGE 5 #	AK T-AGE 5 Rate	NCBC T-AGE 3 #	NCBC T-AGE 3 Rate	NCBC T-AGE 4 #	NCBC T-AGE 4 Rate	WCVI T-AGE 3 #	WCVI T-AGE 3 Rate	WCVI T-AGE 4 #	WCVI T-AGE 4 Rate	GS T-AGE 3 #	GS T-AGE 3 Rate	GS T-AGE 4 #	GS T-AGE 4 Rate	GS S-AGE 3 #	GS S-AGE 3 Rate	GS S-AGE 4 #	GS S-AGE 4 Rate	Survival Rate
85	11	0.00012	10	0.00011	8	0.00009	7	0.00008	4	0.00004	7	0.00008	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00222
86	7	0.00022	-		0	0.00000	4	0.00013	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	-
87	-		-		7	0.00004	-		0	0.00000	-		0	0.00000	-		0	0.00000	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	9	0.00017	10	0.00011	0	0.00000	6	0.00010	0	0.00000	4	0.00004	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.002218
Average	9	0.00017	10	0.00011	3	0.00003	6	0.00010	1	0.00001	4	0.00004	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.002218
SD	3	0.00007	0	0.00000	5	0.00005	2	0.00004	2	0.00003	5	0.00005	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.000000
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	203707		319386		NC		342822		NC		912530		NC		NC		NC		NC		
Lower 70%	290350		319386		NC		456265		NC		NC		NC		NC		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	247899		159693		5236711		2967142		7855066		456265		NC		NC		NC		NC		

Appendix Table 12. Estimated recoveries and contribution rates for the Quillayute River summer fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
85	3	0.00003	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00222
86	0	0.00000	3	0.00010	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	-
87	2	0.00001	-		0	0.00000	-		0	0.00000	-		0	0.00000	-		0	0.00000	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	2	0.00005	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.002218
Mean	1	0.00001	2	0.00005	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.002218
SD	2	0.00002	2	0.00007	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.000000
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		732153		NC		NC		NC		NC		NC		NC		NC		NC		
Lower 70%	NC		NC		NC		NC		NC		NC		NC		NC		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	3148072		3956189		NC		NC		NC		NC		NC		NC		NC		NC		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 13. Tagging history and use of the Samish Hatchery fall fingerling stock.

Hatchery - Samish
Brood Source - Return to hatchery
Agency - WDF
Release Type - Fingerling
Base Period Tagging - Yes
Escapement Data - Escapement counts are made at the hatchery rack. The escapement counts include some fish that are released above the rack. In recent years, a program has been implemented to sample carcasses below the hatchery for age and CWT.

Current Use of Data:
_X_ Fishery or Stock Harvest Rate Index
_X_ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
_X_ Chinook Model

Comments - Only one brood year is available from the base period for both age 3 and age 4. Tagged releases from the Nooksack Hatchery have been included because of geographical proximity and similarity of broodstock.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
011305	74	Nooksack	Nooksack	Kendall	75	6	907	51,340	
130104	74	Samish	Samish	Friday	75	5	454	72,493	
130215	74	Nooksack	Nooksack	Kendall	75	5	454	75,761	
130302	75	Nooksack	Nooksack	Kendall	76	6	907	72,842	
130602	75	Samish	Samish	Friday	76	5	329	9,770	
130603	75	Samish	Clark	Samish	76	6	334	76,106	
632042	79	Samish	Samish	Samish	80	5	1,221	100,514	
632101	79	Samish	Samish	Friday	80	5	440	106,037	
632102	79	Samish	Samish	Friday	80	5	488	103,023	
633804	85	Samish	Samish	Friday	86	5	454	53,773	
633805	85	Samish	Samish	Friday	86	5	454	52,297	
633806	85	Samish	Samish	Friday	86	5	454	52,297	
633807	85	Samish	Samish	Friday	86	5	454	52,506	
634111R4	85	Nooksack	Nooksack X Samish	Kendall	86	6	709	201,804	
634122R4	86	Samish	Samish	Friday	87	5	372	204,517	
634732R4	87	Samish	Samish	Friday	88	5	468	205,145	
635242R4	88	Samish	Samish	Friday	89	5	384	199,723	

Appendix Table 14. Estimated recoveries and contribution rates for the Samish Hatchery fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 90094

Brood Year	AK T-AGE 4		AK T-AGE 5		NCBC T-AGE 3		NCBC T-AGE 4		WCVI T-AGE 3		WCVI T-AGE 4		GS T-AGE 3		GS T-AGE 4		GS S-AGE 3		GS S-AGE 4		Survival
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
75	0	0.00000	0	0.00000	27	0.00017	2	0.00001	180	0.00113	309	0.00195	154	0.00097	30	0.00019	309	0.00195	108	0.00068	0.04301
79	14	0.00005	0	0.00000	57	0.00018	155	0.00050	872	0.00282	1325	0.00428	245	0.00079	68	0.00022	606	0.00196	459	0.00148	0.08951
85	0	0.00000	0	0.00000	4	0.00001	4	0.00001	54	0.00013	79	0.00019	4	0.00001	0	0.00000	62	0.00015	37	0.00009	0.00555
86	3	0.00001	-		5	0.00002	11	0.00005	94	0.00046	433	0.00212	24	0.00012	54	0.00026	283	0.00138	214	0.00105	-
87	-		-		4	0.00002	-		26	0.00013	-		26	0.00013	-		21	0.00010	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	2	0.00001	0	0.00000	5	0.00002	8	0.00003	94	0.00046	371	0.00203	24	0.00012	42	0.00020	283	0.00138	161	0.00086	0.066259
Average	4	0.00001	0	0.00000	19	0.00008	43	0.00014	240	0.00091	537	0.00213	85	0.00038	38	0.00017	252	0.00109	205	0.00082	0.062890
SD	7	0.00002	0	0.00000	24	0.00009	75	0.00024	359	0.00115	546	0.00167	109	0.00047	30	0.00012	239	0.00095	185	0.00059	0.048139
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	4772064		NC		1431619		1054436		76150		17224		298254		171287		25294		40537		
Lower 70%	NC		NC		1431619		2777565		76150		17978		298254		185171		25294		51436		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	15103717		NC		3749388		1836475		132702		69768		261488		953030		104136		170942		

Appendix Table 14. Estimated recoveries and contribution rates for the Samish Hatchery fall fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
75	12	0.00008	24	0.00015	72	0.00045	82	0.00052	156	0.00098	646	0.00407	122	0.00077	70	0.00044	46	0.00029	4	0.00003	0.04301
79	104	0.00034	229	0.00074	896	0.00289	298	0.00096	990	0.00320	1620	0.00523	253	0.00082	524	0.00169	234	0.00076	108	0.00035	0.08951
85	30	0.00007	30	0.00007	72	0.00017	4	0.00001	142	0.00034	225	0.00055	31	0.00008	34	0.00008	10	0.00002	10	0.00002	0.00555
86	41	0.00020	402	0.00197	63	0.00031	13	0.00006	359	0.00176	625	0.00306	83	0.00041	69	0.00034	25	0.00012	28	0.00014	-
87	30	0.00015	-		2	0.00001	-		43	0.00021	-		45	0.00022	-		11	0.00005	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	30	0.00008	130	0.00045	72	0.00031	48	0.00029	156	0.00098	636	0.00356	83	0.00041	70	0.00039	25	0.00012	19	0.00008	0.066259
Mean	37	0.00014	171	0.00073	221	0.00077	99	0.00039	329	0.00126	779	0.00323	98	0.00041	174	0.00064	63	0.00024	38	0.00013	0.062890
SD	40	0.00013	181	0.00087	379	0.00120	137	0.00045	391	0.00128	593	0.00200	99	0.00038	234	0.00072	97	0.00031	48	0.00015	0.048139
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median		462928		78569		113621		120647		35610		9823		86242		89926		286324		431806	
Lower 70%		462928		231464		113621		550623		35610		11453		86242		103741		286324		1388783	
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%		319814		184909		205374		394351		82841		32845		174037		237267		478873		1051982	

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 15. Tagging history and use of the Lummi Bay Hatchery fall fingerling stock.

Hatchery - Lummi Bay Hatchery
Brood Source - Generally Samish Hatchery
Agency - Lummi
Release Type - Fingerling
Base Period Tagging - Yes
Escapement Data - Straying appears to be a problem with this stock.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
__ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
_X_ Chinook Model

Comments - Data for this stock are of limited value to the CTC.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
140711	75	Skookum Cr	Green	Lummi Bay	76	6	1,170	12,735	
052601	76	Lummi Ponds	Green	Lummi Bay	77	6	503	23,447	
050324	77	Skookum Cr	Green	Lummi Bay	78	6	567	96,486	
050326	78	Lummi Ponds	Samish	Lummi Bay	79	7	732	45,484	
050526	78	Lummi Ponds	Samish	Lummi Bay	79	7	757	14,019	
050727	79	Lummi Ponds	Samish	Lummi Bay	80	7	613	40,468	
050831	80	Lummi Ponds	Samish	Lummi Bay	81	6	700	46,423	
050857	81	Skookum Cr	Green	Lummi Bay	82	6	560	48,847	
211902R4	85	Lummi Ponds	Samish	Lummi Bay	86	6	649	100,719	
212232R4	86	Lummi Ponds	Samish	Lummi Bay	87	5	652	93,685	
212235R4	86	Lummi Ponds	Samish	Lummi Bay	87	5	652	98,550	
212537R4	87	Lummi Ponds	Samish	Lummi Bay	88	6	560	96,572	
212538R4	87	Lummi Ponds	Samish	Lummi Bay	88	6	516	92,897	
213142R4	88	Lummi Ponds	Green	Lummi Bay	89	5	600	190,485	

Appendix Table 16. Estimated recoveries and contribution rates for the Lummi Bay Hatchery fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 77935

Brood Year	AK T-AGE 4		AK T-AGE 5		NCBC T-AGE 3		NCBC T-AGE 4		WCVI T-AGE 3		WCVI T-AGE 4		GS T-AGE 3		GS T-AGE 4		GS S-AGE 3		GS S-AGE 4		Survival
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
75	5	0.00039	0	0.00000	4	0.00031	0	0.00000	72	0.00565	56	0.00440	9	0.00071	4	0.00031	47	0.00369	13	0.00102	0.08699
76	0	0.00000	0	0.00000	7	0.00030	4	0.00017	42	0.00179	61	0.00260	11	0.00047	0	0.00000	10	0.00043	19	0.00081	0.03397
77	0	0.00000	0	0.00000	12	0.00012	27	0.00028	48	0.00050	107	0.00111	75	0.00078	28	0.00029	206	0.00214	202	0.00209	0.03832
78	0	0.00000	0	0.00000	0	0.00000	0	0.00000	22	0.00037	19	0.00032	0	0.00000	0	0.00000	19	0.00032	3	0.00005	0.00642
79	2	0.00005	0	0.00000	7	0.00017	0	0.00000	21	0.00052	35	0.00087	0	0.00000	0	0.00000	19	0.00047	18	0.00045	0.01542
80	0	0.00000	0	0.00000	0	0.00000	0	0.00000	21	0.00045	24	0.00052	0	0.00000	8	0.00017	24	0.00052	19	0.00041	0.01177
81	3	0.00006	0	0.00000	21	0.00043	11	0.00023	33	0.00068	5	0.00010	27	0.00055	0	0.00000	53	0.00109	28	0.00057	0.01741
85	0	0.00000	0	0.00000	4	0.00004	0	0.00000	2	0.00002	14	0.00014	0	0.00000	0	0.00000	13	0.00013	7	0.00007	0.00296
86	7	0.00004	-		12	0.00006	10	0.00005	161	0.00084	565	0.00294	40	0.00021	45	0.00023	665	0.00346	380	0.00198	-
87	-		-		2	0.00001	-		33	0.00017	-		2	0.00001	-		7	0.00004	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	6	0.00009	0	0.00000	28	0.00051	35	0.00087	5	0.00010	0	0.00000	22	0.00049	19	0.00057	0.016416
Average	2	0.00006	0	0.00000	7	0.00014	6	0.00008	42	0.00108	98	0.00144	16	0.00027	9	0.00011	106	0.00122	77	0.00083	0.026658
SD	3	0.00013	0	0.00000	7	0.00015	9	0.00011	47	0.00168	178	0.00152	25	0.00032	16	0.00014	205	0.00138	130	0.00075	0.027346
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		374743		NC		68786		40372		336408		NC		70878		61059		
Lower 70%	NC		NC		560680		NC		70354		67700		NC		NC		74369		78501		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	1066297		NC		712036		670097		74842		35192		328646		475374		65593		55268		

Appendix Table 16. Estimated recoveries and contribution rates for the Lummi Bay Hatchery fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
75	0	0.00000	0	0.00000	10	0.00079	28	0.00220	32	0.00251	105	0.00824	11	0.00086	9	0.00071	3	0.00024	0	0.00000	0.08699
76	0	0.00000	6	0.00026	18	0.00077	13	0.00055	18	0.00077	68	0.00290	17	0.00073	6	0.00026	0	0.00000	0	0.00000	0.03397
77	3	0.00003	19	0.00020	37	0.00038	43	0.00045	52	0.00054	376	0.00390	19	0.00020	20	0.00021	0	0.00000	4	0.00004	0.03832
78	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	45	0.00076	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00642
79	0	0.00000	1	0.00002	5	0.00012	3	0.00007	22	0.00054	65	0.00161	3	0.00007	7	0.00017	7	0.00017	13	0.00032	0.01542
80	2	0.00004	0	0.00000	1	0.00002	4	0.00009	11	0.00024	62	0.00134	19	0.00041	5	0.00011	14	0.00030	0	0.00000	0.01177
81	0	0.00000	0	0.00000	14	0.00029	2	0.00004	36	0.00074	58	0.00119	8	0.00016	10	0.00020	4	0.00008	0	0.00000	0.01741
85	5	0.00005	10	0.00010	3	0.00003	0	0.00000	20	0.00020	39	0.00039	6	0.00006	0	0.00000	0	0.00000	0	0.00000	0.00296
86	122	0.00063	339	0.00176	88	0.00046	9	0.00005	885	0.00460	1185	0.00616	77	0.00040	57	0.00030	40	0.00021	28	0.00015	-
87	7	0.00004	-		0	0.00000	-		58	0.00031	-		8	0.00004	-		2	0.00001	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	1	0.00002	8	0.00021	4	0.00007	21	0.00054	65	0.00161	10	0.00018	7	0.00020	2	0.00004	0	0.00000	0.016416
Mean	13	0.00008	42	0.00026	18	0.00029	11	0.00038	108	0.00101	223	0.00294	16	0.00029	13	0.00022	7	0.00010	5	0.00006	0.026658
SD	38	0.00020	112	0.00057	27	0.00031	15	0.00071	274	0.00145	376	0.00270	23	0.00031	18	0.00021	13	0.00012	10	0.00011	0.027346
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		1413020		170541		471007		64583		21739		194069		170965		854823		NC		
Lower 70%	NC		NC		282604		747573		64943		26207		213706		201860		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	742409		196413		252666		194879		69838		14647		222644		226354		537900		650611		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 17. Tagging history and use of the Tulalip Hatchery fall fingerling stock.

Hatchery - Tulalip
Brood Source - Varies
Agency - Tulalip
Release Type - Fingerling
Base Period Tagging - No
Escapement Data - Escapement to the hatchery is limited as the fishery in Area 8D is managed to harvest the entire return. Straying to the Snohomish and Stillaguamish rivers may be occurring.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
__ Brood Exploitation Rate Analysis
__ Catch Distribution
__ Survival
__ Chinook Model

Comments - This program is difficult to evaluate because of the limited duration of the tagging.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
212204R4	86	Tulalip	Samish	Tulalip	87	5	509	191,825	
212544R4	87	Tulalip	Green X Tulalip	Tulalip	88	5	503	188,110	
213141	88	Tulalip	Snohomish	Tulalip	89	5	534	181,873	

Appendix Table 18. Tagging history and use of the Stillaguamish Hatchery fall fingerling stock.

Hatchery - Stillaguamish
Brood Source - Broodstock collection program
Agency - Stillaguamish Tribe
Release Type - Fingerling
Base Period Tagging - No
Escapement Data - Estimates of tagged escapement are currently not available.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
__ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
_X_ Chinook Model

Comments - Brood years prior to 1987 had small tag groups and recoveries were limited. Small tag group sizes resulted from difficulty in collecting sufficient broodstock from the river.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
050843	80	Stillaguamish	Stillaguamish	Stillaguamish	81	4	251	59,274	
051063	81	Stillaguamish	Stillaguamish	Stillaguamish	82	3	239	46,186	
051427	82	Stillaguamish	Stillaguamish	Stillaguamish	83	4	251	33,444	
211618	83	Stillaguamish	Stillaguamish	Stillaguamish	83	3	251	26,915	
212221R4	86	Stillaguamish	Stillaguamish	Stillaguamish	87	4	275	23,904	Broodstock collection limited by small escapement
212555R4	87	Stillaguamish	Stillaguamish	Stillaguamish	88	5	503	127,910	"
213147R4	88	Stillaguamish	Stillaguamish	Stillaguamish	89	5	500	36,599	"

Appendix Table 19. Estimated recoveries and contribution rates for the Stillaguamish Hatchery fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 239008

Brood Year	AK T-AGE 4 #	AK T-AGE 4 Rate	AK T-AGE 5 #	AK T-AGE 5 Rate	NCBC T-AGE 3 #	NCBC T-AGE 3 Rate	NCBC T-AGE 4 #	NCBC T-AGE 4 Rate	WCVI T-AGE 3 #	WCVI T-AGE 3 Rate	WCVI T-AGE 4 #	WCVI T-AGE 4 Rate	GS T-AGE 3 #	GS T-AGE 3 Rate	GS T-AGE 4 #	GS T-AGE 4 Rate	GS S-AGE 3 #	GS S-AGE 3 Rate	GS S-AGE 4 #	GS S-AGE 4 Rate	Survival Rate
80	0	0.00000	0	0.00000	0	0.00000	0	0.00000	10	0.00017	2	0.00003	0	0.00000	0	0.00000	5	0.00008	6	0.00010	0.00209
81	10	0.00022	0	0.00000	20	0.00043	0	0.00000	4	0.00009	3	0.00006	0	0.00000	0	0.00000	6	0.00013	0	0.00000	0.00390
82	0	0.00000	0	0.00000	4	0.00013	0	0.00000	28	0.00092	10	0.00033	0	0.00000	0	0.00000	10	0.00033	12	0.00040	0.01092
83	6	0.00022	0	0.00000	0	0.00000	0	0.00000	20	0.00074	5	0.00019	0	0.00000	0	0.00000	6	0.00022	7	0.00026	0.00825
86	0	0.00000	-		8	0.00033	0	0.00000	29	0.00121	5	0.00021	0	0.00000	0	0.00000	23	0.00096	19	0.00079	-
87	-		-		36	0.00028	-		76	0.00059	-		2	0.00002	-		18	0.00014	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	2	0.00007	0	0.00000	15	0.00046	5	0.00019	0	0.00000	0	0.00000	6	0.00018	7	0.00026	0.006073
Average	3	0.00009	0	0.00000	5	0.00015	0	0.00000	15	0.00052	5	0.00016	0	0.00000	0	0.00000	8	0.00029	9	0.00031	0.006288
SD	5	0.00012	0	0.00000	8	0.00019	0	0.00000	12	0.00050	3	0.00012	0	0.00000	0	0.00000	8	0.00035	7	0.00031	0.004024
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		530688		NC		76772		188405		NC		NC		198394		134575		
Lower 70%	NC		NC		NC		NC		207459		188405		NC		NC		269418		134575		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	878413		NC		204802		NC		63725		678741		22961674		NC		129839		364156		

Appendix Table 19. Estimated recoveries and contribution rates for the Stillaguamish Hatchery fall fingerling stock (continued).

Brood Year	WA T-AGE 3		WA T-AGE 4		PSN N-AGE 3		PSN N-AGE 4		PSO N-AGE 3		PSO N-AGE 4		PSN S-AGE 3		PSN S-AGE 4		PSO S-AGE 3		PSO S-AGE 4		Survival
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
80	0	0.00000	0	0.00000	1	0.00002	0	0.00000	3	0.00005	2	0.00003	0	0.00000	0	0.00000	10	0.00017	0	0.00000	0.00209
81	0	0.00000	0	0.00000	0	0.00000	0	0.00000	1	0.00002	5	0.00011	2	0.00004	0	0.00000	3	0.00006	0	0.00000	0.00390
82	0	0.00000	0	0.00000	1	0.00003	8	0.00026	3	0.00010	5	0.00016	0	0.00000	0	0.00000	4	0.00013	10	0.00033	0.01092
83	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	4	0.00015	8	0.00030	0	0.00000	0	0.00000	0	0.00000	0.00825
86	14	0.00059	0	0.00000	3	0.00013	0	0.00000	4	0.00017	2	0.00008	17	0.00071	0	0.00000	14	0.00059	6	0.00025	-
87	23	0.00018	-		2	0.00002	-		0	0.00000	-		8	0.00006	-		26	0.00020	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	1	0.00001	0	0.00000	2	0.00004	4	0.00011	1	0.00002	0	0.00000	4	0.00010	0	0.00000	0.006073
Mean	2	0.00010	0	0.00000	1	0.00003	2	0.00005	2	0.00006	4	0.00011	5	0.00018	0	0.00000	5	0.00016	3	0.00012	0.006288
SD	6	0.00024	0	0.00000	1	0.00005	4	0.00012	2	0.00007	2	0.00005	7	0.00029	0	0.00000	6	0.00022	5	0.00016	0.004024
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of 35																					
Median	NC		NC		4149180		NC		968671		323302		1616510		NC		355584		NC		
Lower 70%	NC		NC		NC		NC		1616510		323302		NC		NC		538837		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	591143		NC		4908652		4867079		1403258		968007		284154		NC		158103		1622378		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll
WCVI T:	West Coast Vancouver Island Troll
GS S:	Georgia Strait Sport
PSO N:	Puget Sound Other Net
PSN S:	Area 5,6,7 Sport
NCBC T:	North/Central BC Troll
GS T:	Georgia Strait Troll
WA T:	Washington Area 1,2,3,4,4B Troll
PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 20. Tagging history and use of the Green River Hatchery fall fingerling stock.

Hatchery - Green River
Brood Source - Return to hatchery
Agency - WDF
Release Type - Fingerling
Base Period Tagging - Yes
Escapement Data - The extent of straying should be further quantified.

Current Use of Data:
_X_ Fishery or Stock Harvest Rate Index
_X_ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
_X_ Chinook Model

Comments - Data for this stock are combined with other mid-Sound stocks for use in the exploitation rate analysis.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
011403	74	Green R.	Big Soos	Big Soos	75	5	488	39,704	
011404	74	Green R.	Big Soos	Big Soos	75	5	488	40,124	
130604	75	Green R.	Big Soos	Big Soos	76	5	553	78,146	
631935	78	Green R.	Big Soos	Big Soos	79	5	458	99,372	
631936	78	Green R.	Big Soos	Big Soos	79	5	405	100,664	
631945	78	Green R.	Big Soos	Big Soos	79	5	454	185,133	
631944	79	Green R.	Big Soos	Big Soos	80	5	428	119,913	
632253	80	Green R.	Big Soos	Big Soos	81	5	280	159,801	
632158	81	Green R.	Big Soos	Big Soos	82	5	349	211,883	
633643	85	Green R.	Big Soos	Big Soos	86	5	412	50,487	
633644	85	Green R.	Big Soos	Big Soos	86	5	412	50,488	
633645	85	Green R.	Big Soos	Big Soos	86	5	412	50,488	
633646	85	Green R.	Big Soos	Big Soos	86	5	412	50,487	
634116R4	86	Green R.	Big Soos	Green	87	5	657	199,670	
635221R4	87	Green R.	Big Soos	Green	88	5	445	206,718	
635238R4	88	Green R.	Big Soos	Green	89	5	521	217,988	

Appendix Table 21. Estimated recoveries and contribution rates for the Green River Hatchery fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 85763

Brood Year	AK T-AGE 4 #	AK T-AGE 4 Rate	AK T-AGE 5 #	AK T-AGE 5 Rate	NCBC T-AGE 3 #	NCBC T-AGE 3 Rate	NCBC T-AGE 4 #	NCBC T-AGE 4 Rate	WCVI T-AGE 3 #	WCVI T-AGE 3 Rate	WCVI T-AGE 4 #	WCVI T-AGE 4 Rate	GS T-AGE 3 #	GS T-AGE 3 Rate	GS T-AGE 4 #	GS T-AGE 4 Rate	GS S-AGE 3 #	GS S-AGE 3 Rate	GS S-AGE 4 #	GS S-AGE 4 Rate	Survival Rate
75	0	0.00000	0	0.00000	24	0.00031	25	0.00032	300	0.00384	289	0.00370	60	0.00077	10	0.00013	165	0.00211	58	0.00074	0.07112
78	4	0.00001	0	0.00000	6	0.00002	24	0.00006	128	0.00033	224	0.00058	10	0.00003	33	0.00009	155	0.00040	19	0.00005	0.01202
79	5	0.00004	0	0.00000	5	0.00004	45	0.00038	193	0.00161	143	0.00119	7	0.00006	8	0.00007	34	0.00028	41	0.00034	0.03175
80	0	0.00000	0	0.00000	0	0.00000	0	0.00000	42	0.00026	7	0.00004	0	0.00000	0	0.00000	3	0.00002	0	0.00000	0.00273
81	0	0.00000	0	0.00000	16	0.00008	0	0.00000	91	0.00043	77	0.00036	7	0.00003	6	0.00003	83	0.00039	22	0.00010	0.01505
85	0	0.00000	0	0.00000	6	0.00003	0	0.00000	14	0.00007	41	0.00020	0	0.00000	3	0.00001	0	0.00000	19	0.00009	0.00583
86	0	0.00000	-		12	0.00006	9	0.00005	149	0.00075	568	0.00284	4	0.00002	2	0.00001	148	0.00074	125	0.00063	-
87	-		-		0	0.00000	-		8	0.00004	-		0	0.00000	-		0	0.00000	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	6	0.00004	9	0.00005	110	0.00038	143	0.00058	6	0.00002	6	0.00003	59	0.00034	22	0.00010	0.015051
Average	1	0.00001	0	0.00000	9	0.00007	15	0.00011	115	0.00091	193	0.00128	11	0.00011	9	0.00005	74	0.00049	41	0.00028	0.022594
SD	2	0.00002	0	0.00000	8	0.00010	17	0.00016	101	0.00129	193	0.00143	20	0.00027	11	0.00005	74	0.00070	42	0.00030	0.023421
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		980293		776494		91887		60183		1521882		1235984		103663		337087		
Lower 70%	NC		NC		1178042		NC		105320		96310		1747113		2356083		123440		372013		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	7355531		NC		4813619		1263200		164576		59019		2906068		1008592		427981		279819		

Appendix Table 21. Estimated recoveries and contribution rates for the Green River Hatchery fall fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
75	18	0.00023	24	0.00031	65	0.00083	21	0.00027	44	0.00056	55	0.00070	145	0.00186	56	0.00072	84	0.00107	76	0.00097	0.07112
78	11	0.00003	46	0.00012	29	0.00008	38	0.00010	16	0.00004	305	0.00079	57	0.00015	48	0.00012	161	0.00042	56	0.00015	0.01202
79	13	0.00011	25	0.00021	51	0.00043	5	0.00004	83	0.00069	338	0.00282	17	0.00014	90	0.00075	121	0.00101	113	0.00094	0.03175
80	2	0.00001	3	0.00002	3	0.00002	0	0.00000	18	0.00011	33	0.00021	0	0.00000	0	0.00000	26	0.00016	6	0.00004	0.00273
81	7	0.00003	7	0.00003	19	0.00009	4	0.00002	85	0.00040	256	0.00121	37	0.00017	36	0.00017	103	0.00049	52	0.00025	0.01505
85	6	0.00003	25	0.00012	12	0.00006	3	0.00001	1	0.00000	93	0.00046	7	0.00003	21	0.00010	8	0.00004	20	0.00010	0.00583
86	131	0.00066	470	0.00235	64	0.00032	56	0.00028	351	0.00176	757	0.00379	94	0.00047	123	0.00062	163	0.00082	227	0.00114	-
87	7	0.00003		-	0	0.00000		-	9	0.00004		-	0	0.00000		-	9	0.00004		-	-
88		-		-		-		-		-		-		-		-		-		-	-
Summary Statistics																					
Median	9	0.00003	25	0.00012	24	0.00008	5	0.00004	31	0.00026	256	0.00079	27	0.00014	48	0.00017	94	0.00045	56	0.00025	0.015051
Mean	24	0.00014	86	0.00045	30	0.00023	18	0.00010	75	0.00045	262	0.00143	45	0.00035	53	0.00035	83	0.00050	79	0.00051	0.022594
SD	44	0.00022	170	0.00084	26	0.00029	21	0.00012	117	0.00059	251	0.00135	52	0.00063	42	0.00032	66	0.00043	74	0.00048	0.023421
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median		1115584		282730		424336		839391		136238		44200		241582		205997		77424		142614	
Lower 70%		1178042		293063		464859		1853976		310724		49729		246880		280852		83732		240731	
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%		906188		183525		551073		531454		263191		28782		737993		195431		225431		126008	

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 22. Tagging history and use of the Grovers Creek Hatchery fall fingerling stock.

Hatchery - Grovers Creek
Brood Source - Return to hatchery
Agency - Suquamish Tribe
Release Type - Fingerling
Base Period Tagging - No
Escapement Data - The probability of straying by this stock is minimized by the shape of bay, which funnels fish into hatchery outlet, and the lack of other streams in the vicinity.

Current Use of Data:
X Fishery or Stock Harvest Rate Index
X Brood Exploitation Rate Analysis
X Catch Distribution
X Survival
__ Chinook Model

Comments - Data for this stock are combined with other mid-Sound stocks for use in the exploitation rate analysis.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
051047	81	Grovers Creek	Deschutes	Grovers	82	5	946	47,471	
051346	82	Grovers Creek	Grovers	Grovers	83	5	649	45,436	
211622	83	Grovers Creek	Grovers	Grovers	84	5	638	40,324	
211657	84	Grovers Creek	Grovers	Grovers	85	5	757	45,907	
211901R4	85	Grovers Creek	Grovers	Grovers	86	5	733	207,155	
211961R4	86	Grovers Creek	Grovers	Grovers	87	5	658	187,757	
212542R4	87	Grovers Creek	Grovers	Grovers	88	5	703	193,906	
213137R4	88	Grovers Creek	Grovers	Grovers	89	5	388	124,626	Severe BGD at release

Appendix Table 23. Estimated recoveries and contribution rates for the Grovers Creek Hatchery fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 35560

Brood Year	AK T-AGE 4 #	AK T-AGE 4 Rate	AK T-AGE 5 #	AK T-AGE 5 Rate	NCBC T-AGE 3 #	NCBC T-AGE 3 Rate	NCBC T-AGE 4 #	NCBC T-AGE 4 Rate	WCVI T-AGE 3 #	WCVI T-AGE 3 Rate	WCVI T-AGE 4 #	WCVI T-AGE 4 Rate	GS T-AGE 3 #	GS T-AGE 3 Rate	GS T-AGE 4 #	GS T-AGE 4 Rate	GS S-AGE 3 #	GS S-AGE 3 Rate	GS S-AGE 4 #	GS S-AGE 4 Rate	Survival Rate
81	0	0.00000	0	0.00000	11	0.00023	0	0.00000	135	0.00284	25	0.00053	7	0.00015	0	0.00000	20	0.00042	7	0.00015	0.05851
82	0	0.00000	0	0.00000	0	0.00000	0	0.00000	24	0.00053	52	0.00114	0	0.00000	0	0.00000	6	0.00013	4	0.00009	0.01687
83	0	0.00000	0	0.00000	0	0.00000	0	0.00000	18	0.00045	17	0.00042	0	0.00000	0	0.00000	10	0.00025	4	0.00010	0.01430
84	2	0.00004	0	0.00000	0	0.00000	5	0.00011	40	0.00087	50	0.00109	0	0.00000	0	0.00000	31	0.00068	22	0.00048	0.02562
85	2	0.00001	0	0.00000	6	0.00003	0	0.00000	53	0.00026	60	0.00029	4	0.00002	0	0.00000	19	0.00009	13	0.00006	0.01406
86	0	0.00000	-		8	0.00004	0	0.00000	127	0.00068	300	0.00160	0	0.00000	0	0.00000	32	0.00017	22	0.00012	-
87	-		-		2	0.00001	-		75	0.00039	-		2	0.00001	-		6	0.00003	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	0	0.00000	0	0.00000	40	0.00053	51	0.00081	0	0.00000	0	0.00000	19	0.00017	10	0.00011	0.016867
Average	1	0.00001	0	0.00000	4	0.00004	1	0.00002	57	0.00080	84	0.00084	2	0.00002	0	0.00000	17	0.00025	12	0.00017	0.025871
SD	1	0.00002	0	0.00000	5	0.00008	2	0.00004	53	0.00094	107	0.00051	3	0.00005	0	0.00000	12	0.00023	8	0.00016	0.018838
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		NC		NC		66261		43322		NC		NC		205359		323521		
Lower 70%	NC		NC		NC		NC		78408		66459		NC		NC		265043		352835		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	2665659		NC		2613324		1412463		39488		28481		1708320		NC		120909		134987		

Appendix Table 23. Estimated recoveries and contribution rates for the Grovers Creek Hatchery fall fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
81	0	0.00000	3	0.00006	10	0.00021	0	0.00000	99	0.00209	11	0.00023	34	0.00072	12	0.00025	206	0.00434	14	0.00029	0.05851
82	0	0.00000	2	0.00004	12	0.00026	0	0.00000	4	0.00009	4	0.00009	2	0.00004	7	0.00015	30	0.00066	29	0.00064	0.01687
83	11	0.00027	11	0.00027	0	0.00000	1	0.00002	11	0.00027	7	0.00017	0	0.00000	8	0.00020	16	0.00040	3	0.00007	0.01430
84	20	0.00044	26	0.00057	1	0.00002	5	0.00011	34	0.00074	19	0.00041	12	0.00026	12	0.00026	23	0.00050	3	0.00007	0.02562
85	70	0.00034	61	0.00029	39	0.00019	34	0.00016	36	0.00017	58	0.00028	30	0.00014	35	0.00017	16	0.00008	14	0.00007	0.01406
86	112	0.00060	259	0.00138	28	0.00015	2	0.00001	157	0.00084	76	0.00040	81	0.00043	63	0.00034	118	0.00063	93	0.00050	-
87	75	0.00039	-		1	0.00001	-		12	0.00006	-		24	0.00012	-		46	0.00024	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	11	0.00027	19	0.00028	10	0.00015	2	0.00002	34	0.00027	15	0.00026	12	0.00014	12	0.00023	23	0.00050	14	0.00018	0.016867
Mean	30	0.00023	60	0.00044	13	0.00012	7	0.00005	49	0.00060	29	0.00027	23	0.00023	23	0.00023	58	0.00094	26	0.00027	0.025871
SD	44	0.00024	100	0.00050	15	0.00011	13	0.00007	58	0.00073	30	0.00013	29	0.00027	22	0.00007	76	0.00152	34	0.00025	0.018838
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	128304		123401		234696		1974546		128304		136798		241681		155149		69858		189540		
Lower 70%	NC		128304		1606745		3285748		201401		151044		795130		176418		88209		470447		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	78110		62975		243457		531069		98320		107535		148897		95083		41306		85302		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 24. Tagging history and use of the Kalama Hatchery fall fingerling stock.

Hatchery - Kalama Creek
Brood Source - Varies
Agency - Nisqually Tribe
Release Type - Fingerling
Base Period Tagging - No
Escapement Data - Fish do not return well to the hatchery.

Current Use of Data:
__ Fishery Fishery or Stock Harvest Rate Index
__ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
_X_ Chinook Model

Comments - Source of broodstock and time at release have not been consistent.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
050722	79	Nisqually	Green	Kalama	80	4	391	33,494	
050839	80	Nisqually	Puyallup	Kalama	81	5	483	14,106	
050840	80	Nisqually	Puyallup	Kalama	81	5	483	33,298	
051048	81	Kalama	Green	Kalama	82	4	596	9,486	
051049	81	Kalama	Green	Kalama	82	4	596	29,150	
051344	82	Kalama	Green	Kalama	83	4	630	37,118	
051345	82	Kalama	Green	Kalama	83	4	630	11,675	
211628	83	Kalama	Nisqually X Green	Kalama	84	4	567	37,541	
211629	83	Kalama	Nisqually X Green	Kalama	84	4	567	11,317	
211706	84	Kalama	Kalama	Kalama	85	4	638	38,605	
211707	84	Kalama	Deschutes	Kalama	85	5	384	44,898	
211759	85	Kalama	Deschutes	Kalama	86	5	638	94,552	
211761	85	Kalama	Deschutes	Kalama	86	6	567	85,934	
211962R4	86	Kalama	Kalama X Green	Kalama	87	6	1,134	194,459	
212541R4	87	Kalama	Kalama X Green	Kalama	88	7	907	195,101	
213138R4	88	Kalama	Kalama	Kalama	89	6	900	193,837	

Appendix Table 25. Estimated recoveries and contribution rates for the Kalama Creek Hatchery fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 94903

Brood Year	AK T-AGE 4		AK T-AGE 5		NCBC T-AGE 3		NCBC T-AGE 4		WCVI T-AGE 3		WCVI T-AGE 4		GS T-AGE 3		GS T-AGE 4		GS S-AGE 3		GS S-AGE 4		Survival
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
79	0	0.00000	0	0.00000	0	0.00000	0	0.00000	6	0.00018	29	0.00087	8	0.00024	0	0.00000	3	0.00009	6	0.00018	0.01135
80	0	0.00000	0	0.00000	5	0.00011	0	0.00000	1	0.00002	19	0.00040	5	0.00011	0	0.00000	10	0.00021	0	0.00000	0.00527
81	0	0.00000	0	0.00000	0	0.00000	0	0.00000	38	0.00098	6	0.00016	0	0.00000	0	0.00000	4	0.00010	0	0.00000	0.01032
82	0	0.00000	0	0.00000	0	0.00000	0	0.00000	15	0.00031	5	0.00010	0	0.00000	0	0.00000	0	0.00000	4	0.00008	0.00539
83	0	0.00000	0	0.00000	0	0.00000	3	0.00006	13	0.00027	14	0.00029	0	0.00000	0	0.00000	8	0.00016	0	0.00000	0.00578
84	0	0.00000	0	0.00000	0	0.00000	0	0.00000	2	0.00002	0	0.00000	2	0.00002	0	0.00000	10	0.00012	5	0.00006	0.00398
85	0	0.00000	0	0.00000	9	0.00005	0	0.00000	17	0.00009	27	0.00015	11	0.00006	0	0.00000	4	0.00002	0	0.00000	0.00530
86	0	0.00000	-		5	0.00003	3	0.00002	35	0.00018	307	0.00158	0	0.00000	0	0.00000	32	0.00016	45	0.00023	-
87	-		-		0	0.00000	-		2	0.00001	-		0	0.00000	-		0	0.00000	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	0	0.00000	0	0.00000	13	0.00018	17	0.00022	0	0.00000	0	0.00000	4	0.00010	2	0.00003	0.005390
Average	0	0.00000	0	0.00000	2	0.00002	1	0.00001	14	0.00023	51	0.00044	3	0.00005	0	0.00000	8	0.00010	8	0.00007	0.006769
SD	0	0.00000	0	0.00000	3	0.00004	1	0.00002	14	0.00030	104	0.00053	4	0.00008	0	0.00000	10	0.00008	15	0.00009	0.002847
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		NC		NC		195382		158428		NC		NC		338065		1169042		
Lower 70%	NC		NC		NC		NC		371589		225377		NC		NC		390763		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	NC		NC		4935229		3018154		103688		100991		527976		NC		235816		717439		

Appendix Table 25. Estimated recoveries and contribution rates for the Kalama Creek Hatchery fall fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
79	2	0.00006	9	0.00027	3	0.00009	2	0.00006	21	0.00063	1	0.00003	0	0.00000	13	0.00039	20	0.00060	17	0.00051	0.01135
80	0	0.00000	0	0.00000	1	0.00002	0	0.00000	2	0.00004	22	0.00046	0	0.00000	5	0.00011	11	0.00023	12	0.00025	0.00527
81	3	0.00008	0	0.00000	2	0.00005	0	0.00000	37	0.00096	5	0.00013	2	0.00005	6	0.00016	26	0.00067	0	0.00000	0.01032
82	1	0.00002	0	0.00000	3	0.00006	0	0.00000	8	0.00016	27	0.00055	0	0.00000	5	0.00010	0	0.00000	3	0.00006	0.00539
83	0	0.00000	1	0.00002	2	0.00004	1	0.00002	13	0.00027	34	0.00070	5	0.00010	3	0.00006	4	0.00008	0	0.00000	0.00578
84	8	0.00010	5	0.00006	0	0.00000	0	0.00000	13	0.00016	7	0.00008	4	0.00005	4	0.00005	10	0.00012	4	0.00005	0.00398
85	16	0.00009	13	0.00007	1	0.00001	3	0.00002	13	0.00007	133	0.00074	5	0.00003	7	0.00004	13	0.00007	22	0.00012	0.00530
86	20	0.00010	313	0.00161	21	0.00011	0	0.00000	248	0.00128	468	0.00241	28	0.00014	32	0.00016	73	0.00038	131	0.00067	-
87	2	0.00001	-		0	0.00000	-		8	0.00004	-		0	0.00000	-		17	0.00009	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	2	0.00006	3	0.00004	2	0.00004	0	0.00000	13	0.00016	25	0.00051	2	0.00003	6	0.00010	11	0.00012	8	0.00009	0.005390
Mean	6	0.00005	43	0.00025	4	0.00004	1	0.00001	39	0.00040	87	0.00064	5	0.00004	9	0.00013	17	0.00024	24	0.00021	0.006769
SD	8	0.00004	109	0.00056	7	0.00004	1	0.00002	79	0.00046	160	0.00077	9	0.00005	10	0.00011	23	0.00025	44	0.00025	0.002847
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	586145		871237		855015		NC		213469		68799		1263402		336619		292261		381727		
Lower 70%	1707755		1710030		1659140		NC		224816		75415		NC		341551		427507		569252		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	393928		380690		859457		2610466		123161		172932		653656		200831		81196		243798		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 26. Tagging history and use of the George Adams Hatchery fall fingerling stock.

Hatchery - George Adams
Brood Source - Return to hatchery
Agency - WDF
Release Type - Fingerling
Base Period Tagging - Yes
Escapement Data - Escapement counts are made at the hatchery rack.

Current Use of Data:
_X_ Fishery or Stock Harvest Rate Index
_X_ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
_X_ Chinook Model

Comments - Tagged releases from the Hood Canal Hatchery have been included because of geographical proximity and frequent mixing of broodstock.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comment
130303	74	George Adams	Hood Canal X George Adams	Purdy	75	6	856	70,315	
130913	75	George Adams	Deschutes	Purdy	76	6	667	77,369	
631752	78	George Adams	George Adams	Purdy	79	5	378	37,439	
631915	78	Hood Canal	Finch	Finch	79	5	454	34,300	
632041	79	George Adams	Mixed South Sound	Purdy	79	4	302	73,387	
632109	79	Hood Canal	Finch	Finch	80	4	302	48,954	
632146	80	George Adams	Mixed South Sound	Purdy	81	5	454	38,530	
632262	80	George Adams	Mixed South Sound	Purdy	81	4	453	56,372	
632161	80	Hood Canal	Finch	Finch	81	4	319	65,178	
632235	81	George Adams	South Sound X Hood Canal	Purdy	82	5	440	73,550	
632331	81	Hood Canal	Finch	Finch	82	5	420	55,145	
633501	85	George Adams	South Sound X Hood Canal	Purdy	86	5	527	51,828	
633502	85	George Adams	South Sound X Hood Canal	Purdy	86	5	527	54,070	
633503	85	George Adams	South Sound X Hood Canal	Purdy	86	5	526	52,945	
633504	85	George Adams	South Sound X Hood Canal	Purdy	86	5	527	52,814	
634119R4	86	George Adams	George Adams	Purdy	87	5	613	210,674	
635208R4	87	George Adams	Mixed Hood Canal	Purdy	88	5	582	198,497	
635237R4	88	George Adams		Purdy	89	6	504	206,049	

Appendix Table 27. Estimated recoveries and contribution rates for the George Adams Hatchery fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 123494

Brood Year	AK T-AGE 4		AK T-AGE 5		NCBC T-AGE 3		NCBC T-AGE 4		WCVI T-AGE 3		WCVI T-AGE 4		GS T-AGE 3		GS T-AGE 4		GS S-AGE 3		GS S-AGE 4		Survival
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
75	0	0.00000	0	0.00000	0	0.00000	0	0.00000	11	0.00014	9	0.00012	2	0.00003	0	0.00000	7	0.00009	0	0.00000	0.00405
78	0	0.00000	0	0.00000	15	0.00021	4	0.00006	66	0.00092	138	0.00192	7	0.00010	0	0.00000	56	0.00078	8	0.00011	0.04828
79	0	0.00000	0	0.00000	0	0.00000	5	0.00004	33	0.00027	58	0.00047	2	0.00002	0	0.00000	0	0.00000	6	0.00005	0.00766
80	0	0.00000	0	0.00000	5	0.00003	0	0.00000	25	0.00016	7	0.00004	0	0.00000	0	0.00000	8	0.00005	4	0.00002	0.00318
81	7	0.00005	0	0.00000	39	0.00030	1	0.00001	175	0.00136	68	0.00053	13	0.00010	0	0.00000	41	0.00032	11	0.00009	0.02452
85	0	0.00000	0	0.00000	8	0.00004	0	0.00000	81	0.00038	129	0.00061	0	0.00000	0	0.00000	23	0.00011	32	0.00015	0.02055
86	0	0.00000	-		1	0.00000	5	0.00002	34	0.00016	140	0.00066	0	0.00000	0	0.00000	30	0.00014	40	0.00019	-
87	-		-		5	0.00003	-		131	0.00066	-		0	0.00000	-		32	0.00016	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	3	0.00002	1	0.00001	34	0.00022	68	0.00053	1	0.00001	0	0.00000	16	0.00010	8	0.00009	0.020552
Average	1	0.00001	0	0.00000	9	0.00007	2	0.00002	53	0.00042	78	0.00062	3	0.00003	0	0.00000	21	0.00019	14	0.00009	0.019318
SD	3	0.00002	0	0.00000	13	0.00012	2	0.00002	56	0.00047	58	0.00062	5	0.00004	0	0.00000	21	0.00026	15	0.00007	0.016101
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		1945468		4504325		162366		66240		4281935		NC		351508		409484		
Lower 70%	NC		NC		7373590		NC		216870		73826		NC		NC		386845		713656		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	11578955		NC		1364423		6236124		125225		160111		2333493		NC		359537		936345		

Appendix Table 27. Estimated recoveries and contribution rates for the George Adams Hatchery fall fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
75	3	0.00004	9	0.00012	0	0.00000	0	0.00000	16	0.00021	10	0.00013	5	0.00006	0	0.00000	32	0.00041	7	0.00009	0.00405
78	14	0.00020	20	0.00028	23	0.00032	83	0.00116	117	0.00163	133	0.00185	57	0.00079	14	0.00020	227	0.00316	12	0.00017	0.04828
79	5	0.00004	1	0.00001	37	0.00030	6	0.00005	27	0.00022	20	0.00016	6	0.00005	15	0.00012	20	0.00016	18	0.00015	0.00766
80	0	0.00000	0	0.00000	7	0.00004	3	0.00002	18	0.00011	12	0.00007	20	0.00012	5	0.00003	19	0.00012	2	0.00001	0.00318
81	25	0.00019	4	0.00003	20	0.00016	3	0.00002	114	0.00089	87	0.00068	57	0.00044	23	0.00018	142	0.00110	59	0.00046	0.02452
85	97	0.00046	126	0.00060	82	0.00039	14	0.00007	51	0.00024	179	0.00085	101	0.00048	122	0.00058	73	0.00034	30	0.00014	0.02055
86	36	0.00017	162	0.00077	28	0.00013	0	0.00000	31	0.00015	46	0.00022	42	0.00020	52	0.00025	21	0.00010	48	0.00023	-
87	68	0.00034	-		25	0.00013	-		72	0.00036	-		71	0.00036	-		61	0.00031	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	10	0.00011	9	0.00012	22	0.00014	3	0.00002	29	0.00021	46	0.00022	31	0.00016	15	0.00018	27	0.00025	18	0.00015	0.020552
Mean	23	0.00014	46	0.00026	25	0.00017	16	0.00019	47	0.00043	70	0.00057	36	0.00027	33	0.00019	67	0.00068	25	0.00018	0.019318
SD	33	0.00015	68	0.00031	27	0.00015	30	0.00043	45	0.00055	66	0.00064	35	0.00028	43	0.00019	79	0.00106	22	0.00014	0.016101
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	330579		300879		242792		1501442		163744		160295		215851		195840		137694		237885		
Lower 70%	856387		1126081		263343		1867600		169245		214097		280140		285462		214097		246933		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	394214		356192		265347		1120728		113652		171804		214213		496383		107901		384982		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll
WCVI T:	West Coast Vancouver Island Troll
GS S:	Georgia Strait Sport
PSO N:	Puget Sound Other Net
PSN S:	Area 5,6,7 Sport
NCBC T:	North/Central BC Troll
GS T:	Georgia Strait Troll
WA T:	Washington Area 1,2,3,4,4B Troll
PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 28. Tagging history and use of the Lower Elwha Hatchery and Elwha Channel fall fingerling stock.

Hatchery - Lower Elwha Hatchery, Elwha Channel
Brood Source - Return to hatchery, broodstock collection, Elwha Channel
Agency - Lower Elwha Klallam Tribe (Lower Elwha Hatchery), WDF (Elwha Channel)
Release Type - Fingerling
Base Period Tagging - No
Escapement Data - Fish do not return well to either hatchery located on this system. Estimates of total in-river escapement, calculated from cumulative redd counts, are available. Estimates of the total CWT contribution are not currently available in the PSMFC database.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
__ Brood Exploitation Rate Analysis
X Catch Distribution
X Survival
__ Chinook Model

Comments - Releases from the Elwha Channel are no longer tagged as part of the exploitation indicator stock program.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
051363	82	Lower Elwha	Elwha	Elwha	83	6	907	45,120	
632721	82	Elwha Channel	Elwha	Elwha	83	7	504	25,535	
632722	82	Elwha Channel	Elwha	Elwha	83	7	503	25,584	
211616	83	Lower Elwha	Elwha	Elwha	84	6	927	40,592	
633038	83	Elwha Channel	Elwha	Elwha	84	6	756	25,316	
633039	83	Elwha Channel	Elwha	Elwha	84	6	756	24,964	
211658	84	Lower Elwha	Elwha	Elwha	85	6	811	41,550	
633419	84	Elwha Channel	Elwha	Elwha	85	6	732	26,510	
633420	84	Elwha Channel	Elwha	Elwha	85	6	732	26,317	
211919	85	Lower Elwha	Elwha	Elwha	86	6	604	16,621	
211920	85	Lower Elwha	Elwha	Elwha	86	6	604	16,125	
211921	85	Lower Elwha	Elwha	Elwha	86	6	604	16,107	
633543	85	Elwha Channel	Elwha	Elwha	86	6	732	25,992	
633544	85	Elwha Channel	Elwha	Elwha	86	6	732	26,097	
633547	85	Elwha Channel	Elwha	Elwha	86	7	907	26,060	
633548	85	Elwha Channel	Elwha	Elwha	86	7	907	26,607	
212208R4	86	Lower Elwha	Elwha	Elwha	87	6	567	49,097	
213132	88	Lower Elwha	Elwha	Elwha	89	6	600	191,895	

Appendix Table 29. Estimated recoveries and contribution rates for the Lower Elwha Hatchery fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 413133

Brood Year	AK T-AGE 4		AK T-AGE 5		NCBC T-AGE 3		NCBC T-AGE 4		WCVI T-AGE 3		WCVI T-AGE 4		GS T-AGE 3		GS T-AGE 4		GS S-AGE 3		GS S-AGE 4		Survival
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
82	157	0.00348	51	0.00113	15	0.00033	12	0.00027	33	0.00073	58	0.00129	0	0.00000	5	0.00011	2	0.00004	10	0.00022	0.03751
83	19	0.00047	9	0.00022	10	0.00025	9	0.00022	61	0.00150	44	0.00108	0	0.00000	0	0.00000	17	0.00042	9	0.00022	0.00606
84	16	0.00039	10	0.00024	25	0.00060	18	0.00043	12	0.00029	49	0.00118	5	0.00012	0	0.00000	26	0.00063	0	0.00000	0.00680
85	16	0.00033	0	0.00000	1	0.00002	10	0.00020	12	0.00025	10	0.00020	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00121
86	0	0.00000	-		1	0.00002	5	0.00010	1	0.00002	6	0.00012	0	0.00000	0	0.00000	0	0.00000	0	0.00000	-
Summary Statistics																					
Median	16	0.00039	10	0.00023	10	0.00025	10	0.00022	12	0.00029	44	0.00108	0	0.00000	0	0.00000	2	0.00004	0	0.00000	0.006428
Average	42	0.00093	18	0.00040	10	0.00024	11	0.00025	24	0.00056	33	0.00078	1	0.00002	1	0.00002	9	0.00022	4	0.00009	0.012894
SD	65	0.00144	23	0.00050	10	0.00024	5	0.00012	24	0.00059	24	0.00056	2	0.00005	2	0.00005	12	0.00029	5	0.00012	0.016596
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median		90891		151387		142072		157858		121188		32289		NC		NC		789600		NC	
Lower 70%		90891		157858		142072		157858		121188		32289		NC		NC		789600		NC	
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%		248062		361689		4240408		3407194		324559		194021		9830237		13654599		1026640		2244754	

Appendix Table 29. Estimated recoveries and contribution rates for the Lower Elwha Hatchery fall fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
82	2	0.00004	0	0.00000	3	0.00007	37	0.00082	10	0.00022	1	0.00002	16	0.00035	59	0.00131	5	0.00011	0	0.00000	0.03751
83	6	0.00015	4	0.00010	38	0.00094	11	0.00027	5	0.00012	0	0.00000	21	0.00052	23	0.00057	2	0.00005	0	0.00000	0.00606
84	9	0.00022	14	0.00034	5	0.00012	25	0.00060	0	0.00000	17	0.00041	24	0.00058	15	0.00036	2	0.00005	2	0.00005	0.00680
85	7	0.00014	7	0.00014	5	0.00010	6	0.00012	0	0.00000	3	0.00006	7	0.00014	23	0.00047	0	0.00000	0	0.00000	0.00121
86	0	0.00000	0	0.00000	2	0.00004	3	0.00006	0	0.00000	2	0.00004	5	0.00010	6	0.00012	0	0.00000	0	0.00000	-
Summary Statistics																					
Median	6	0.00014	4	0.00010	5	0.00010	11	0.00027	0	0.00000	2	0.00004	16	0.00035	23	0.00047	2	0.00005	0	0.00000	0.006428
Mean	5	0.00011	5	0.00012	11	0.00025	16	0.00038	3	0.00007	5	0.00011	15	0.00034	25	0.00057	2	0.00004	0	0.00001	0.012894
SD	4	0.00009	6	0.00014	15	0.00038	14	0.00032	4	0.00010	7	0.00017	8	0.00021	20	0.00045	2	0.00005	1	0.00002	0.016596
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	244265		355180		341971		129156		NC		859198		98700		74342		727125		NC		
Lower 70%	244265		355180		341971		129156		NC		859198		98700		74342		727125		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	1400644		1332568		464764		401969		2947513		1224707		361578		224655		5987452		25715524		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 30. Tagging history and use of the Hoko River fall fingerling stock.

Hatchery - Hoko River
Brood Source - Broodstock collection program
Agency - Makah Tribe
Release Type - Fingerling
Base Period Tagging - No
Escapement Data - There is no return to the hatchery rack; all hatchery fish stray to the river as part of a supplementation program. Total escapement estimates are made, however, escapement estimates for tagged fish are currently not available.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
_X_ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
__ Chinook Model

Comments - Size at release and time of release should be evaluated for similarity to natural stock.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
211935R4	85	Makah NFH	Hoko	Hoko	86	5	966	123,563	Unable to collect sufficient broodstock.
212216R4	86	Makah NFH	Hoko	Hoko	87	5	649	144,482	"
211907R4	87	Hoko Ponds	Hoko	Hoko	88	6	762	199,740	

Appendix Table 31. Estimated recoveries and contribution rates for the Hoko Ponds fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 205254

Brood Year	AK T-AGE 4 #	AK T-AGE 4 Rate	AK T-AGE 5 #	AK T-AGE 5 Rate	NCBC T-AGE 3 #	NCBC T-AGE 3 Rate	NCBC T-AGE 4 #	NCBC T-AGE 4 Rate	WCVI T-AGE 3 #	WCVI T-AGE 3 Rate	WCVI T-AGE 4 #	WCVI T-AGE 4 Rate	GS T-AGE 3 #	GS T-AGE 3 Rate	GS T-AGE 4 #	GS T-AGE 4 Rate	GS S-AGE 3 #	GS S-AGE 3 Rate	GS S-AGE 4 #	GS S-AGE 4 Rate	Survival Rate
85	10	0.00008	10	0.00008	13	0.00011	6	0.00005	16	0.00013	12	0.00010	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00244
86	84	0.00058	-		21	0.00015	43	0.00030	24	0.00017	64	0.00044	0	0.00000	0	0.00000	6	0.00004	4	0.00003	-
87	-		-		7	0.00004	-		39	0.00020	-		2	0.00001	-		0	0.00000	-		-
Summary Statistics																					
Median	47	0.00033	10	0.00008	13	0.00011	25	0.00017	16	0.00013	38	0.00027	0	0.00000	0	0.00000	0	0.00000	2	0.00001	0.002436
Average	47	0.00033	10	0.00008	11	0.00008	25	0.00017	13	0.00010	38	0.00027	0	0.00000	0	0.00000	2	0.00001	2	0.00001	0.002436
SD	52	0.00035	0	0.00000	11	0.00008	26	0.00018	12	0.00009	37	0.00024	0	0.00000	0	0.00000	3	0.00002	3	0.00002	0.000000
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	105689		432471		332670		202211		270294		129611		NC		NC		NC		2528435		
Lower 70%	432471		432471		332670		720784		270294		360392		NC		NC		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	134642		216235		1832287		3284585		213084		149886		15894386		NC		4001274		4105730		

Appendix Table 31. Estimated recoveries and contribution rates for the Hoko Ponds fall fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
85	0	0.00000	1	0.00001	1	0.00001	0	0.00000	0	0.00000	0	0.00000	12	0.00010	17	0.00014	0	0.00000	0	0.00000	0.00244
86	1	0.00001	11	0.00008	2	0.00001	0	0.00000	0	0.00000	0	0.00000	37	0.00026	32	0.00022	0	0.00000	0	0.00000	-
87	0	0.00000	-		6	0.00003	-		0	0.00000	-		14	0.00007	-		2	0.00001	-		-
Summary Statistics																					
Median	0	0.00000	6	0.00004	1	0.00001	0	0.00000	0	0.00000	0	0.00000	12	0.00010	25	0.00018	0	0.00000	0	0.00000	0.002436
Mean	0	0.00000	6	0.00004	1	0.00001	0	0.00000	0	0.00000	0	0.00000	16	0.00012	25	0.00018	0	0.00000	0	0.00000	0.002436
SD	1	0.00000	7	0.00005	1	0.00001	0	0.00000	0	0.00000	0	0.00000	19	0.00013	11	0.00006	0	0.00000	0	0.00000	0.000000
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of 35																					
Median	NC		831087		4324705		NC		NC		NC		360392		194952		NC		NC		
Lower 70%	NC		4324705		4324705		NC		NC		NC		360392		254394		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	24007642		1109847		2176762		NC		NC		NC		261000		170085		15894386		NC		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll
WCVI T:	West Coast Vancouver Island Troll
GS S:	Georgia Strait Sport
PSO N:	Puget Sound Other Net
PSN S:	Area 5,6,7 Sport
NCBC T:	North/Central BC Troll
GS T:	Georgia Strait Troll
WA T:	Washington Area 1,2,3,4,4B Troll
PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 32. Tagging history and use of the Makah National Fish Hatchery fall fingerling stock.

Hatchery - Makah National Fish Hatchery
Brood Source - Return to hatchery
Agency - USFWS
Release Type - Fingerling
Base Period Tagging - No
Escapement Data - Escapement is enumerated at the hatchery rack.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
_X_ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
__ Chinook Model

Comments - Survival rates for this stock have been poor. Data for this stock are of limited value to the CTC.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
051744	85	Makah NFH	Sooes	Sooes	86	5	570	35,827	
051745	85	Makah NFH	Sooes	Sooes	86	5	570	36,173	
051746	85	Makah NFH	Sooes	Sooes	86	5	570	35,914	
051747	85	Makah NFH	Sooes	Sooes	86	5	570	30,076	
051907R4	86	Makah NFH	Sooes	Sooes	87	5	550	127,387	
051950R3	87	Makah NFH	Sooes	Sooes	88	5	610	203,819	

Appendix Table 33. Estimated recoveries and contribution rates for the Makah National Fish Hatchery fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 259258

Brood Year	AK T-AGE 4		AK T-AGE 5		NCBC T-AGE 3		NCBC T-AGE 4		WCVI T-AGE 3		WCVI T-AGE 4		GS T-AGE 3		GS T-AGE 4		GS S-AGE 3		GS S-AGE 4		Survival
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
85	14	0.00010	6	0.00004	3	0.00002	0	0.00000	1	0.00001	3	0.00002	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00193
86	0	0.00000	-		1	0.00001	6	0.00005	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	-
87	-		-		14	0.00007	-		21	0.00010	-		0	0.00000	-		4	0.00002	-		-
Summary Statistics																					
Median	7	0.00005	6	0.00004	1	0.00001	3	0.00002	0	0.00000	2	0.00001	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.001929
Average	7	0.00005	6	0.00004	1	0.00001	3	0.00002	0	0.00000	2	0.00001	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.001929
SD	10	0.00007	0	0.00000	2	0.00001	4	0.00003	1	0.00000	2	0.00002	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.000000
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	689950		804942		4458545		1486182		NC		3219767		NC		NC		NC		NC		
Lower 70%	NC		804942		4458545		NC		NC		NC		NC		NC		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	1188317		402471		19589240		NC		2436157		5545477		NC		NC		14691929		NC		

Appendix Table 33. Estimated recoveries and contribution rates for the Makah National Fish Hatchery fall fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
85	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00193
86	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	-
87	2	0.00001		-	0	0.00000		-	0	0.00000		-	0	0.00000		-	0	0.00000		-	-
Summary Statistics																					
Median	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.001929
Mean	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.001929
SD	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.000000
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		NC		NC		NC		NC		NC		NC		NC		NC		
Lower 70%	NC		NC		NC		NC		NC		NC		NC		NC		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	29383858		NC		NC		NC		NC		NC		NC		NC		NC		NC		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll	NCBC T:	North/Central BC Troll
WCVI T:	West Coast Vancouver Island Troll	GS T:	Georgia Strait Troll
GS S:	Georgia Strait Sport	WA T:	Washington Area 1,2,3,4,4B Troll
PSO N:	Puget Sound Other Net	PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSN S:	Area 5,6,7 Sport	PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 34. Tagging history and use of the Queets River fall fingerling stock.

Release Site - Salmon River Ponds
Brood Source - Broodstock collection program
Agency - Quinault
Release Type - Fingerling
Base Period Tagging - Yes
Escapement Data - Escapement estimates are currently not available in the PSMFC database.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
__ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
__ Chinook Model

Comments - Broodstock is collected in the Queets and Clearwater rivers, eggs are incubated at the Lake Quinault Hatchery, eyed eggs are transferred to the Quinault National Fish Hatchery for incubation, rearing, and tagging, and fingerlings are transferred to the Salmon River Ponds for imprinting and release.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
050361	77	Quinault NFH	Queets	Salmon	78	7	1,243	32,934	
050520	78	Quinault NFH	Quinault	Salmon	79	6	1,107	27,201	
050521	78	Quinault NFH	Green X Samish	Salmon	79	6	887	26,200	
050522	78	Quinault NFH	Green X Samish	Salmon	79	6	887		Combine with 050521
050525	78	Quinault NFH	Queets	Salmon	79	6	657	44,633	
050661	79	Quinault NFH	Quinault X Queets	Salmon	80	8	1,680	16,829	
050830	80	Quinault NFH	Deschutes	Salmon	81	6	1,138	33,073	
050833	80	Quinault NFH	Queets	Salmon	81	6	825	47,617	
050962	81	Quinault NFH	Deschutes	Salmon	82	6	503	45,789	
051016	82	Quinault NFH	Queets	Salmon	82	8	503	35,701	
051425	82	Quinault NFH	Queets	Salmon	83	6	873	58,470	
211621	83	Quinault NFH	Queets	Salmon	84	7	1,032	98,684	
211908R4	85	Quinault NFH	Queets	Salmon	86	7	477	117,674	
212101R4	86	Salmon R Ponds	Queets	Salmon	87	7	1,746	199,013	
212835R4	87	Quinault NFH	Queets	Salmon	88	8	1,822	101,914	
213144R4	88	Salmon R Ponds	Queets	Salmon	89	8	1,261	132,135	

Appendix Table 35. Estimated recoveries and contribution rates for the Queets River fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 118059

Brood Year	AK T-AGE 4		AK T-AGE 5		NCBC T-AGE 3		NCBC T-AGE 4		WCVI T-AGE 3		WCVI T-AGE 4		GS T-AGE 3		GS T-AGE 4		GS S-AGE 3		GS S-AGE 4		Survival
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
77	7	0.00018	0	0.00000	3	0.00008	7	0.00018	0	0.00000	7	0.00018	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00380
78	28	0.00029	10	0.00010	11	0.00011	31	0.00032	5	0.00005	21	0.00021	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00563
79	35	0.00208	0	0.00000	15	0.00089	3	0.00018	6	0.00036	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.02037
80	20	0.00025	31	0.00038	2	0.00002	8	0.00010	3	0.00004	5	0.00006	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00621
81	15	0.00018	25	0.00031	4	0.00005	21	0.00026	6	0.00007	4	0.00005	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00424
82	11	0.00019	14	0.00024	3	0.00005	9	0.00015	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00468
83	132	0.00134	113	0.00115	22	0.00022	63	0.00064	21	0.00021	5	0.00005	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.02259
85	34	0.00029	59	0.00050	33	0.00028	26	0.00022	4	0.00003	23	0.00020	0	0.00000	0	0.00000	0	0.00000	0	0.00000	-
86	116	0.00058	-		33	0.00017	43	0.00022	26	0.00013	43	0.00022	0	0.00000	0	0.00000	0	0.00000	0	0.00000	-
87	-		-		10	0.00010	-		16	0.00016	-		0	0.00000	-		0	0.00000	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	28	0.00029	20	0.00027	8	0.00009	21	0.00022	5	0.00004	5	0.00006	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.005634
Average	44	0.00060	32	0.00033	13	0.00019	23	0.00025	7	0.00009	12	0.00011	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.009646
SD	46	0.00067	38	0.00037	13	0.00026	20	0.00016	9	0.00012	14	0.00009	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.008151
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	122544		128152		372146		161987		793817		564830		NC		NC		NC		NC		
Lower 70%	141208		146175		461172		196338		941383		690788		NC		NC		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	66404		135955		1708650		1928881		459575		215104		NC		NC		NC		NC		

Appendix Table 35. Estimated recoveries and contribution rates for the Queets River fall fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
77	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00380
78	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	4	0.00004	0	0.00000	0	0.00000	0	0.00000	0.00563
79	0	0.00000	1	0.00006	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.02037
80	0	0.00000	0	0.00000	2	0.00002	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00621
81	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00424
82	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	2	0.00002	0	0.00000	0	0.00000	0.00468
83	0	0.00000	3	0.00003	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.02259
85	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	3	0.00003	0	0.00000	0	0.00000	-
86	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	6	0.00005	4	0.00003	0	0.00000	0	0.00000	-
87	0	0.00000	-		0	0.00000	-		0	0.00000	0	0.00000	3	0.00002	0	0.00000	0	0.00000	0	0.00000	-
88	-		-		-		-		-		-		0	0.00000	-		0	0.00000	-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.005634
Mean	0	0.00000	0	0.00001	0	0.00000	0	0.00000	0	0.00000	0	0.00000	1	0.00001	1	0.00001	0	0.00000	0	0.00000	0.009646
SD	0	0.00000	1	0.00002	1	0.00001	0	0.00000	0	0.00000	0	0.00000	2	0.00002	2	0.00002	0	0.00000	0	0.00000	0.008151
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median	NC		NC		NC		NC		NC		NC		NC		NC		NC		NC		
Lower 70%	NC		NC		NC		NC		NC		NC		NC		NC		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	NC		6994691		9796287		NC		NC		NC		2877530		3069886		NC		NC		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll
WCVI T:	West Coast Vancouver Island Troll
GS S:	Georgia Strait Sport
PSO N:	Puget Sound Other Net
PSN S:	Area 5,6,7 Sport
NCBC T:	North/Central BC Troll
GS T:	Georgia Strait Troll
WA T:	Washington Area 1,2,3,4,4B Troll
PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 36. Tagging history and use of the Quinault National Fish Hatchery fall fingerling stock.

Hatchery - Quinault National Fish Hatchery
Brood Source - Return to hatchery and broodstock collection
Agency - USFWS
Release Type - Fingerling
Base Period Tagging - Yes
Escapement Data - Escapement counts are made at the hatchery. It is unclear at this time if the limited return to the hatchery is due to high in-river harvest rates or straying, or both.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
__ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
_X_ Chinook Model

Comments -

Tagging History:

Code	Brood Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
140402	74 Quinault NFH	Cook	Cook	75	8	2,495	25,228	
140502	74 Quinault NFH	Cook	Cook	75	6	873	14,634	
141402	74 Quinault NFH	Quinault X Willapa	Cook	75	6	757	20,294	
140310	75 Quinault NFH	Cook	Cook	76	6	1,009	13,744	
140410	75 Quinault NFH	Cook	Cook	76	8	1,974	15,203	
140510	75 Quinault NFH	Quinault X Willapa	Cook	76	6	1,009	18,475	
140610	75 Quinault NFH	Quinault X Willapa	Cook	76	8	1,974	17,377	
140710	75 Quinault NFH	Quinault X Nemah	Cook	76	6	1,948	14,445	
140810	75 Quinault NFH	Quinault X Nemah	Cook	76	7	1,974	14,601	
053501	76 Quinault NFH	Deschutes X Nemah	Cook	77	7	950	184,453	
053601	76 Quinault NFH	Cook	Cook	77	7	1,297	8,806	
050337	77 Quinault NFH	Cook	Cook	78	7	3,492	93,363	
050338	78 Quinault NFH	Cook	Cook	79	6	779	95,123	
050328	79 Quinault NFH	Cook	Cook	80	7	1,102	44,896	
050724	79 Quinault NFH	Cook	Cook	80	6	714	39,165	
050835	80 Quinault NFH	Cook	Cook	81	8	962	49,111	
050836	80 Quinault NFH	Cook	Cook	81	7	954	51,275	
051117	82 Quinault NFH	Cook	Cook	83	6	904	46,873	
051463	83 Quinault NFH	Cook	Cook	84	8	1,970	46,384	
211654	84 Quinault NFH	Quinault	Cook	85	8	1,182	51,943	
211904R4	85 Quinault NFH	Quinault	Cook	86	7	1,164	201,209	
212102R4	86 Quinault NFH	Quinault	Cook	87	7	1,109	200,006	
212550R4	87 Quinault NFH	Quinault	Cook	88	7	837	193,395	
213152R4	88 Quinault NFH	Quinault	Cook	89	7	800	38,928	
213501R4	88 Quinault NFH	Quinault	Cook	89	7	800	122,190	

Appendix Table 37. Estimated recoveries and contribution rates for the Quinault National Fish Hatchery fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 85360

Brood Year	AK T-AGE 4		AK T-AGE 5		NCBC T-AGE 3		NCBC T-AGE 4		WCVI T-AGE 3		WCVI T-AGE 4		GS T-AGE 3		GS T-AGE 4		GS S-AGE 3		GS S-AGE 4		Survival
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
75	59	0.00063	34	0.00036	50	0.00053	51	0.00054	70	0.00075	29	0.00031	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.01896
76	29	0.00015	0	0.00000	26	0.00013	37	0.00019	24	0.00012	24	0.00012	0	0.00000	0	0.00000	3	0.00002	0	0.00000	0.00601
77	11	0.00012	13	0.00014	23	0.00025	25	0.00027	14	0.00015	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00586
78	18	0.00019	6	0.00006	3	0.00003	19	0.00020	8	0.00008	7	0.00007	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00477
79	17	0.00020	4	0.00005	1	0.00001	12	0.00014	5	0.00006	7	0.00008	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00447
80	70	0.00070	20	0.00020	34	0.00034	56	0.00056	18	0.00018	58	0.00058	0	0.00000	0	0.00000	2	0.00002	0	0.00000	0.01662
82	27	0.00058	28	0.00060	8	0.00017	9	0.00019	5	0.00011	7	0.00015	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.01683
83	103	0.00222	51	0.00110	42	0.00091	70	0.00151	57	0.00123	77	0.00166	0	0.00000	0	0.00000	4	0.00009	0	0.00000	0.07499
84	48	0.00092	50	0.00096	37	0.00071	83	0.00160	19	0.00037	81	0.00156	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.06736
85	157	0.00078	147	0.00073	79	0.00039	151	0.00075	44	0.00022	53	0.00026	0	0.00000	0	0.00000	0	0.00000	0	0.00000	-
86	72	0.00036	-		11	0.00005	15	0.00007	6	0.00003	12	0.00006	0	0.00000	0	0.00000	0	0.00000	0	0.00000	-
87	-		-		3	0.00001	-		2	0.00001	-		0	0.00000	-		0	0.00000	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	48	0.00058	24	0.00028	25	0.00021	37	0.00027	16	0.00014	24	0.00015	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.016726
Average	56	0.00062	35	0.00042	26	0.00029	48	0.00055	23	0.00027	32	0.00044	0	0.00000	0	0.00000	1	0.00001	0	0.00000	0.024075
SD	44	0.00060	43	0.00040	24	0.00029	42	0.00054	23	0.00036	30	0.00060	0	0.00000	0	0.00000	1	0.00002	0	0.00000	0.025855
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of									35												
Median		60761		124659		167856		130708		255346		234365		NC		NC		NC		NC	
Lower 70%		97225		175676		205069		175227		281836		281836		NC		NC		NC		NC	
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%		104919		248740		799493		572274		212288		214769		NC		NC		7339704		NC	

Appendix Table 37. Estimated recoveries and contribution rates for the Quinault National Fish Hatchery fall fingerling stock (continued).

Brood Year	WA T-AGE 3 #	WA T-AGE 3 Rate	WA T-AGE 4 #	WA T-AGE 4 Rate	PSN N-AGE 3 #	PSN N-AGE 3 Rate	PSN N-AGE 4 #	PSN N-AGE 4 Rate	PSO N-AGE 3 #	PSO N-AGE 3 Rate	PSO N-AGE 4 #	PSO N-AGE 4 Rate	PSN S-AGE 3 #	PSN S-AGE 3 Rate	PSN S-AGE 4 #	PSN S-AGE 4 Rate	PSO S-AGE 3 #	PSO S-AGE 3 Rate	PSO S-AGE 4 #	PSO S-AGE 4 Rate	Survival Rate
75	3	0.00003	0	0.00000	2	0.00002	0	0.00000	0	0.00000	0	0.00000	7	0.00007	8	0.00009	0	0.00000	0	0.00000	0.01896
76	0	0.00000	4	0.00002	5	0.00003	0	0.00000	0	0.00000	0	0.00000	13	0.00007	7	0.00004	0	0.00000	0	0.00000	0.00601
77	6	0.00006	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	6	0.00006	0	0.00000	0	0.00000	0	0.00000	0.00586
78	0	0.00000	0	0.00000	0	0.00000	16	0.00017	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00477
79	0	0.00000	0	0.00000	3	0.00004	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00447
80	0	0.00000	5	0.00005	2	0.00002	0	0.00000	0	0.00000	0	0.00000	0	0.00000	13	0.00013	0	0.00000	0	0.00000	0.01662
82	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.01683
83	4	0.00009	2	0.00004	0	0.00000	0	0.00000	0	0.00000	0	0.00000	12	0.00026	10	0.00022	0	0.00000	0	0.00000	0.07499
84	0	0.00000	3	0.00006	1	0.00002	0	0.00000	0	0.00000	0	0.00000	0	0.00000	5	0.00010	0	0.00000	0	0.00000	0.06736
85	4	0.00002	2	0.00001	2	0.00001	0	0.00000	0	0.00000	0	0.00000	5	0.00002	17	0.00008	0	0.00000	0	0.00000	-
86	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	5	0.00002	0	0.00000	0	0.00000	-
87	0	0.00000	-		0	0.00000	-		0	0.00000	-		0	0.00000	-		0	0.00000	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	1	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	5	0.00004	0	0.00000	0	0.00000	0.016726
Mean	1	0.00002	1	0.00002	1	0.00001	1	0.00002	0	0.00000	0	0.00000	4	0.00004	6	0.00006	0	0.00000	0	0.00000	0.024075
SD	2	0.00003	2	0.00002	2	0.00001	5	0.00005	0	0.00000	0	0.00000	5	0.00007	6	0.00007	0	0.00000	0	0.00000	0.025855
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of 35																					
Median	NC		NC		7042315		NC		NC		NC		NC		966295		NC		NC		
Lower 70%	NC		NC		NC		NC		NC		NC		NC		1400042		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	2515585		4470380		2373623		1144449		NC		NC		1196244		1276389		NC		NC		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll
WCVI T:	West Coast Vancouver Island Troll
GS S:	Georgia Strait Sport
PSO N:	Puget Sound Other Net
PSN S:	Area 5,6,7 Sport
NCBC T:	North/Central BC Troll
GS T:	Georgia Strait Troll
WA T:	Washington Area 1,2,3,4,4B Troll
PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 38. Tagging history and use of the Humptulips Hatchery fall fingerling stock.

Hatchery - Humptulips
Brood Source - Return to hatchery and broodstock collection
Agency - WDF
Release Type - Fingerling
Base Period Tagging - No
Escapement Data - Escapement counts are made at the hatchery rack; however, significant straying is believed to occur. Escapements of the total hatchery escapement would be needed for continued PSC tagging to be useful.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
__ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
__ Chinook Model

Comments - Since fish are reared mainly on Humptulips River water and the hatchery is located on Stevens Creek, there is a high stray rate for which there is currently insufficient accounting.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
632257	82	Humptulips	Humptulips	Stevens	83	6	454	112,592	
633229	84	Humptulips	Humptulips	Stevens	85	6	295	59,334	
633230	84	Humptulips	Humptulips	Stevens	85	6	295	58,133	
633231	84	Humptulips	Humptulips	Stevens	85	6	295	58,430	
632842	85	Humptulips	Humptulips	Stevens	86	7	351	133,358	
634414R4	86	Humptulips	Humptulips	Stevens	87	7	493	201,468	
635235R4	87	Humptulips	Humptulips	Stevens	88	6	605	209,254	
635259R4	88	Humptulips	Humptulips	Stevens	89	7	698	206,735	

Appendix Table 39. Estimated recoveries and contribution rates for the Humptulips Hatchery fall fingerling stock.

Minimum Tagging Level Based on Hankin Cohort Size Criterion
Minimum Cohort Size: 500
Minimum Tagging Level: 57315

Brood Year	AK T-AGE 4 #	AK T-AGE 4 Rate	AK T-AGE 5 #	AK T-AGE 5 Rate	NCBC T-AGE 3 #	NCBC T-AGE 3 Rate	NCBC T-AGE 4 #	NCBC T-AGE 4 Rate	WCVI T-AGE 3 #	WCVI T-AGE 3 Rate	WCVI T-AGE 4 #	WCVI T-AGE 4 Rate	GS T-AGE 3 #	GS T-AGE 3 Rate	GS T-AGE 4 #	GS T-AGE 4 Rate	GS S-AGE 3 #	GS S-AGE 3 Rate	GS S-AGE 4 #	GS S-AGE 4 Rate	Survival Rate
82	33	0.00029	25	0.00022	1	0.00001	4	0.00004	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00872
84	9	0.00005	82	0.00047	7	0.00004	32	0.00018	2	0.00001	7	0.00004	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.01835
85	13	0.00010	89	0.00067	5	0.00004	16	0.00012	6	0.00004	4	0.00003	0	0.00000	0	0.00000	0	0.00000	0	0.00000	-
86	58	0.00029	-		0	0.00000	6	0.00003	7	0.00003	25	0.00012	0	0.00000	0	0.00000	5	0.00002	0	0.00000	-
87	-		-		0	0.00000	-		19	0.00009	-		0	0.00000	-		0	0.00000	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	23	0.00019	82	0.00047	1	0.00001	11	0.00008	2	0.00001	6	0.00003	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.013538
Average	28	0.00018	65	0.00045	3	0.00002	15	0.00009	3	0.00002	9	0.00005	0	0.00000	0	0.00000	1	0.00000	0	0.00000	0.013538
SD	22	0.00013	35	0.00022	3	0.00002	13	0.00007	3	0.00002	11	0.00005	0	0.00000	0	0.00000	2	0.00001	0	0.00000	0.006808
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of 35																					
Median	181644		75078		3940720		450148		3078198		1003002		NC		NC		NC		NC		
Lower 70%	359041		75078		3940720		985180		3078198		1166883		NC		NC		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	140307		73454		14925327		28850284		1703669		755454		NC		NC		7341998		NC		

Appendix Table 39. Estimated recoveries and contribution rates for the Humptulips Hatchery fall fingerling stock (continued).

Brood Year	WA T-AGE 3		WA T-AGE 4		PSN N-AGE 3		PSN N-AGE 4		PSO N-AGE 3		PSO N-AGE 4		PSN S-AGE 3		PSN S-AGE 4		PSO S-AGE 3		PSO S-AGE 4		Survival
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Rate
82	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.00872
84	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.01835
85	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	-
86	2	0.00001	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	4	0.00002	0	0.00000	0	0.00000	0	0.00000	-
87	0	0.00000	-		0	0.00000	-		0	0.00000	-		0	0.00000	-		0	0.00000	-		-
88	-		-		-		-		-		-		-		-		-		-		-
Summary Statistics																					
Median	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0.013538
Mean	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	1	0.00000	0	0.00000	0	0.00000	0	0.00000	0.013538
SD	1	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	0	0.00000	2	0.00001	0	0.00000	0	0.00000	0	0.00000	0.006808
Minimum Fishery Specific Tagging Based On Minimum Recoveries Of 35																					
Median	NC		NC		NC		NC		NC		NC		NC		NC		NC		NC		
Lower 70%	NC		NC		NC		NC		NC		NC		NC		NC		NC		NC		
Minimum Fishery Specific Tagging Based On CTC Cohort Criterion																					
Lower 95%	18354996		NC		NC		NC		NC		NC		9177498		NC		NC		NC		

NC = Not Computed

Fisheries:

AK T:	Alaska Troll
WCVI T:	West Coast Vancouver Island Troll
GS S:	Georgia Strait Sport
PSO N:	Puget Sound Other Net
PSN S:	Area 5,6,7 Sport
NCBC T:	North/Central BC Troll
GS T:	Georgia Strait Troll
WA T:	Washington Area 1,2,3,4,4B Troll
PSN N:	Area 4B,5,6,6A,6C,7,7A Net
PSO S:	Area 8,9,10,11,12,13 Sport

Appendix Table 40. Tagging history and use of the Percival Cove (Deschutes Complex) and Coulter Creek Hatchery fall yearling stock.

Hatchery - Percival Cove and Coulter Creek
Brood Source - Return to hatchery.
Agency - WDF
Release Type - Yearling
Base Period Tagging - Yes
Escapement Data - Complete enumeration occurs at a trapping site located in the Deschutes River; there is no accounting for straying below the trap.

Current Use of Data:
_X_ Fishery or Stock Harvest Rate Index
_X_ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
_X_ Chinook Model

Comments - Tagging was discontinued and replaced with the Squaxin Net Pen tagging program.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
632004	78	Deschutes	Hood Canal X Green	Capitol Lake	80	3	3,780	48,196	
632019	79	Deschutes	South Sound	Capitol Lake	81	3	15,120	30,929	
632054	79	Coulter	Big Soos	Coulter	81	3	6,480	8,383	
632055	79	Coulter	Deschutes	Coulter	81	3	6,480	9,696	
632056	79	Coulter	Deschutes + Minter	Coulter	81	3	6,480	8,681	
H10204	79	Coulter	Big Soos	Coulter	81	3	7,560	9,095	
632248	80	Coulter	Big Soos	Coulter	82	2	5,040	17,770	
632302	80	George Adams	South Sound X Hood Canal	Capitol Lake	82	5	1,972	57,684	
632308	80	Deschutes	South Sound X Hood Canal	Capitol Lake	82	5	6,048	23,020	
632147	81	Deschutes	South Sound	Capitol Lake	83	5	4,877	28,997	
632360	81	Deschutes	South Sound	Capitol Lake	83	5	4,877	21,218	
634959R6	86	Deschutes	South Sound	Capitol Lake	88	4	11,063	38,977	

Appendix Table 41. Tagging history and use of the Squaxin Island Pens fall yearling stock.

Hatchery - Squaxin Net Pens
Brood Source - Return to Deschutes Hatchery.
Agency - WDF
Release Type - Yearling
Base Period Tagging - No
Escapement Data - Escapement will be difficult to estimate because straying over many streams is likely.

Current Use of Data:
__ Fishery or Stock Harvest Rate Index
__ Brood Exploitation Rate Analysis
_X_ Catch Distribution
_X_ Survival
__ Chinook Model

Comments - This program is difficult to evaluate because of its limited duration.

Tagging History:

Code	Brood	Hatchery	Stock	Release Site	Year	Month	Weight in centigrams	Number Tagged	Comments
634162R3	86	S Sound Net Pens	Deschutes	Peale	88	4	11,063	133,528	
634202R3	87	S Sound Net Pens	Deschutes	Peale	89	4	10,080	144,032	
635244R3	88	S Sound Net Pens	Deschutes	Peale	90	4	7,316	146,359	