

1999-2000 WINTER AND SUMMER
STEELHEAD FORECASTS
AND
MANAGEMENT RECOMMENDATIONS

Section I - Tributaries to the Strait of Juan de Fuca
(Other Than the Elwha River)

Section II - Elwha River

Section III - Tributaries to Hood Canal

Joint Report Prepared by:

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1. Strait of Juan de Fuca Tributaries (Other than the Elwha River)

1.1 Management Periods

The management periods indicated in this report define the time interval during which regulatory actions are directed to meeting conservation and allocation needs of steelhead runs while taking into account catches (actual or expected) of steelhead made outside the management periods. Since many runs extend over lengthy periods of time and only a small portion of the population of each run is available at the extremes of its run timing, it is impractical to exercise directed management for nonselective fisheries on these portions of runs while continuing harvests of other species. However, effort should be spread throughout the management periods to achieve escapement and catch from all segments of the run. The following management periods have been identified for each area:

Winter Steelhead

Dungeness River
Discovery Bay and Sequim Bay Tributaries
Hoko River and Sekiu River
Other Strait Tributaries

Management Periods

December 12 through April 14
November 28 through March 31
December 5 through March 31
November 28 through April 14

Summer Steelhead

Dungeness River
Lyre River, Morse Creek

Management Periods

May 25 through August 24
June 8 through September 5

Management periods for winter and summer steelhead in streams along the Strait of Juan de Fuca were estimated on the basis of historical harvest patterns of the recreational fishery and have been adjusted to minimize overlaps with the management periods of other species. Catch accounting periods for all fisheries in the Strait of Juan de Fuca rivers and streams are November 1 - April 30 for winter run steelhead and May 1 - October 31 for summer run steelhead.

1.2 Run Size Forecasts

Run size estimates are approximate and used only for the purpose of estimating harvestable numbers for the 1999-00 fishery.

Winter Steelhead

Treaty net fisheries have generally been targeted at hatchery reared recruits which are expected to return primarily from December through February. To calculate estimated run size each year, the estimated harvests were adjusted for an assumed harvest rate of 90 percent for treaty net fisheries and 70 percent for recreational fisheries. The run size forecasts for the December through February portion of the run (Tables 1 and 2) are based on steelhead harvests and estimated run sizes from past years. Even though data for more years is available, only the past five years were used to estimate the run size forecast because these years best represent the current trend in survival.

Table 1 shows winter steelhead run size forecasts for Strait of Juan de Fuca rivers (excluding the Elwha River) during the December through February portion of the run. These forecasts do not represent the total anticipated steelhead return to each river system. For example, most of the wild winter steelhead return during March, April, and May. These wild steelhead are not included in the run size forecasts in Table 1. These forecasts will not be further modified in-season unless agreed to by all affected parties. Fish originating from hatchery smolts stocked, as well as natural runs, were forecast as the estimated mean run size in each river from 1994-95 through 1998-99 (Appendix Tables A.1 to A.12). The method of forecasting adult returns from number of hatchery smolts stocked was not used for this region because no significant relationship has been found between number of hatchery smolts stocked and subsequent landed harvest levels. In the Hoko River the forecast was estimated as the mean run size of the last five years, reconstructed by adding harvest and escapement estimates in each year (Appendix Table A.11).

River	Stock	Run Size
Dungeness River	Natural and Hatchery	170
Morse Creek	Natural and Hatchery	191
Lyre River	Natural and Hatchery	928
East Twin River	Natural	16
West Twin River	Natural	12
Salt Creek	Natural	9
Deep Creek	Natural	7
Pysht River	Natural and Hatchery	287
Clallam River	Natural and Hatchery	86
Hoko River	Natural and Hatchery	1,247
Sekiu River	Natural and Hatchery	87
Total:		3,040

Summer Steelhead

Table 2 shows summer steelhead run size forecasts for Strait of Juan de Fuca rivers. These forecasts do not represent the total anticipated steelhead return to each river system. For the Lyre River, expected return to harvest was estimated from the number of smolts stocked and the mean age specific return rates for the last five available smolt years. Based on age composition information provided by WDFW for Kalama River summer steelhead, an assumed age composition of 3.8 percent age 2, 78.8 percent age 3, and 14.6 percent age 4+ was used and other age groups and repeat spawners were accounted for by dividing the estimated return by 0.972. For Lyre River summer steelhead, total run size was estimated by dividing the expected return to harvest by an estimated maximum harvest rate of 0.80 (Appendix Table A.15). This method was discontinued this season for Dungeness summer steelhead since no hatchery summer steelhead smolts have been stocked since 1995 (Appendix Table A.13a).

For summer steelhead in the Dungeness River and Morse Creek, run size forecast is the mean of the estimated run sizes from the 1994 through 1998 seasons. The run size for each season was estimated by dividing the total harvest for each year by an estimated maximum harvest rate of 0.70 (Appendix Tables A.13b and A.14).

River	Stock	Run Size
Dungeness River	Natural	29
Morse Creek	Natural	6
Lyre River	Natural and Hatchery	88
Total:		123

1.3 Harvest and Escapement

No escapement goals have been agreed to between WDFW and the Tribes for any runs of winter or summer steelhead returning to natural spawning areas in tributaries to the Strait of Juan de Fuca. Wild steelhead spawner escapement has been monitored in several Strait of Juan de Fuca streams (Appendix Table A.16).

The treaty and non-treaty harvestable shares of steelhead have been computed by halving the total harvest forecast using allowable harvest rates (summer and winter) in each system. The harvest forecast is calculated by applying an 80 percent harvest rate to the run size forecast. The 80 percent harvest rate is appropriate whenever the harvest rate is to be shared equally, with the recreational fishery exerting a maximum harvest rate of 70 percent and the commercial fishery a maximum harvest rate of 90 percent [(Appendix Table A.1) and [Appendix Table C.1(Hood Canal)]. Tribes in the Point No Point Treaty Area and the Makah Treaty Area intend to harvest their share of summer steelhead during the winter steelhead management period. If the treaty share of summer steelhead is taken during the winter steelhead season, no treaty fisheries directed at summer steelhead should occur. In accordance with prior agreements with the WDFW, a maximum of 65 fish of the Pysht River Treaty Indian share may be taken during the winter fishery in Pysht Bay. The number of harvestable winter and summer steelhead for each system is shown in Table 3 and the expected harvest by Treaty Indian fisheries and non-treaty (recreational) fisheries is shown in Table 4. The number of harvestable winter steelhead in the Hoko River was estimated by applying the mean exploitation rate for the 1984-85 through 1998-99 return years (excluding 1990-91) to the 1999-00 forecasted run size (Appendix Table A.11).

1.4 Management Recommendations

For winter steelhead, there is uncertainty regarding the status of some wild stocks and the run timing of naturally reared steelhead in tributaries of the Strait of Juan de Fuca. Limited available information indicates that the catch after the end of February is comprised primarily of naturally reared steelhead. In order to provide additional protection for that portion of the run, commercial net and consumptive recreational fisheries should be prohibited after February 28. In streams where returns from hatchery smolts are expected, fisheries should be regulated to harvest, prior to March 1, the number of fish indicated in Table 3. This management strategy will provide for the harvest of hatchery steelhead while protecting from harvest wild steelhead entering the streams after March 1. In addition, wild steelhead release regulations have been in effect for recreational fisheries from June 1 through February 28 in the Dungeness River since the 1993-94 season, in Morse Creek since the 1994-95 season, and in Salt Creek, Lyre River, East Twin River, and West Twin River since the 1996-97 season. Deep Creek will again be closed to steelhead fishing for the 1999-00 season due to severe habitat degradation caused by a landslide into the stream.

For summer steelhead, the management period overlaps the spring/summer chinook management period in the Dungeness River. During that period, non-selective fisheries should remain closed. It is also recommended that no wild summer steelhead harvest be permitted in Morse Creek, because of the extremely low anticipated return. In order to minimize recreational fishery impacts to wild summer steelhead, wild steelhead release regulations have been in effect in all freshwater areas since 1992 and in all marine areas since 1993.

River	Winter	Summer	Total	50% Share
Dungeness River	136	0	136	68
Morse Creek	152	0	152	77
Lyre River	742	71	813	407
East Twin River	13		13	7
West Twin River	9		9	5
Salt Creek	7		7	4
Deep Creek	0		0	0
Pysht River	229		229	115
Clallam River	69		69	35
Hoko River	529		529	265
Sekiu River	69		69	35
Totals:	1,956	71	2,026	1,018

River	Treaty Indian Harvest			Non-Treaty Harvest		
	Winter	Summer	Totals	Winter	Summer	Totals
Dungeness River	68		68	68	0	68
Morse Creek	77	0	77	77	0	77
Lyre River	407	0	407	336	71	407
East Twin River	7		7	7		7
West Twin River	5		5	5		5
Salt Creek	4		4	4		4
Deep Creek	0		0	0		0
Pysht River	115		115	115		115
Clallam River	35		35	35		35
Hoko River	265		265	265		265
Sekiu River	35		35	35		35
Totals:	1,018	0	1,018	947	71	1,018

1.5 Spawner Surveys

Steelhead spawner escapement should be monitored in Strait of Juan de Fuca streams. Wild steelhead spawner surveys and escapement estimates have been made on Snow Creek, Dungeness River, Morse Creek, Salt Creek, Lyre River, East Twin River, West Twin River, Deep Creek, Pysht River and Hoko River (Appendix Table A.16). Surveys on these streams should be continued. However, past spawner surveys have been limited to periods after March 1 in most seasons. For the 1999-00 season, it is recommended that spawner surveys during begin during January or early February on Morse Creek and the Pysht River to better estimate steelhead spawn timing and spawner escapement. These streams often flood during the recommended spawner survey period and the amount of information collected will depend on suitable river conditions.

2. Elwha River

2.1 Management Periods

The management periods described in this report define the time interval during which regulatory actions will be directed to meet conservation and allocation needs of steelhead runs while taking into account catches (actual or expected) of steelhead made outside of these management periods. The management periods are intended to encompass the majority of the historical run timing of the target species. However, many runs extend over lengthy periods of time while only a small portion of the population of each run is available at the extremes of its run timing. Therefore, it is impractical to exercise directed management for nonselective fisheries on these portions of runs while continuing harvests of other species or stocks. To achieve escapement and limit impacts on any particular segment of the runs, effort should be spread throughout the management periods.

<u>Fishery</u>	<u>Management Period</u>
Winter Steelhead	December 12 through April 14
Summer Steelhead	June 8 through September 5

Management periods for winter and summer steelhead in the Elwha River were estimated on the basis of the historical harvest pattern of the sport fishery.

Catch accounting periods for all fisheries in the Elwha River are November 1 - April 30 for winter run steelhead and May 1 - October 31 for summer run steelhead.

2.2 Run Size Forecast

2.2.1 Winter Steelhead

Table 5 1999-00 Elwha River Winter Steelhead Forecast		
River	Stock	Run size
Elwha River	Natural and Hatchery	2,672

The total forecast return of 2,672 Elwha River winter steelhead was derived from a separate hatchery reared forecast return of 2,519 winter steelhead and a naturally reared forecast return of 153 winter steelhead (Table 6). These estimates were developed utilizing information from prior seasons' fisheries and numbers of hatchery smolts released.

The hatchery reared forecast return of 2,441 age 3 and age 4 fish (Table 6) was based on a return of 1,954 age 3 fish (160,188 smolt year 1998 releases and a mean age 3 return rate of 0.0122) and 487 age 4 fish (135,145 smolt year 1997 releases and a projected age 4 return rate of 0.0036). The resulting total was then divided by 0.9690 to account for other hatchery age classes (Table 7), providing a total hatchery origin forecast return of 2,519 fish (Table 6).

The hatchery reared forecast return was calculated as:

Hatchery Forecast Return =

$$[(\text{Mean Age 3 return rate}) * (\text{Smolt release during 1996 smolt year}) + (\text{Projected Age 4 return rate}) * (\text{Smolt release during 1995 smolt year})] / 0.9690.$$

It should be noted that in prior years age 4 returns were estimated via a quadratic relation between age 4 and age 3 return rates. Scale data from last years' fishery will be available when samples are analyzed.

The naturally reared forecast return of 153 fish (Table 6) was based on a five year average of the estimated natural returns for return years 1992-93 through 1996-97 (Table 8).

The naturally reared component and the hatchery reared component of each years' run were estimated as follows. First the historical total run size estimate (natural and hatchery fish) for each of the prior seasons was determined by dividing the combined harvest (sport, commercial, ceremonial, and subsistence) by 0.9 (assumed maximum harvest rate of fish escaping to spawn naturally) and adding hatchery rack returns.

Second, the historical naturally reared component for each years' total run (Table 8) was estimated using scale data collected from the commercial fishery during each season from 1982-83 through 1996-97 and an estimate of the 'completeness' of the natural run on the last sample date (Table 9), using the equation:

$$N = \frac{P_i * C}{H * T_i}$$

where:

- P_i = cumulative proportion of the commercial catch estimated to be naturally reared;
- C = commercial catch;
- H = commercial harvest rate; and,
- T_i = cumulative proportion of the commercial catch (proportion of the natural run complete on the last day of the commercial season).

Third, the historical hatchery component of the run was estimated by simply subtracting the natural component from the total run size. The results of this analysis are shown in Table 9. Table 10 shows the estimated run timing for naturally reared Elwha winter steelhead used to calculate T_i above.

During the 1995-96 season, the tribal hatchery blocked entry of fish into the hatchery following the week ending January 20, 1996. However, a large number of fish were still in the system. It is expected that the true harvest rate in 1995-96 was lower than the assumed 90% level. It is strongly recommended that State and Tribal managers consider options for estimating actual harvest rates in future years.

Table 6 1999-00 Elwha River Winter Steelhead Forecast by Age Group			
Cohort	Smolts Released	Projected Return Rate	Estimated Return
Age 3	160,188	0.0122	1,954
Age 4	135,145	0.0036	487
Subtotal			2,441
Proportion of Age 3 and Age 4 hatchery return (from Table 7):			0.9690
Total hatchery run forecast:			2,519
Average natural run size (from Table 8):			153
Total run size forecast:			2,672

Table 7 Age Composition of Elwha River Hatchery-reared Winter Steelhead				
Return Year	Age 3	Age 4	Others	Sample Size
1982-83	0.622	0.352	0.026	384
1983-84	0.783	0.175	0.041	314
1984-85	0.909	0.070	0.021	1,005
1985-86	0.799	0.172	0.029	732
1986-87	0.682	0.258	0.061	264
1987-88	0.806	0.177	0.017	526
1988-89	0.177	0.783	0.040	576
1989-90	0.866	0.128	0.009	335
1990-91	0.553	0.431	0.019	295
1991-92	0.324	0.568	0.108	53
1992-93	0.602	0.364	0.034	88
1993-94	0.957	0.043	0.000	115
1994-95	0.736	0.220	0.044	252
1995-96	0.757	0.222	0.020	342
1996-97	0.854	0.146	0.000	48
Mean	0.695	0.274	0.031	

Table 8
Computation of Return Rates Used to Predict Hatchery-Reared Winter Steelhead
Returning to the Elwha River

Return Year	Total Run	Wild Run	Hatchery Run	Smolt Year	Smolt Release	Age 3 Return	Age 3 Return Rate	Age 4 Return	Age 4 Return Rate
				1979	30,000			521	0.0174
1981-82 ^a	2,907	643	2,264	1980	51,000	1,758	0.0345	561	0.0110
1982-83	2,243	647	1,596	1981	66,400	993	0.0150	532	0.0080
1983-84	3,590	554	3,036	1982	63,600	2,379	0.0374	366	0.0058
1984-85	6,085	835	5,250	1983	86,300	4,775	0.0553	658	0.0076
1985-86	4,655	834	3,821	1984	95,600	3,054	0.0319	785	0.0082
1986-87	3,542	493	3,049	1985	89,950	2,079	0.0231	741	0.0082
1987-88	4,690	499	4,191	1986	118,800	3,378	0.0284	1963	0.0165
1988-89	2,923	416	2,507	1987	73,630	444	0.0060	311	0.0042
1989-90	2,707	286	2,421	1988	88,174	2,096	0.0238	575	0.0065
1990-91	1,483	148	1,335	1989	118,611	738	0.0062	249	0.0021
1991-92	998	560	438	1990	46,065	142	0.0031	278	0.0060
1992-93	836	70	766	1991	90,997	461	0.0051	70	0.0008
1993-94	1,834	225	1,609	1992	83,500	1,539	0.0184	697	0.0083
1994-95	3,434	270	3,164	1993	229,146	2,328	0.0102	444	0.0019
1995-96	2,046	47	1,999	1994	92,436	1,514	0.0164	173	0.0010
1996-97	1,337	153	1,184	1995	94,000	1,011	0.0108		
				1996	170,055				
Means:		153 ^d				Avg:	0.0122	Avg:	0.0036

- a) 1981-82 wild run size estimate is based on the average of the following five years.
b) Age 3 average return rate is based on the smolt years 1991 through 1995.
c) Age 4 average return rate is based on the smolt years 1990-95.
d) Average of 1992-93 through 1996-97 return years.

Table 9
Calculation of Naturally Reared Elwha River Winter Steelhead Return
 $N = (P * C) / (H * T)$

Year	Total Run ¹	Treaty Commercial Harvest (C)	Commercial Rate (H)	Number Aged ²	Wild Fish ³	Proportn Wild (P)	Wild Run Completed (T) ⁴	Wild Run Estimate (N)
1982-83	2,243	1,088	0.485	230	13	0.057	0.196	647
1983-84	3,590	1,582	0.441	168	10	0.060	0.386	554
1984-85	6,085	1,857	0.305	416	31	0.075	0.543	835
1985-86	4,655	2,767	0.594	695	86	0.124	0.691	834
1986-87	3,542	2,546	0.719	185	15	0.081	0.583	493
1987-88	4,690	1,760	0.375	470	26	0.055	0.520	499
1988-89	2,923	1,078	0.369	455	24	0.053	0.371	416
1989-90	2,707	1,605	0.593	357	22	0.062	0.583	286
1990-91	1,483	823	0.555	317	22	0.069	0.695	148
1991-92	998	423	0.424	53	16	0.302	0.538	560
1992-93	836	242	0.289	25	1	0.040	0.479	70
1993-94	1,847	809	0.438	125	10	0.080	0.656	225
1994-95	3,434	1,179	0.343	152	9	0.059	0.754	270
1995-96	2,046	995	0.486	188	3	0.016	0.695	47
1996-97	1,337	575	0.430	52	4	0.077	0.674	153

1. Total run = ((Sport + Commercial + C&S) / 0.9) + hatchery escapement.
2. Number of fish in commercial net fishery with readable scales.
3. Number of wild fish (aged 2.x.x or 2+.x.x) from (2).
4. Proportion of wild run completed as estimated from historical sport catch data (See Table 10).

Table 10
Estimated Run Timing of Elwha River Naturally Reared Winter Steelhead

	Month							Total
	Nov	Dec	Jan	Feb	Mar	Apr	May	
Avg Sport Catch	6	235	278	198	265	231	16	1,229
Proportion	0.005	0.191	0.226	0.161	0.216	0.188	0.013	
Cum. Prop.	0.005	0.196	0.422	0.583	0.799	0.987	1.000	

The run timing of the natural winter run of steelhead to the Elwha River was estimated from sport catches in years in which the return from stocked fish was minimal. Years included are 1961-62 through 1965-66.

2.2.2 Summer Steelhead

River	Stock	Run size
Elwha River	Hatchery/Natural	81

The 1998 summer steelhead run size was forecast as the estimated steelhead adult return adjusted by an assumed maximum harvest rate (Appendix Table B.1). The number of hatchery steelhead adults returning to harvest was estimated (1) using the mean return-to-harvest rate, by age group, for hatchery smolts released during smolt years 1987 through 1994; (2) an assumed adult age composition of 3.8% aged 2, 78.8% age 3, and 14.6% age 4 based on information for summer steelhead in the Kalama River supplied by WDFW; and (3) the number of adults in other age groups and repeat spawners were accounted for by dividing this estimate by 0.972. The return to harvest estimate of summer steelhead represents the average number of fish available for harvest, not the total run size. The total return was estimated by dividing the expected return to harvest by an assumed maximum recreational harvest rate of 0.70, resulting in the 2000 forecast of 81 fish (Table 11). Historically, approximately 85% of the harvest was taken in the recreational fishery.

2.3 Harvest and Escapement

Harvestable			Treaty Share			Non-Treaty Share		
Winter	Summer	Total	Winter	Summer	Total	Winter	Summer	Total
2270	57	2,327	1,146	17	1,163	1,123	40	1,163

No escapement goals for natural spawning areas have been agreed to for winter or summer steelhead in the Elwha River. A total of 150 winter steelhead will be required for broodstock at the Elwha Hatchery. The number of harvestable winter steelhead in the Elwha River was computed by multiplying the estimated run size, after subtracting hatchery escapement requirements of 150, by an expected harvest rate of 90 percent, resulting in 2,270 fish. This harvest rate should provide sport fishermen with an opportunity to harvest the non-treaty share of winter steelhead if the commercial fishery is dispersed in time. The harvestable number of summer steelhead was estimated from the run size of fish multiplied by the assumed harvest rate of 0.70.

The treaty and non-treaty shares of steelhead were computed by halving the total number of harvestable fish (summer and winter) for the Elwha River. The Lower Elwha S'Klallam Tribe intends to harvest the majority of its share of all steelhead during the winter steelhead management period. The remainder (17 summer steelhead) will be reserved for anticipated incidental and summer recreational harvests in tribal fisheries. If the targeted treaty share of summer steelhead is taken during the winter steelhead season, no treaty net fisheries directed at summer steelhead should occur. The number of harvestable fish and preseason estimates of shares are given in Table 12.

2.4 Management Recommendations

During the November-January fishing period, commercial net fisheries should be scheduled to secure a minimum of 23 landings (historic minimum number of landings during the update period), during the evaluation or update period (November 1 - January 15). Information from these fisheries will be used to update the preseason run size estimate. Thereafter, tribal net fisheries should be periodic, with intervening closures of sufficient duration to provide each party with an adequate opportunity to harvest its share. Fisheries should also be scheduled at widely spread intervals, in order to avoid preemption of recreational opportunity as the run comes in.

The 1999-00 management period for winter steelhead does not overlap the management period for fall chum which ends December 11. Treaty net fisheries should not occur prior to the end of the chum management period, as the chum salmon escapement needs should receive priority. Additionally, following the end of the chum management period, area closures for steelhead fishing should be considered if escapement surveys show significant numbers of chum salmon remain in the river.

To protect an expected low return of wild steelhead, the WDFW and Lower Elwha Tribe have agreed that the Elwha River, from the mouth to the Aldwell Lake Dam, will close to all recreational angling for game fish on February 29, 2000. The Lower Elwha Tribe will cease net fishing by February 29, 2000. Wild steelhead release regulations are in effect for recreational fisheries during the 1999-00 season since most hatchery steelhead returning to the river have been marked with clipped adipose fins. This management strategy will provide for the harvest of hatchery steelhead while protecting wild steelhead from harvest.

The 2000 management period for summer steelhead overlaps the management period for spring chinook. In order to protect spring chinook, which are expected to return below escapement needs, non-selective fisheries should remain closed during the spring chinook management period. It also overlaps the management period for summer/fall chinook salmon. During that period, non-selective fisheries should be targeted to meet summer/fall chinook management objectives while taking appropriate measures to minimize any unnecessary harvest of summer steelhead.

2.5 In-season Update

Prior to January 15, or until sufficient fisheries occur, the preseason forecast will be used to manage the Elwha River steelhead fishery. Fisheries will be considered sufficient when there has been a minimum of 23 landings. Given sufficient fisheries, the cumulative steelhead net catch and landings from November 1 thru January 15 will be used to update the run size, assuming that the observed catch is within the historic data range (Table 13). The following equation using run size and catch data for winter fisheries of 1987-88 through 1996-97 was used to derive the steelhead in season update of abundance for the Elwha River:

$$N = 172.6675 + 3.4726 * (\text{Catch})$$

where: N = Runsize,

Catch = Cumulative steelhead net catch from November 1 through January 15

For the above inseason update model (Table 13) the coefficient of multiple determination (R^2) was 0.888, the square root of the mean square error (σ) was 429.9 and the F test p value for the significance of the regression model was 4.49E-05. If the observed cumulative catch in 1999-00 is outside the historic data range, then the updated run size will be developed by agreement of the parties using all available information.

Table 13
Historical data used for the Elwha River Steelhead In Season Update Model

Return Year	Preseason Forecast	Commercial Catch (11/1 - 01/15)	Commercial Landings (11/1 - 01/15)	Run Size	Hindcasting Prediction
1987-88	5,610	1,144	204	4,690	4,169
1988-89	4,211	699	117	2,923	2,625
1989-90	3,892	897	170	2,707	3,264
1990-91	3,038	528	95	1,483	1,994
1991-92	2,754	223	42	998	914
1992-93	2,076	113	23	836	525
1993-94	1,760	481	56	1,834	1,931
1994-95	4,322	864	64	3,434	3,482
1995-96	2,891	693	40	2,046	2,579
1996-97	2,093	279	24	1,337	1,142

Tributaries to Hood Canal

3.1 Management Periods

The management periods indicated in this report define the time interval during which regulatory actions are directed to meeting conservation and allocation needs of steelhead stocks while taking into account catches (actual or expected) of steelhead made outside of the management periods. Since many runs extend over lengthy periods of time and only a small portion of the population of each run is available at the extremes of its run timing, it is impractical to exercise directed management for nonselective fisheries on these portions of runs while continuing harvests of other species or stocks. Effort should be spread throughout the management periods to achieve escapement and catch from all segments of the run.

Winter Steelhead

<u>Area</u>	<u>Management Period</u>
Area 9A	December 5 through March 31
Hood Canal Rivers	December 5 through April 8

Management periods for winter steelhead were established by reviewing historical information on the timing of recreational catches. The end of the management period was adjusted to match the beginning of the spring chinook management period.

Summer Steelhead

<u>Area</u>	<u>Management Period</u>
Dosewallips River	June 1 through September 15
Duckabush River	June 1 through September 15
Skokomish River	June 1 through August 22

Summer-run steelhead management periods for the Dosewallips River, Duckabush River, and the Skokomish River were established on the basis of historical harvest patterns by recreational fisheries to include approximately the central 80 percent of the run distribution. Catch accounting periods for all fisheries in Hood Canal rivers and streams are November 1 - April 30 for winter run steelhead and May 1 - October 31 for summer run steelhead.

3.2 Run Size Forecasts

Run size estimates are approximate and used only for the purpose of estimating harvestable numbers for the 1999-2000 fishery.

Winter Steelhead

Treaty net fisheries have generally been targeted at hatchery reared recruits which are expected to return primarily from December through February. To calculate estimated run size each year, the estimated harvests were adjusted for an assumed harvest rate of 90 percent for treaty net fisheries and 70 percent for recreational fisheries. The run size forecasts for the December through February portion of the run (Tables 1 and 2) are based on steelhead harvests and estimated run sizes from past years. Even though data for more years is available, only the past five years were used to estimate the run size forecast because these years best represent the current trend in survival.

Table 14 shows winter steelhead run size forecasts for Hood Canal rivers during the December through February portion of the run. These forecasts do not represent the total anticipated steelhead return to each river system. For example, most of the wild winter steelhead return during March, April, and May; these wild steelhead are not included in the run size forecasts in Table 14. These forecasts will not be further modified in-season unless agreed to by all affected parties. Fish originating from hatchery smolts stocked, as well as natural runs, were forecast as the estimated mean run size in each river based on steelhead harvests from 1994-95 through 1998-99 (Appendix Tables C.1 through C.9). The method of forecasting adult returns from number of hatchery smolts stocked was not used for this region because no significant relationship has been found between number of hatchery smolts stocked and subsequent harvest levels.

Table 14
1999-2000 Hood Canal Winter Steelhead Run Size Forecast

River	Stock	Run Size
Big Quilcene River	Natural	6
Dosewallips River	Natural and Hatchery	10
Duckabush River	Natural and Hatchery	11
Hamma Hamma River	Natural	0
Dewatto River	Natural	0
Skokomish River	Natural and Hatchery	28
Tahuya River	Natural	8
Union River	Natural	3
Total:		66

Summer Steelhead

Table 15 shows summer steelhead run size forecasts for Hood Canal rivers. These forecasts do not represent the total anticipated steelhead return to each river system. Run size of summer steelhead during 2000 was predicted using the mean harvest in the years 1994 through 1998. Run size in the Dosewallips River, Duckabush River, and the Skokomish River, where there was no treaty net catch during that period, was estimated by dividing the recreational catch by an assumed maximum harvest rate of 0.70 (Appendix Tables C.10 to C.12).

Table 15
2000 Hood Canal Summer Steelhead Run Size Forecast

River	Stock	Run Size
Dosewallips River	Natural	3
Duckabush River	Natural	4
Skokomish River	Natural	13
Total:		20

3.3 Harvest and Escapement

No escapement goals have been agreed to between WDFW and the Tribes for any natural stocks of winter or summer steelhead in the Hood Canal area. Wild steelhead spawner escapement has been monitored in some Hood Canal streams (Appendix Table C.13). Harvestable numbers were estimated by applying a 80% harvest rate to each run size forecast. The treaty and non-treaty harvestable shares of steelhead were computed by halving the total harvestable number (summer and winter) for each system as shown in Tables 16 and 17.

In accordance with prior agreements with WDFW, the mixed stock harvest to be taken by treaty fishermen in Area 9A shall be limited to one-sixth of the total harvestable number for Hood Canal. The expected mixed stock harvest of Hood Canal stocks by non-treaty fishermen in recreational areas 9 and 12 was estimated using the average sport harvest in the years 1993 through 1996 and apportioning it to each Hood Canal river on the basis of runsize forecasts for the 1996-97 season. Similarly, the expected mixed stock harvest of Hood Canal stocks by Treaty Indian fisheries in area 9A was estimated using the average tribal harvest in the years 1993 through 1997 and apportioning it to each Hood Canal river on the basis of runsize forecasts for the 1999-2000 season. The number of harvestable fish for each system and the expected harvest by Treaty Indian fisheries and non-treaty (recreational) fisheries are shown in Tables 18 and 19.

River	Winter	Summer	Totals	50% Share
Big Quilcene River	5		5	2
Dosewallips River	8	2	10	5
Duckabush River	9	3	12	6
Hamma Hamma River	0		0	0
Dewatto River	0		0	0
Skokomish River	22	10	32	16
Tahuya River	6		6	3
Union River	2		2	1
Totals:	52	15	67	33

Table 17						
1999-2000 Expected Timing of Hood Canal Steelhead Harvest by Management Unit						
Harvest Area	Treaty Indian Harvest			Non-Treaty Harvest		
	Winter	Summer	Totals	Winter	Summer	Totals
Big Quilcene River	3		3	2		2
Dosewallips River	5		5	3	2	5
Duckabush River	6		6	3	3	6
Hamma Hamma River	0		0	0		0
Dewatto River	0		0	0		0
Skokomish River	16		16	6	10	16
Tahuya River	3		3	3		3
Union River	1		1	1		1
Totals:	34	0	34	18	15	33

Table 18			
1999-2000 Treaty Indian Harvest Adjusted for Marine Area 9A			
Harvest Area	Winter	Summer	Totals
Big Quilcene River	3		3
Dosewallips River	5	0	5
Duckabush River	6	0	6
Hamma Hamma River	0		0
Dewatto River	0		0
Skokomish River	16	0	16
Tahuya River	3		3
Union River	1		1
Marine Area 9A	0	0	0
Totals:	34	0	34

Table 19			
1999-2000 Non-Treaty Harvest Adjusted for Marine Areas 9 and 12			
Harvest Area	Winter	Summer	Totals
Big Quilcene River	2		2
Dosewallips River	3	2	5
Duckabush River	3	3	6
Hamma Hamma River	0		0
Dewatto River	0		0
Skokomish River	6	10	16
Tahuya River	3		3
Union River	1		1
Marine Area 12	0		0
Marine Area 9	0		0
Totals:	18	15	33

3.4 Management Recommendations

The first net fisheries for steelhead on the Dosewallips and Duckabush rivers may be scheduled no earlier than the week of December 13. In all cases, through December 26, priority shall be given to chum salmon management needs when managing non-selective fisheries.

Tribes of the Point No Point Treaty Area intend to harvest the majority of their share of summer steelhead during the winter steelhead management period, therefore, no treaty fisheries directed at summer steelhead should occur. Treaty and non-treaty shares were divided into mixed stock and extreme terminal area (river) harvests. One sixth of the harvestable total has been allocated to marine Area 9A and if the mixed stock share is not expected to be taken by February 1, 2000, then the remaining numbers shall be reallocated to the extreme terminal areas on a gradual basis starting January 10.

For winter steelhead, there is uncertainty regarding the status of some wild stocks and run timing of naturally reared stocks returning to tributaries of Hood Canal. Due to this uncertainty, fisheries should be targeted at hatchery reared stocks, which are expected to return primarily during December and January. Due to the low harvestable shares presented it is recommended that no commercial net fisheries occur in the Skokomish River. In order to minimize recreational fishery impacts to wild winter steelhead, wild steelhead release regulations have been in effect in the Skokomish and Tahuya rivers since 1987 and in all other Hood Canal tributaries open during the winter steelhead season since the 1994-95 season. In addition, these regulations have been in effect since 1993 in all marine areas to protect wild winter steelhead.

For summer steelhead, the management period overlaps the spring chinook salmon management period (May 1 - Aug. 1) in the Skokomish River. In order to avoid the incidental capture of spring chinook, which are expected to return at levels below escapement needs, non-selective fisheries should remain closed through the end of the spring chinook management period in the Skokomish River. Wild steelhead release regulations have been in effect for recreational fisheries in all freshwater areas since 1992 and in all marine areas since 1993 to protect wild summer steelhead.

3.5 Test Fisheries

The run size forecasts presented in this report are based on simple expansion from recent historical harvest, and in the absence of significant fisheries, may result in a continuous reduction of run size forecasts. Therefore, an in-river test fishery was implemented in the Skokomish River during the 1996-97 through 1998-99 seasons to assess the entry timing pattern, stock contribution, and age distribution of the winter steelhead run. However, the test fishery has not been successful and will need re-evaluation. There will be no test fishery for steelhead in the Skokomish River during the 1999-2000 season.

3.6 Spawner Surveys

Steelhead spawner escapement should be monitored in Hood Canal streams. Wild steelhead spawner surveys and escapement estimates have been made on the Dewatto, Tahuya, Skokomish, Hamma Hamma, and Dosewallips rivers (Appendix Table C.13) and periodically on the Union and Duckabush rivers; these surveys should be continued. However, past spawner surveys have been limited to periods after March 1 in most seasons. For the 1999-2000 season, it is recommended that spawner surveys begin during January on the Tahuya and Skokomish rivers to better estimate steelhead spawn timing and spawner escapement. In addition, estimates of spawn timing and spawner escapement before March 1 on the Skokomish River system will complement population information collected in test fisheries and may enable better estimation of each run component. The Tahuya and Skokomish rivers often flood during the recommended spawner survey period and the amount of information collected will depend on suitable river conditions.

Appendix Tables A

Supporting Data for Estimation of Run Size
and Harvestable Shares for
Strait of Juan de Fuca Steelhead

Appendix Table A.1
Run Size Forecasts and Harvest Forecasts for Winter and Summer Run Steelhead
in the Strait of Juan de Fuca during the 1999-00 Management Season

Stream	Run Size Forecast	Harvest Rate ¹	Harvest Forecast
Winter Run Steelhead			
Dungeness River	170	0.8	136
Morse Creek	191	0.8	152
Lyre River	928	0.8	742
E. Twin River	16	0.8	13
W. Twin River	12	0.8	9
Salt Creek	9	0.8	7
Deep Creek	7	0	0
Pysht River	287	0.8	229
Clallam River	86	0.8	69
Hoko River	1,247	0.4242	529
Sekiu River	87	0.8	69
Total	3,040		1,955
Summer Run Steelhead			
Dungeness River	29	0	0
Morse Creek	6	0	0
Lyre River	88	0.8	71
Total	123		71

¹The 0.80 harvest rate is appropriate whenever the harvest rate is to be shared equally, with the recreational fishery exerting a maximum harvest rate of 0.70 and the commercial fishery a maximum harvest rate of 0.90.

Appendix Table A.2 Total Harvest and Estimated Run Size for Winter Run Steelhead in Dungeness River.

Winter Return Year	Sport Harvest	Tribal Harvest	Total Harvest	Estimated Run Size	Smolt Year	Smolts Stocked	Smolt-to-harvest Index ¹
1978-79					1977	40,100	
1979-80	411	181	592	788	1978	30,300	0.0180
1980-81	629	67	696	973	1979	24,800	0.0265
1981-82	518	158	676	916	1980	20,000	0.0318
1982-83	376	61	437	605	1981	20,100	0.0218
1983-84	448	142	590	798	1982	17,000	0.0331
1984-85	388	106	494	672	1983	18,600	0.0272
1985-86	226	48	274	376	1984	14,800	0.0173
1986-87	400	9	409	581	1985	15,900	0.0262
1987-88	409	44	453	633	1986	15,400	0.0292
1988-89	143	6	149	211	1987	15,545	0.0096
1989-90	169	0	169	241	1988	20,100	0.0089
1990-91	116	14	130	181	1989	20,123	0.0065
1991-92	115	4	119	169	1990	20,300	0.0059
1992-93	73	0	73	104	1991	15,000	0.0044
1993-94	148	8	156	220	1992	15,100	0.0103
1994-95	215	0	215	307	1993	15,300	0.0141
1995-96	146	0	146	209	1994	18,850	0.0082
1996-97	131	0	131	187	1995	9,900	0.0107
1997-98	22	0	22	31	1996	10,000	0.0022
1998-99	81	0	81	116	1997	10,000	0.0081
					1998	10,690	
Mean 1994-95 to 1998-99			119	170			

¹Index is calculated assuming 0.735 Age 3 and 0.265 Age 4 contribution of hatchery reared fish.

Appendix Table A.3 Total Harvest and Estimated Run Size for Winter Run Steelhead in Morse Creek.

Winter Return Year	Sport Harvest	Tribal Harvest	Total Harvest	Estimated Run Size	Smolt Year	Smolts Stocked	Smolt-to-harvest Index ¹
1978-79					1977	10,000	
1979-80	194	0	194	277	1978	15,000	0.0142
1980-81	357	166	523	694	1979	12,900	0.0389
1981-82	290	116	406	543	1980	12,300	0.0326
1982-83	310	258	568	730	1981	18,000	0.0344
1983-84	546	216	762	1,020	1982	15,400	0.0474
1984-85	285	351	636	797	1983	16,400	0.0394
1985-86	235	281	516	648	1984	15,500	0.0328
1986-87	223	200	423	541	1985	15,900	0.0268
1987-88	188	283	471	583	1986	18,800	0.0261
1988-89	215	58	273	372	1987	15,200	0.0169
1989-90	189	45	234	320	1988	15,000	0.0155
1990-91	90	0	90	129	1989	15,514	0.0059
1991-92	135	0	135	193	1990	10,100	0.0117
1992-93	96	12	108	150	1991	14,700	0.0080
1993-94	195	0	195	281	1992	15,200	0.0131
1994-95	117	2	119	169	1993	15,400	0.0078
1995-96	258	11	269	381	1994	15,338	0.0175
1996-97	155	0	155	221	1995	15,029	0.0103
1997-98	73	0	73	104	1996	5,076	0.0094
1998-99	54	0	54	77	1997	5,000	0.0106
					1998	5,000	
Mean 1994-95 to 1998-99			134	191			

¹Index is calculated assuming 0.735 Age 3 and 0.265 Age 4 contribution of hatchery reared fish.

Appendix Table A.4 Total Harvest and Estimated Run Size for Winter Run Steelhead in Salt Creek.

Winter Return Year	Sport Harvest	Tribal Harvest	Total Harvest	Estimated Run Size
1979-80	98	0	98	140
1980-81	27	0	27	39
1981-82	55	79	134	166
1982-83	15	0	15	21
1983-84	46	0	46	66
1984-85	28	18	46	60
1985-86	11	0	11	16
1986-87	32	11	43	58
1987-88	2	13	15	17
1988-89	2	9	11	13
1989-90	37	2	39	55
1990-91	11	0	11	16
1991-92	36	0	36	51
1992-93	16	0	16	23
1993-94	17	0	17	24
1994-95	6	0	6	9
1995-96	6	0	6	9
1996-97	6	0	6	9
1997-98	8	0	8	11
1998-99	6	0	6	9
Mean of 1994-95 to 1998-99			6	9

Appendix Table A.5 Total Harvest and Estimated Run Size for Winter Run Steelhead in Lyre River.

Winter Return Year	Sport Harvest	Tribal Harvest	Total Harvest	Estimated Run Size	Smolt Year	Smolts Stocked	Smolt-to-harvest Index ¹
1978-79					1977	30,000	
1979-80	578	150	728	992	1978	30,400	0.0240
1980-81	961	152	1,113	1,542	1979	30,000	0.0370
1981-82	685	173	858	1,171	1980	26,500	0.0313
1982-83	921	576	1,497	1,956	1981	30,100	0.0514
1983-84	1,100	443	1,543	2,064	1982	26,000	0.0570
1984-85	1,283	545	1,828	2,438	1983	22,100	0.0790
1985-86	635	350	985	1,296	1984	25,900	0.0396
1986-87	903	281	1,184	1,602	1985	15,600	0.0646
1987-88	788	566	1,354	1,755	1986	23,600	0.0630
1988-89	623	343	966	1,271	1987	20,700	0.0450
1989-90	564	444	1,008	1,299	1988	25,200	0.0420
1990-91	444	55	499	695	1989	30,152	0.0173
1991-92	462	66	528	733	1990	24,100	0.0205
1992-93	366	0	366	523	1991	25,000	0.0148
1993-94	362	0	362	521	1992	25,400	0.0144
1994-95	796	100	896	1,248	1993	25,100	0.0356
1995-96	930	0	930	1,329	1994	26,094	0.0360
1996-97	893	0	893	1,276	1995	25,169	0.0351
1997-98	87	0	87	124	1996	25,159	0.0035
1998-99	463	1	464	663	1997	25,012	0.0184
					1998	25,061	
Mean of 1994-95 to 1998-99			654	928			

¹Index is calculated assuming 0.735 Age 3 and 0.265 Age 4 contribution of hatchery reared fish.