HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Hood River Production Program
Species or Hatchery Stock:	Spring Chinook Salmon
Agency/Operator:	Confederated Tribes of the Warm Springs / Oregon Department of Fish and Wildlife
Watershed and Region:	Hood River
Date Submitted:	June 23, 2000
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SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.
Hood River Production Program (HRPP)

1.2) Species and population (or stock) under propagation, and ESA status.
Oncorhynchus tschawytscha, spring Chinook salmon

1.3) Responsible organization and individuals

Name (and title):	Mick Jennings, Coordinator
Agency or Tribe:	Confederated Tribes of the Warm Springs Reservation of Oregon
Address:	3430 West 10th Street, The Dalles, OR 97058
Telephone:	(541)296-6866
Fax:	(541)296-8886
Email:	mickjennings@netcnct.net

This hatchery program is co-managed with the Oregon Department of Fish and Wildlife.

1.4) Funding source, staffing level, and annual hatchery program operational costs. Funding for this program is with Bonneville Power Administration. The annual budget for the spring chinook program is as follows:

Pelton Ladder – Hatchery (89-029-00) 1 FTE
- 2001 - $139,500
- 2002 - $115,000 (projected)
- 2003 - $137,500 (projected)

Powerdale, Parkdale, & Oak Springs O&M (88-053-07) ½ FTE
- 2001 - $50,000 (about 9% of budget)
- 2002 - $45,000
- 2003 - $46,000

Pelton Ladder – PGE O&M (95-007-00) ½ FTE
- 2001 - $51,500
- 2002 - $45,000
- 2003 - $50,000

1.5) Location(s) of hatchery and associated facilities.
Adult Collection: Powerdale Dam is located on the Hood River, Oregon at river mile (RM) 4.0. When sufficient adults (Hood River released Deschutes stock) begin returning to the Hood River broodstock will be collected there. Currently, broodstock is taken at the Pelton Trap on the Deschutes River.

Spawning, egg incubation, rearing: When sufficient adults begin returning to Powerdale Dam, broodstock will be collected at Powerdale Dam, taken to Parkdale Fish Facility where they will be held, spawned and incubated to the eyed egg stage. Eyed eggs will be transported to Round Butte Hatchery on the Deschutes River for final incubation and rearing. Extended rearing will take place in the Pelton Ladder cells on the Deschutes River. Currently, all phases of the hatchery operation, including adult broodstock

collection and early rearing occurs at Round Butte Hatchery. Extended rearing occurs in rearing cells in the old Pelton Ladder.

Acclimation and release: There are two acclimation sites in the West Fork Hood River. Blackberry Creek acclimation site is located at RM 8.5 and Jones Creek acclimation site is located at RM 14.5. Facilities at both sites include portable ponds. Approximately 55,000 spring chinook are trucked from Pelton Ladder to Blackberry Creek acclimation and 40,000 spring chinook to Jones Creek acclimation (95,000 total into the West Fork) where they remain for two weeks and are volitionally released into the West Fork Hood River. Non-migrants are trucked and released at the mouth of Hood River.

One acclimation pond at the Parkdale Fish Facility is used to volitionally release 30,000 spring chinook over a two-week period. Again, non-migrants are trucked and released at the mouth of Hood River.

1.6) Type of program.

Re-establish spring chinook population in Hood River.

1.7) Purpose (Goal) of program.

The goal of this program is to re-establish a naturally self-sustaining spring chinook population in Hood River subbasin using Deschutes stock.

1.8) Justification for the program.

The indigenous Hood River spring chinook salmon population was extirpated by the late 1960's. This program objective is to re-establish a self-sustaining spring chinook salmon population by using Deschutes River spring chinook as the donor stock.

The hatchery program is a conservative approach that has started with a lower hatchery smolt allocation (125,000 smolts), instead of 250,000 smolts identified in the Hood River Master Plan. With the lower hatchery production, risks to listed steelhead should be minimized while HRPP monitors any potential impacts.

1.9) List of program "Performance Standards".

Performance standards for the spring chinook salmon component of the Hood River Production Program include: 1) Re-establish a naturally self-sustaining run of Hood River spring chinook with an annual run of 1,700 to Hood River, with a spawner escapement of 400 and 1,100 available for in-river sport and tribal fish harvest by 2016; 2) The research component of the HRPP monitors several performance standards to evaluate the HRPP's benefit to ESA listed species in the Hood River subbasin. Performance standards are summarized according to the Research Objectives identified in **SECTION 11 MONITORING AND EVALUATION OF PERFORMANCE INDICATORS**; and 3) maintain the genetic character of naturally producing populations of native and re-established salmonids in the Hood River subbasin.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

1.10.1) "Performance Indicators" addressing benefits.

The research component of the HRPP monitors several performance indicators to evaluate the HRPP's benefit to ESA listed species in the Hood River subbasin. Performance indicators are summarized according to the Research Objectives identified in **SECTION 11 MONITORING AND EVALUATION OF PERFORMANCE INDICATORS**.

Objective 1

Sub-Objective 1

1-1-1) Smolt-to-adult survival rates will be estimated for subbasin hatchery production releases to determine if the HRPP is achieving the programs defined smolt-to-adult survival rate.

1-1-2) Naturally produced spring chinook salmon will be counted at downstream migrant traps located in the Hood River subbasin. Counts will be used to monitor relative abundance of naturally produced pre-smolt and smolt spring chinook salmon migrating from the Hood River subbasin. Numbers caught at the downstream migrant traps are currently too small to accurately estimate subbasin production. Data will be used to determine if the HRPP is successfully achieving its defined goal of reintroducing a naturally sustaining population of spring chinook salmon in the Hood River subbasin.

Sub-Objective 2

1-2-1) Natural and subbasin hatchery jack and adult spring salmon will be counted at the Powerdale Dam trap. Estimates of escapement to the Powerdale Dam trap will be combined with estimates of harvest (see 1-5-1) below Powerdale Dam to estimate escapements to the mouth of the Hood River. Numbers passed above Powerdale Dam will be used to estimate spawner escapements to the Hood River subbasin. Data will be used to determine if the HRPP is achieving its defined escapement objectives for natural and subbasin hatchery produced spring chinook salmon.

Sub-Objective 4

1-4-1) Spawning ground surveys will be conducted annually to determine if natural and subbasin hatchery produced spring chinook salmon are spawning throughout the presumed range of the original native population (i.e., fully utilizing the available spawning habitat).

Sub-Objective 5

1-5-1) Harvest will be estimated for the fishery below Powerdale Dam to determine if the HRPP is achieving the program's defined harvest objectives. No fishery currently exists above Powerdale Dam.

1.10.2) "Performance Indicators" addressing risks.

The research component of the HRPP monitors several performance indicators to evaluate the HRPP's impact (i.e., risk) on indigenous populations of fish in the Hood River subbasin. Performance indicators used to evaluate the HRPP's potential risk to ESA listed species are summarized according to the Research Objectives identified in

SECTION 11 MONITORING AND EVALUATION OF PERFORMANCE INDICATORS.

Objective 1

Sub-Objective 3

1-3-1) Age structure, mean fork length, mean weight, and mean condition factor will be estimated at Round Butte Hatchery for hatchery spring chinook salmon smolts destined for release in the Hood River subbasin. Mean estimates will be compared between natural and subbasin hatchery produced spring chinook salmon (see 1-3-2) to determine if the selected morphometric and meristic characteristics of the subbasin hatchery stock are the same as, or dissimilar to, estimates for the natural population.

1-3-2) Age structure, mean fork length, mean weight, and mean condition factor will be estimated at downstream migrant traps for both pre-smolt and smolt naturally produced spring chinook salmon. Mean estimates will be compared between natural and subbasin hatchery produced spring chinook salmon (see 1-3-1) to determine if the selected morphometric and meristic characteristics of the subbasin hatchery stock are the same as, or dissimilar to, estimates for the natural population.

1-3-3) Temporal distribution of migration will be estimated for pre-smolt and smolt natural and hatchery produced spring chinook salmon sampled at migrant traps located in the Hood River subbasin. Data will be used to determine if hatchery smolts have a migration pattern similar to that of naturally produced spring chinook salmon smolts.

Sub-Objective 4

1-4-2) Age structure, sex ratio, mean fork length, and mean weight will be estimated at Powerdale Dam for both jack and adult natural and subbasin hatchery spring chinook salmon. Mean estimates will be compared between natural and subbasin hatchery produced spring chinook salmon to determine if the selected morphometric and meristic characteristics of the subbasin hatchery stock are the same as, or dissimilar to, estimates for the natural population. Estimates of age structure will also be used in determining if the fishery below Powerdale Dam is disproportionately harvesting specific age categories of returning natural and subbasin jack and adult spring chinook salmon (see 1-6-1).

1-4-3) Temporal distribution of migration will be monitored for wild and subbasin hatchery jack and adult spring chinook salmon escaping to the Powerdale Dam trap. Data will be used to determine if migration timing of the hatchery stock is similar to that of the natural run.

1-4-4) Spatial distribution of the population was determined from radio tagged adult spring chinook salmon. Data was used in conjunction with historical records to identify where hatchery spring chinook salmon smolts should be released in the subbasin.

1-4-5) Coded wire tags will be recovered from spring chinook salmon sampled at the Powerdale Dam trap, in the creel, and from jack and adult fish used for hatchery broodstock. Data will be summarized to 1) determine the extent to which non-indigenous stocks of spring chinook salmon stray into the Hood River subbasin and 2) identify the potential for non-indigenous stocks to spawn in the subbasin.

Sub-Objective 5

1-5-2) Out-of-subbasin recoveries of coded wire tagged hatchery spring chinook salmon will be summarized for subbasin hatchery spring chinook salmon released as smolts in the Hood River subbasin. Data will be used to determine if the HRPP's hatchery production releases stray at a disproportionately higher rate than for other hatchery programs located in the general geographic area of the Hood River subbasin. Comparisons will principally be made with the hatchery program in the Deschutes River subbasin primarily because broodstock for the HRPP was developed from jack and adult spring chinook salmon escaping to the Deschutes River subbasin (Deschutes stock).

Sub-Objective 6

1-6-1) Age structure will be monitored for jack and adult spring chinook salmon harvested in the fishery below Powerdale Dam. Data will be used to determine if the fishery is disproportionately harvesting specific age categories in either the natural or subbasin hatchery components of the run. The selective harvest of specific age categories would ultimately modify the age structure of the population of natural and subbasin hatchery produced spring chinook salmon escaping to the spawning grounds (see 1-4-2).

1.11) Expected size of program.

Production of 2000 brood year spring chinook in the Hood basin includes: 125,000 Deschutes stock (66) of which 30,000 smolts will be acclimated and volitionally released into the Middle Fork at the Parkdale Fish Facility and 95,000 smolts will be volitionally released from West Fork acclimation sites in April, 2001. The spring chinook *program is scheduled for review in FY2002 and it may expand to full production of 250,000 smolts if indicators are positive and habitat is available.*

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

Broodstock needs for the 125,000 smolt program are 55 females and 55 males. Full production of 250,000 smolts would be 110 females and 110 males.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	West Fork Hood River Middle Fork Hood River	95,000 spring chinook smolts 30,000 spring chinook smolts

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.
Table 1 summarizes the estimated smolt to adult returns on natural and hatchery reared spring chinook salmon to Hood River at Powerdale Dam. Table 2 summarizes the spring chinook returns and the spawner escapement above Powerdale Dam.

1.13) Date program started (years in operation), or is expected to start.
Release of Deschutes stock began with the 1993 brood (1994 smolt release).

1.14) Expected duration of program.
The Hood River spring chinook program (Deschutes stock) is ongoing.

1.15) Watersheds targeted by program.
Spring chinook are reared at Round Butte Hatchery and Pelton Ladder for release into the Hood River subbasin, however, one comparison group is released into the Deschutes River.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.
The other management alternative considered for spring chinook was the no action alternative. This alternative was not selected since it would not result in the re-establishment of a spring chinook population in the subbasin.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.
The Oregon Department of Fish and Wildlife has operated under ESA Permit #899, which was a Section 10 permit covering incidental take of listed species. An annual report was submitted to NMFS in February 2000 summarizing past activities associated with this permit. Permit #899 expired December 31, 1999. A draft application was submitted in April 2000 to renew this permit.

The Hood River Production Program is a Bonneville Power Administration funded program and is included in the NMFS Section 7 consultation biological opinion entitled: "Biological Opinion on Artificial Propagation in the Columbia River Basin – Incidental take of listed salmon and steelhead from federal and non-federal hatchery programs that collect, rear and release unlisted fish species" (March 3, 1999).

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.
There are three Hood River fish stocks that are listed as "Threatened" under the Endangered Species Act. These stocks include summer steelhead, winter steelhead, and bull trout.

Table 1. Jack and adult spring chinook salmon escapements to the Powerdale Dam trap by origin, stock, brood year, and total age. (Percent return is in parentheses. Brood years are boldfaced for those years in which brood year specific estimates of escapement are complete. Estimates are based on returns in the 1992-1999 run years.) Data source: Olsen and French (2000).

Origin, Stock, Brood Year[a]	Smolt Production	Total Age				
		Age 2	Age 3	Age 4	Age 5	Age 6
Natural,						
Hood River,[b]						
1986	--	--	--	--	--	0
1987	--	--	--	--	4	0
1988	--	--	--	32	18	1
1989	--	--	1	23	11	0
1990	--	0	1	19	13	0
1991	--	1	2	3	2	0
1992	--	1	4	89	42	1
1993	--	0	4	30	37	0
1994	--	2	1	30	5	--
1995	--	14	13	14	--	--
1996	--	5	5	--	--	--
1997	--	1	--	--	--	--
Subbasin hatchery,						
Carson,						
1986	149,939	--	--	--	--	0
1987	134,047	--	--	--	18 (0.01)	0
1988	197,988	--	--	395 (0.20)	233 (0.12)	0
1989	125,432	--	3 (.002)	213 (0.17)	16 (0.01)	1 (.001)
1990	163,295	0	15 (.009)	245 (0.15)	36 (0.02)	0
Deschutes,[c]						
1991	75,205	3 (.004)	5 (.007)	27 (0.04)	2 (0.003)	--
1992[d]	0	--	--	--	--	--
1993	170,004	4 (.002)	17 (0.01)	279 (0.16)	3 (0.002)	--
1994	123,230	0	1 (0.001)	12 (0.01)	1 (0.001)	--
1995	100,719	11 (0.01)	2 (0.002)	84 (0.08)	--	--
1996	123,760	14 (0.01)	4 (0.003)	--	--	--
1997	121,348	183 (0.15)	--	--	--	--

[a] Complete brood returns are available beginning with the 1990 natural and 1989 hatchery broods, as determined based on age structure for jack and adult spring chinook salmon sampled at the Powerdale Dam trap. Estimates of escapement for prior brood years do not include returns from all possible age categories.

[b] Developed from Deschutes and Carson stock hatchery production releases.

[c] Beginning with the 1994 brood release, hatchery smolts were volitionally released from acclimation facilities located in the Hood River subbasin. Hatchery smolts were held at the facilities for approximately two weeks prior to release.

[d] No hatchery fish were released from the 1992 brood (see **HATCHERY PRODUCTION**, **Production Releases**).

Table 2. Bimonthly counts of upstream migrant jack and adult spring chinook salmon captured at the Powerdale Dam trap, by origin and run year. Counts are boldfaced for the bimonthly period in which the median date of migration occurred in each origin category. Mini-jack spring chinook salmon are included in parenthesis. Data source: Olsen and French (2000).

Origin,	April		May		June		July		August		September		October		November		
Run Year	01-15	16-30	01-15	16-31	01-15	16-30	01-15	16-31	01-15	16-31	01-15	16-30	01-15	16-31	01-15	16-31	Total
Natural,																	
1992	0	0	1	8	5	**11**	4	4	0	0	0	1	0	0	0	0	34
1993	0	0	1	4	3	9	**6**	8	2	6	2	0	0	0	0	0	41
1994	0	0	1	5	0	1	3	**8**	1	2	0	12	0	0	0	0	33
1995	0	0	0	2	4	2	**4**	4	0	0	1	1	0	0	0	0	18
1996	0	0	1	7	**50**	4	9	4	8	6	1	0	0	0	0	0	90
1997	0	0	1	8	**29**	14	5	6 (6)	6 (4)	0 (1)	0	0	0 (1)	0	0	0	69 (12)
1998	0	0	3	7	18	8 (1)	**5** (2)	7	2 (2)	2	6	16	3	0	0	0	77 (5)
1999	0	0	0	0	1	4	4	1	1	**1** (1)	4	7	0	0	0	0	24
Subbasin hatchery,																	
1992	0	9	77	**145**	75	62	15	4	4	1	2	2	1	0	0	0	397
1993	0	1	25	**205**	89	51	51	15 (1)	4	9	5	0	0	0	0	0	455 (1)
1994	0	6	33	**165**	28	7	4	17	1	0	1	1	0	0	0	0	263
1995	0	0	0	6	**28**	10	10 (1)	1 (2)	0	0	1	0	0	0	0	0	56 (3)
1996	0	0	0	0	**10**	4	1	0	0	0	0	0	0	0	0	0	15
1997	0	0	1	33	**107**	65	34	6 (4)	16 (4)	8 (1)	0 (1)	0	0	0	0	0	270 (10)
1998	0	0	1	1	**10** (1)	1 (4)	2 (6)	0 (3)	0	0	0	0	0	0	0	0	15 (14)
1999	0	0	0	21	**28**	11 (8)	7 (95)	6 (50)	4 (14)	6 (14)	0 (1)	0	0	0	0 (1)	0	83 (183)
Stray hatchery,																	
1992	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	0	1
1993	0	0	0	0	**1**	0	1	0	0	0	0	0	0	0	0	0	2
1994	0	0	0	0	0	0	1	1 (3)	**1**	2	0	0	0	0	0	0	5 (3)
1995	0	0	0	0	0	0	0	0	0	**1**	0	1	0	0	0	0	2
1996	0	0	0	0	**7**	2	4	0	0	0	1	0	0	0	0	0	14
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	**1**	0	0	1	0	0	0	0	0	0	0	0	2
1999	0	0	0	0	2	0	**1**	0	0 (2)	0 (3)	2	0	0	0	0	0	5 (5)

Note: All spring chinook captured at the Powerdale Trap have been passed upstream to spawn naturally, except for 110 collected for broodstock in 1998.

The wild summer steelhead adult population enumerated at Powerdale Dam has ranged in size from 65 to 170 in the last five years. All summer steelhead arriving at Powerdale Dam are trapped and examined to determine origin, sex, race, and age. All wild steelhead, except those collected for broodstock for the summer steelhead supplementation program (<25% of the total run) are passed upstream to spawn naturally.

The wild winter steelhead population enumerated at Powerdale Dam has ranged in size from 194 to 274 in the last five years. All winter steelhead arriving at Powerdale Dam are trapped and examined to determine origin, sex, race, and age. All wild steelhead, except those collected for broodstock for the winter steelhead supplementation program (<25% of the total run) are passed upstream to spawn naturally.

The annual escapement of adult bull trout to Powerdale Dam has ranged from 6 to 28 in the last five years. All bull trout are passed above Powerdale Dam.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

Hood River spring chinook salmon were extirpated in the late 1960's. Table 3 summarizes spring chinook sex ratios by fish origin, stock, run year and age category. Table 4 summarizes spring chinook mean weight by origin, stock and brood year. Table 5 summarizes spring chinook length by origin, stock and brood year. This spring chinook program may affect ESA-listed populations, designated as Threatened, which include: winter steelhead (*Oncorhynchus mykiss)*, summer steelhead (*Oncorhynchus mykiss)*, and bull trout (*Salvelinus confluentis).*

The age class structure for summer steelhead populations in the Hood River subbasin are summarized in Table 6. The age class structure for winter steelhead populations in the Hood River subbasin are summarized in Table 7.

Scale samples have been collected from adult migrant bull trout observed at Powerdale Fish Facility during the past nine years, but there is no data summary on the age structure currently available.

The sex ratios for adult summer steelhead are summarized in Table 8. The size range for adult summer steelhead is summarized in Table 9. The weight data for adult summer steelhead is summarized in Table 10.

The sex ratios for adult winter steelhead are summarized in Table 11. The size range for adult winter steelhead is summarized in Table 12. The weight data for adult winter steelhead is summarized in Table 13.

Upstream migrant bull trout sampled at the Powerdale Fish Facility do not express conclusive external characteristics that would enable the determination of individual sexes. Therefore, no sex ratio data are available for bull trout migrants.

Table 3. Jack and adult spring Chinook salmon sex ratios as a percentage of females by origin, stock, run year, and age category. Fish were sampled at the Powerdale Fish Facility. (Sample size is in parentheses.) Data source: Olsen and French (2000).

Origin, Stock, Run Year	Freshwater.Total Age								
	1.2	1.3	1.4	1.5	2.2[a]	2.3	2.4	2.5	2.6
Natural,									
Hood River,[b]									
1992	--	0 (1)	67 (21)	100 (1)	--	--	25 (8)	67 (3)	--
1993	--	0 (1)	73 (15)	80 (10)	0 (1)	--	67 (6)	50 (8)	--
1994	0 (1)	0 (2)	36 (14)	60 (5)	--	--	60 (5)	40 (5)	100 (1)
1995	--	100 (3)[c]	0 (1)	67 (3)	--	--	100 (2)	67 (9)	--
1996	--	50 (4)[c]	50 (6)	--	0 (1)	--	63 (78)	100 (1)	--
1997	--	--	50 (6)	100 (1)	0 (4)	0 (1)	67 (21)	54 (39)	--
1998	--	0 (11)	31 (13)	0 (1)	0 (5)	0 (1)	47 (15)	71 (35)	100 (1)
1999	--	0 (2)	60 (5)	67 (3)	0 (1)	33 (3)[c]	62 (8)	50 (2)	--
Subbasin hatchery,									
Carson,									
1992	--	--	--	--	--	0 (3)	75 (375)	71 (17)	--
1993	--	--	--	--	--	47 (15)[c]	71 (209)	61 (227)	--
1994	--	--	--	--	--	--	64 (242)	62 (16)	--
1995	--	--	--	--	--	--	--	64 (33)	0 (1)
Deschutes,									
1993	--	--	--	--	0 (1)	--	--	--	--
1994	--	--	--	--	*d*	40 (5)[c]	--	--	--
1995	--	--	--	--	0 (4)	*d*	81 (21)	--	--
1996	--	--	--	--	--	7 (14)[c]	*d*	--	--
1997	--	--	--	--	0 (6)	--	68 (269)	--	--
1998	--	--	--	--	0 (14)	0 (1)[c]	73 (11)	67 (3)	--
1999	--	--	--	--	0 (178)	25 (4)[c]	58 (78)	100 (1)	--

[a] Mini-jacks were either visually identified as males, or assumed to be males, unless otherwise noted by the sampler.
[b] Developed from Deschutes and Carson stock hatchery production releases.
[c] Jacks were classified as females based on visual observation.
[d] Hatchery returns in this age class would be progeny of the 1992 brood. No hatchery fish were released into the Hood River subbasin from this brood (see **HATCHERY PRODUCTION**, **Production Releases**).

Table 4. Mean weight (kg) of jack and adult spring chinook salmon by origin, stock, brood year, and age category. [Sample size is in parentheses. Sample statistics, by run year, are presented in previous tables and Olsen and French (2000).]

Origin, Stock, Brood Year	Freshwater.Total Age								
	1.2	1.3	1.4	1.5	2.2	2.3	2.4	2.5	2.6
Natural,									
Hood River,[a]									
1988	--	--	--	--	--	--	--	--	9.5 (1)
1989	--	--	--	10.1 (5)	--	--	--	6.2 (5)	--
1990	--	--	5.4 (13)	9.4 (3)	--	--	4.9 (5)	9.3 (9)	--
1991	--	2.9 (2)	5.7 (1)	--	--	--	4.6 (2)	7.7 (1)	--
1992	0.3 (1)	4.2 (3)	6.5 (6)	8.1 (1)	--	--	5.4 (78)	8.8 (39)	11.7 (1)
1993	--	2.9 (4)	7.6 (6)	8.5 (1)	--	--	5.7 (21)	7.9 (35)	--
1994	--	--	5.9 (13)	6.9 (3)	0.5 (1)	0.7 (1)	7.2 (15)	7.0 (2)	--
1995	--	3.0 (10)	6.1 (5)	--	--	2.5 (1)	4.2 (8)	--	--
1996	--	2.2 (2)	--	--	--	1.5 (3)	--	--	--
1997	--	--	--	--	--	--	--	--	--
Subbasin hatchery,									
Carson,									
1989	--	--	--	--	--	--	--	6.7 (16)	7.4 (1)
1990	--	--	--	--	--	--	5.3 (235)	8.5 (31)	--
Deschutes,									
1991	--	--	--	--	--	1.6 (5)	4.9 (19)	--	--
1992[b]	--	--	--	--	--	--	--	--	--
1993	--	--	--	--	0.3 (1)	1.9 (14)	5.1 (263)	8.7 (3)	--
1994	--	--	--	--	--	--	4.4 (11)	3.9 (1)	--
1995	--	--	--	--	1.2 (1)	2.1 (1)	4.3 (75)	--	--
1996	--	--	--	--	--	1.9 (4)	--	--	--
1997	--	--	--	--	0.2 (22)	--	--	--	--

[a] Developed from Deschutes and Carson stock hatchery production releases.
[b] No hatchery fish were released from the 1992 brood (see **HATCHERY PRODUCTION**, **Production Releases**).

Table 5. Mean fork length (cm) of jack and adult spring chinook salmon by origin, stock, brood year, and age category. [Sample size is in parentheses. Sample statistics, by run year, are presented in previous tables and in Olsen and French (2000).]

Origin, Stock, Brood Year	Freshwater.Total Age								
	1.2	1.3	1.4	1.5	2.2	2.3	2.4	2.5	2.6
Natural,									
Hood River,[a]									
1987	--	--	--	86 (1)	--	--	--	85 (3)	--
1988	--	--	81 (21)	91 (10)	--	--	72 (8)	88 (8)	92 (1)
1989	--	71 (1)	82 (15)	96 (5)	--	--	87 (6)	79 (5)	--
1990	--	78 (1)	77 (14)	92 (3)	--	--	72 (5)	95 (9)	--
1991	--	62 (2)	80 (1)	--	66 (1)	--	72 (2)	84 (1)	--
1992	30 (1)	68 (3)	82 (6)	87 (1)	--	--	77 (78)	92 (39)	98 (1)
1993	--	62 (4)	87 (6)	85 (1)	--	--	78 (21)	86 (35)	--
1994	--	--	77 (13)	80 (3)	32 (1)	38 (1)	85 (15)	84 (2)	--
1995	--	61 (11)	77 (5)	--	31 (4)	60 (1)	71 (8)	--	--
1996	--	56 (2)	--	--	29 (5)	49 (3)	--	--	--
1997	--	--	--	--	18 (1)	--	--	--	--
Subbasin hatchery,									
Carson,									
1987	--	--	--	--	--	--	--	89 (17)	--
1988	--	--	--	--	--	--	74 (377)	89 (230)	--
1989	--	--	--	--	--	56 (3)	83 (210)	82 (16)	85 (1)
1990	--	--	--	--	--	52 (15)	75 (242)	92 (33)	--
Deschutes,									
1991	--	--	--	--	28 (1)	52 (5)	75 (21)	--	--
1992[b]	--	--	--	--	--	--	--	--	--
1993	--	--	--	--	26 (4)	52 (15)	76 (269)	89 (3)	--
1994	--	--	--	--	--	--	72 (11)	69 (1)	--
1995	--	--	--	--	24 (6)	56 (1)	72 (78)	--	--
1996	--	--	--	--	27 (14)	53 (4)	--	--	--
1997	--	--	--	--	27 (178)	--	--	--	--

[a] Developed from Deschutes and Carson stock hatchery production releases.

[b] No hatchery fish were released from the 1992 brood (see **HATCHERY PRODUCTION**, **Production Releases**).

Table 6. Age composition (percent) of adult summer steelhead sampled at the Powerdale Fish Facility by origin, run year, and age category. (Estimates in a given run year may not add to 100% due to rounding error.) Data source: Olsen and French (2000).

Origin, Stock, Run Year	N	Freshwater/Ocean Age												Repeat Spawners
		1/1	1/2	1/3	1/4	2/1	2/2	2/3	2/4	3/1	3/2	3/3	4/2	
Wild,														
Hood River,														
1992-1993	477	--	1.0	0	--	5.2	62.9	9.6	0	1.3	15.9	0	0.2	3.8
1993-1994	223	--	0.4	0.9	--	4.5	44.4	20.6	1.3	2.2	18.4	3.1	0	4.0
1994-1995	177	--	0	0	--	2.3	40.1	13.0	0	0.6	31.1	5.1	0	7.9
1995-1996	122	--	0	0	--	11.5	62.3	13.9	0	1.6	7.4	0.8	0	2.5
1996-1997	170	--	1.2	0	--	3.5	70.6	7.6	0	1.2	11.8	1.2	0	2.9
1997-1998	65	--	1.5	0	--	9.2	55.4	9.2	0	1.5	13.8	0	0	9.2
1998-1999	119	--	1.7	0	--	11.8	56.3	10.1	0	0	11.8	0	0	8.4
Subbasin hatchery,														
Foster,														
1992-1993	1,669	2.8	87.8	8.5	0.1	--	0	--	--	--	--	--	--	0.8
1993-1994	1,069	3.3	74.4	21.4	0.3	--	0	--	--	--	--	--	--	0.7
1994-1995	1,568	0.7	83.2	15.2	0	--	0.1	--	--	--	--	--	--	0.8
1995-1996	510	11.2	76.5	10.8	0	--	0.2	--	--	--	--	--	--	1.4
1996-1997	1,293	0.5	92.7	5.7	0	--	0.5	--	--	--	--	--	--	0.6
1997-1998	563	1.6	91.5	6.2	0	--	0	--	--	--	--	--	--	0.7
1998-1999	525	4.6	68.0	24.2	0	--	0	--	--	--	--	--	--	3.2
Stray hatchery,														
Unknown,														
1992-1993	5	60.0	40.0	0	--	--	--	--	--	--	--	--	--	0
1993-1994	13	7.7	76.9	15.4	--	--	--	--	--	--	--	--	--	0
1994-1995	4	0	25.0	75.0	--	--	--	--	--	--	--	--	--	0
1995-1996	5	40.0	0	40.0	--	--	--	--	--	--	--	--	--	20.0
1996-1997	15	6.7	86.7	6.7	--	--	--	--	--	--	--	--	--	0
1997-1998	6	33.3	66.7	0	--	--	--	--	--	--	--	--	--	0
1998-1999	10	10.0	70.0	20.0	--	--	--	--	--	--	--	--	--	0

Table 7. Age composition (percent) of adult winter steelhead sampled at the Powerdale Fish Facility by origin, stock, and run year. (Estimates in a given run year may not add to 100% due to rounding error. Data source: Olsen and French (2000).

Origin, Stock, Run Year	N	Freshwater/Ocean Age													Repeat Spawners
		1/1	1/2	1/3	1/4	2/1	2/2	2/3	2/4	3/1	3/2	3/3	3/4	4/2	
Wild,															
Hood River,															
1991-1992	662	--	0.5	0.6	0	1.4	60.7	10.7	0	0.2	16.0	2.4	0	0.2	7.4
1992-1993	393	--	0.5	1.5	0	8.7	42.5	29.8	0.3	0.3	4.8	3.8	0	0	7.9
1993-1994	371	--	0.5	1.6	0	2.2	67.7	19.4	0	0.3	4.0	1.1	0	0	3.2
1994-1995	190	--	0.5	0.5	0	13.7	51.1	16.8	0.5	1.6	4.2	1.6	0.5	0	8.9
1995-1996	270	--	4.1	0.4	0.4	6.7	65.2	10.4	0	0.4	7.8	2.2	0	0	2.6
1996-1997	274	--	0.4	0.4	0	4.0	69.3	11.3	0	1.1	8.0	2.6	0	0.4	2.6
1997-1998	207	--	0.5	0	0	5.3	60.4	18.4	0	1.4	8.2	1.0	0	0	4.8
1998-1999	287	--	2.8	0	0	18.1	51.9	12.5	0	0.7	7.3	3.5	0	0	3.1
Subbasin hatchery,															
Big Creek,															
1991-1992	245	--	93.1	2.4	--	--	2.0	0.4	--	--	--	--	--	--	2.0
1992-1993	187	--	31.0	64.2	--	--	0	0	--	--	--	--	--	--	4.8
1993-1994	130	--	--	45.4	--	--	50.8	0	--	--	--	--	--	--	3.8
1994-1995	9	--	--	--	--	--	--	66.7	--	--	--	--	--	--	33.3
Mixed,[a]															
1992-1993	6	100	--	--	--	--	--	--	--	--	--	--	--	--	--
1993-1994	13	--	100	--	--	--	--	--	--	--	--	--	--	--	--
1994-1995	8	--	--	25.0	--	--	75.0	--	--	--	--	--	--	--	--
Hood River,															
1994-1995	82	12.2	86.6	--	--	0	--	--	--	--	--	--	--	--	1.2
1995-1996	259	3.9	90.0	6.2	--	0	0	--	--	--	--	--	--	--	0
1996-1997	611	1.1	82.5	15.1	0	0	0.7	--	--	--	--	--	--	--	0.7
1997-1998	347	0.3	63.4	31.7	0	0	0.9	0.3	--	--	--	--	--	--	3.5
1998-1999	303	3.6	52.1	38.0	0.3	0.3	2.3	--	--	--	--	--	--	--	3.3

Table 8. Adult summer steelhead sex ratios as a percentage of females by origin, run year, and age category. Fish were sampled at the Powerdale Fish Facility. (Sample size is in parentheses.) Data source: Olsen and French (2000).

Origin, Stock, Run Year	Freshwater/Ocean Age 1/1	1/2	1/3	1/4	2/1	2/2	2/3	2/4	3/1	3/2	3/3	4/2	Repeat Spawners
Wild,													
Hood River,													
1992-1993	--	60 (5)	--	--	72 (25)	79 (300)	28 (46)	--	83 (6)	80 (76)	--	100 (1)	69 (16)
1993-1994	--	0 (1)	50 (2)	--	30 (10)	75 (99)	48 (46)	100 (3)	40 (5)	73 (41)	29 (7)	--	75 (8)
1994-1995	--	--	--	--	75 (4)	79 (71)	48 (23)	--	100 (1)	65 (55)	44 (9)	--	82 (11)
1995-1996	--	--	--	--	64 (14)	70 (76)	41 (17)	--	100 (2)	67 (9)	0 (1)	--	100 (1)
1996-1997	--	50 (2)	--	--	33 (6)	71 (120)	46 (13)	--	100 (2)	70 (20)	50 (2)	--	67 (3)
1997-1998	--	100 (1)	--	--	83 (6)	75 (36)	50 (6)	--	0 (1)	56 (9)	--	--	80 (5)
1998-1999	--	0 (2)	--	--	64 (14)	79 (67)	75 (12)	--	--	79 (14)	--	--	75 (8)
Subbasin hatchery,													
Foster,													
1992-1993	47 (47)	73 (1,466)	34 (142)	0 (1)	--	--	--	--	--	--	--	--	77 (13)
1993-1994	60 (35)	76 (795)	43 (229)	100 (3)	--	--	--	--	--	--	--	--	50 (6)
1994-1995	36 (11)	62 (1,304)	41 (239)	--	--	0 (1)	--	--	--	--	--	--	60 (10)
1995-1996	61 (57)	62 (390)	25 (55)	--	--	100 (1)	--	--	--	--	--	--	33 (6)
1996-1997	43 (7)	63 (1,187)	38 (74)	--	--	33 (6)	--	--	--	--	--	--	60 (5)

1997-1998	67 (9)	70 (515)	40 (35)	--	--	--	--	--	--	--	--	--	50 (4)
1998-1999	46 (24)	69 (357)	43 (127)	--	--	--	--	--	--	--	--	--	59 (17)

Table 9. Mean fork length (cm) of adult summer steelhead without spawning checks by origin, brood year, and age category. [Sample size is in parentheses. Sample statistics, by run year, are presented in previous tables and Olsen and French (2000).]

Origin, Stock,	Freshwater/Ocean Age											
Brood Year	1/1	2/1	3/1	1/2	2/2	3/2	4/2	1/3	2/3	3/3	1/4	2/4
Wild,												
Hood River,												
1986	--	--	--	--	--	--	64 (1)	--	--	--	--	--
1987	--	--	--	--	--	68 (76)	--	--	82 (46)	79 (7)	--	79 (3)
1988	--	--	54 (6)	--	70 (300)	66 (41)	--	--	80 (46)	79 (9)	--	--
1989	--	57 (25)	53 (5)	69 (5)	68 (99)	70 (55)	--	88 (2)	80 (23)	81 (1)	--	--
1990	--	55 (10)	54 (1)	70 (1)	69 (71)	68 (9)	--	--	80 (17)	81 (2)	--	--
1991	--	51 (4)	57 (2)	--	68 (76)	68 (20)	--	--	78 (13)	--	--	--
1992	--	60 (14)	56 (2)	--	72 (120)	73 (9)	--	--	77 (6)	--	--	--
1993	--	53 (6)	55 (1)	72 (2)	71 (36)	70 (14)	--	--	73 (12)	--	--	--
1994	--	56 (6)	--	65 (1)	72 (67)	--	--	--	--	--	--	--
1995	--	55 (14)	--	55 (2)	--	--	--	--	--	--	--	--
Subbasin hatchery,												
Foster,												
1987	--	--	--	--	--	--	--	--	--	--	90 (1)	--
1988	--	--	--	--	--	--	--	78 (142)	--	--	79 (3)	--
1989	--	--	--	68 (1,466)	--	--	--	80 (229)	--	--	--	--
1990	55 (47)	--	--	67 (795)	75 (1)	--	--	79 (239)	--	--	--	--
1991	53 (35)	--	--	69 (1,305)	66 (1)	--	--	81 (55)	--	--	--	--
1992	53 (11)	--	--	68 (390)	69 (6)	--	--	80 (74)	--	--	--	--
1993	57 (57)	--	--	69 (1,198)	--	--	--	78 (35)	--	--	--	--
1994	53 (7)	--	--	69 (515)	--	--	--	78 (127)	--	--	--	--
1995	58 (9)	--	--	68 (357)	--	--	--	--	--	--	--	--
1996	56 (24)	--	--	--	--	--	--	--	--	--	--	--

Table 10. Mean weight (kg) of adult summer steelhead without spawning checks by origin, brood year, and age category. [Sample size is in parentheses. Sample statistics, by run year, are presented in previous tables and Olsen and French (2000).]

Origin, Stock, Brood Year	Freshwater/Ocean Age											
	1/1	2/1	3/1	1/2	2/2	3/2	4/2	1/3	2/3	3/3	1/4	2/4
Wild,												
Hood River,												
1988	--	--	--	--	--	--	--	--	--	5.3 (9)	--	--
1989	--	--	--	--	--	3.6 (54)	--	--	5.2 (23)	5.0 (1)	--	--
1990	--	--	--	--	3.4 (70)	3.4 (9)	--	--	5.1 (17)	5.4 (2)	--	--
1991	--	1.6 (3)	2.0 (2)	--	3.2 (75)	3.2 (20)	--	--	4.9 (13)	--	--	--
1992	--	2.3 (13)	1.8 (2)	--	3.8 (116)	3.7 (9)	--	--	4.6 (6)	--	--	--
1993	--	1.6 (6)	1.6 (1)	4.0 (2)	3.5 (36)	3.7 (13)	--	--	4.1 (12)	--	--	--
1994	--	1.9 (6)	--	2.5 (1)	3.8 (66)	--	--	--	--	--	--	--
1995	--	1.9 (14)	--	2.0 (2)	--	--	--	--	--	--	--	--
Subbasin hatchery,												
Foster,												
1990	--	--	--	--	4.1 (1)	--	--	5.1 (183)	--	--	--	--
1991	--	--	--	3.4 (1,065)	2.9 (1)	--	--	5.3 (51)	--	--	--	--
1992	1.6 (10)	--	--	3.2 (368)	2.9 (5)	--	--	4.9 (72)	--	--	--	--
1993	2.0 (54)	--	--	3.4 (1,139)	--	--	--	4.7 (34)	--	--	--	--
1994	1.8 (7)	--	--	3.3 (476)	--	--	--	4.7 (124)	--	--	--	--
1995	2.0 (9)	--	--	3.3 (350)	--	--	--	--	--	--	--	--
1996	1.8 (24)	--	--	--	--	--	--	--	--	--	--	--

Table 11. Adult winter steelhead sex ratios as a percentage of females by origin, stock, run year, and age category. Fish were sampled at the Powerdale Fish Facility. (Sample size is in parentheses.) Data source: Olsen and French (2000).

Origin, Stock, Run Year	Freshwater/Ocean Age													Repeat Spawners
	1/1	1/2	1/3	1/4	2/1	2/2	2/3	2/4	3/1	3/2	3/3	3/4	4/2	
Wild,														
Hood River,														
1991-1992	--	67 (3)	75 (4)	--	0 (9)	58 (402)	63 (71)	--	0 (1)	64 (106)	88 (16)	--	100 (1)	64 (47)
1992-1993	--	50 (2)	67 (6)	--	26 (34)	62 (167)	72 (117)	0 (1)	100 (1)	42 (19)	60 (15)	--	--	87 (31)
1993-1994	--	0 (2)	67 (6)	--	12 (8)	69 (251)	67 (72)	--	0 (1)	60 (15)	75 (4)	--	--	100 (11)
1994-1995	--	0 (1)	100 (1)	--	19 (26)	58 (97)	53 (32)	100 (1)	0 (3)	25 (8)	100 (3)	100 (1)	--	69 (16)
1995-1996	--	45 (11)	100 (1)	0 (1)	22 (18)	65 (176)	68 (28)	--	0 (1)	43 (21)	50 (6)	--	--	57 (7)
1996-1997	--	0 (1)	0 (1)	--	18 (11)	61 (190)	58 (31)	--	67 (3)	68 (22)	71 (7)	--	100 (1)	100 (7)
1997-1998	--	100 (1)	--	--	0 (11)	66 (125)	59 (37)	--	33 (3)	71 (17)	50 (2)	--	--	60 (10)
1998-1999	--	38 (8)	--	--	21 (52)	72 (149)	81 (36)	--	0 (2)	62 (21)	90 (10)	--	--	100 (7)
Subbasin hatchery,														
Big Creek,														
1991-1992	--	36 (228)	100 (6)	--	--	60 (5)	100 (1)	--	--	--	--	--	--	80 (5)
1992-1993	--	21 (58)	74 (120)	--	--	--	--	--	--	--	--	--	--	71 (7)
1993-1994	--	--	66 (59)	--	--	39 (66)	--	--	--	--	--	--	--	50 (4)
1994-1995	--	--	--	--	--	--	100 (6)	--	--	--	--	--	--	100 (3)
Mixed,[a]														
1992-1993	67 (6)	--	--	--	--	--	--	--	--	--	--	--	--	--
1993-1994	--	31 (13)	--	--	--	--	--	--	--	--	--	--	--	--
1994-1995	--	--	100 (2)	--	--	33 (6)	--	--	--	--	--	--	--	--
Hood River,														
1994-1995	10 (10)	52 (71)	--	--	--	--	--	--	--	--	--	--	--	100 (1)
1995-1996	0 (10)	37 (232)	67 (15)	--	--	--	--	--	--	--	--	--	--	--
1996-1997	14 (7)	45 (503)	61 (92)	--	--	25 (4)	--	--	--	--	--	--	--	100 (3)
1997-1998	0 (1)	48 (219)	73 (109)	--	--	100 (3)	0 (1)	--	--	--	--	--	--	67 (12)
1998-1999	0 (11)	46 (158)	63 (115)	0 (1)	100 (1)	71 (7)	--	--	--	--	--	--	--	60 (10)

[a] Returns from the 1991 brood are progeny of wild x Big Creek stock hatchery crosses.

Table 12. Mean fork length (cm) of adult winter steelhead without spawning checks by origin, stock, brood year, and age category. [Sample size is in parentheses. Sample statistics, by run year, are presented in previous tables and Olsen and French (2000).]

Origin, Stock, Brood Year	Freshwater/Ocean Age												
	1/1	2/1	3/1	1/2	2/2	3/2	4/2	1/3	2/3	3/3	1/4	2/4	3/4
Wild,													
Hood River,													
1986	--	--	--	--	--	--	60 (1)	--	--	78 (16)	--	--	--
1987	--	--	--	--	--	65 (106)	--	--	76 (71)	80 (15)	--	95 (1)	--
1988	--	--	52 (1)	--	66 (402)	65 (19)	--	77 (4)	77 (117)	78 (4)	--	--	72 (1)
1989	--	49 (9)	55 (1)	62 (3)	66 (167)	65 (15)	--	77 (6)	77 (72)	77 (3)	--	84 (1)	--
1990	--	52 (34)	47 (1)	59 (2)	68 (251)	65 (8)	--	80 (6)	78 (32)	80 (6)	--	--	--
1991	--	50 (8)	54 (3)	58 (2)	67 (97)	67 (21)	63 (1)	78 (1)	79 (28)	79 (7)	88 (1)	--	--
1992	--	54 (26)	48 (1)	76 (1)	68 (176)	68 (22)	--	74 (1)	79 (31)	75 (2)	--	--	--
1993	--	52 (18)	50 (3)	68 (11)	68 (190)	65 (17)	--	88 (1)	78 (38)	77 (10)	--	--	--
1994	--	49 (11)	50 (3)	65 (1)	65 (125)	68 (21)	--	--	75 (36)	--	--	--	--
1995	--	50 (11)	54 (2)	58 (1)	69 (149)	--	--	--	--	--	--	--	--
1996	--	52 (52)	--	59 (8)	--	--	--	--	--	--	--	--	--
Subbasin hatchery,													
Big Creek,													
1987	--	--	--	--	--	--	--	--	76 (1)	--	--	--	--
1988	--	--	--	--	73 (5)	--	--	75 (6)	--	--	--	--	--
1989	--	--	--	64 (228)	--	--	--	77 (120)	--	--	--	--	--
1990	--	--	--	62 (58)	65 (66)	--	--	77 (59)	76 (6)	--	--	--	--
Mixed,[a]													
1991	57 (6)	--	--	67 (13)	65 (6)	--	--	72 (2)	--	--	--	--	--
Hood River,													
1992	--	--	--	65 (71)	--	--	--	77 (16)	--	--	--	--	--
1993	48 (10)	--	--	66 (233)	67 (4)	--	--	80 (92)	86 (1)	--	--	--	--
1994	46 (10)	--	--	66 (504)	64 (3)	--	--	77 (110)	--	--	78 (1)	--	--
1995	44 (7)	--	--	62 (220)	75 (7)	--	--	76 (115)	--	--	--	--	--
1996	44 (1)	58 (1)	--	64 (158)	--	--	--	--	--	---	--	--	--
1997	47 (11)	--	--	--	--	--	--	--	--	--	--	--	--

[a] Returns from the 1991 brood are progeny of wild x Big Creek hatchery crosses.

Table 13. Mean weight (kg) of adult winter steelhead without spawning checks by origin, stock, brood year, and age category. [Sample size is in parentheses. Sample statistics, by run year, are presented in previous tables and Olsen and French (2000).]

Origin, Stock, Brood Year	Freshwater/Ocean Age												
	1/1	2/1	3/1	1/2	2/2	3/2	4/2	1/3	2/3	3/3	1/4	2/4	3/4
Wild,													
Hood River,													
1988	--	--	--	--	--	--	--	--	--	4.5 (2)	--	--	3.2 (1)
1989	--	--	--	--	--	2.8 (13)	--	--	4.8 (40)	4.6 (3)	--	6.9 (1)	--
1990	--	--	1.1 (1)	--	3.3 (215)	2.7 (8)	--	5.4 (4)	4.8 (32)	4.9 (5)	--	--	--
1991	--	1.3 (8)	1.4 (2)	2.4 (1)	3.1 (95)	3.0 (21)	2.3 (1)	4.7 (1)	5.1 (27)	5.1 (6)	6.0 (1)	--	--
1992	--	1.6 (26)	1.2 (1)	4.6 91)	3.2 9172)	3.2 (22)	--	3.5 (1)	5.0 (30)	3.6 (2)	--	--	--
1993	--	1.5 (18)	1.3 (3)	3.2 911)	3.2 (190)	2.7 (17)	--	6.6 (1)	4.8 (38)	4.7 (10)	--	--	--
1994	--	1.2 (11)	1.3 (3)	2.5 910	2.9 (125)	3.5 (21)	--	--	4.5 (36)	--	--	--	--
1995	--	1.3 (11)	1.5 (20	2.0 (1)	3.5 (149)	--	--	--	--	--	--	--	--
1996	--	1.5 (52)	--	1.8 (8)	--	--	--	--	--	--	--	--	--
Subbasin hatchery,													
Big Creek,													
1990	--	--	--	--	--	--	--	3.9 (1)	4.6 (6)	--	--	--	--
Mixed,[a]													
1991	--	--	--	2.5 93)	3.0 (6)	--	--	3.8 (2)	--	--	--	--	--
Hood River,													
1992	--	--	--	2.8 (61)	--	--	--	4.7 (15)	--	--	--	--	--
1993	1.2 (10)	--	--	2.9 (230)	3.0 (4)	--	--	5.2 (90)	6.3 (1)	--	--	--	--
1994	1.0 (10)	--	--	2.9 (492)	2.7 (3)	--	--	4.5 (110)	--	--	5.4 (1)	--	--
1995	0.8 (6)	--	--	2.4 (220)	4.4 (7)	--	--	4.5 (114)	--	--	--	--	--
1996	1.0 (1)	2.7 (1)	--	2.7 (158)	--	--	--	--	--	--	--	--	--
1997	1.1 (11)	--	--	--	--	--	--	--	--	--	--	--	--

Migration Timing
Summer steelhead adults enter Hood River from March through November. Summer steelhead are typically observed arriving at the Powerdale Fish Facility every month of the year. The peak migration observed at Powerdale Fish Facility occurs during June and July. These fish may spend up to a calendar year in Hood River before spawning.

Winter steelhead arrive at the Powerdale Fish Facility from December through June. The peak of the migration at Powerdale Fish Facility occurs in April.

Bull trout migrants are typically observed at the Powerdale Fish Facility from May through July, but there have been several observations from August to October.

Spawning Range and Spawning Timing
Summer steelhead spawn primarily in the West Fork Hood River and tributaries. Spawning generally occurs from March through May.

Winter steelhead spawn primarily in the East and Middle forks of Hood River and their tributaries. Fish also spawn in the Neal Creek system. Spawning occurs from March through May.

Bull trout spawn exclusively in the Middle Fork Hood River tributaries, including Coe and Clear branches. There is also a bull trout population isolated upstream of Clear Branch Dam. These fish spawn in upper Clear Branch and Pinnacle Creek. Spawning typically occurs from August to October.

Juvenile Life History
It is impossible to distinguish between summer and winter steelhead juveniles or smolts in Hood River. Extensive monitoring of steelhead out-migrants in the mainstem Hood River at RM 4.5 indicates that these smolts typically emigrate from Hood River from early April through July. The peak of the emigration occurs from mid-April through mid-June. Hood River steelhead smolts exhibit three different fresh water life history patterns. These smolts typically emigrate as two year-olds, but there are segments of the populations that emigrate as one and three year-olds.

All hatchery-reared steelhead and spring chinook smolts are released into the Hood River system upstream from Powerdale Dam from early April through mid-May to coincide with the peak natural smolt migration period. All of these hatchery-reared smolts are acclimated from one to two weeks before volitional release. Non-migrant smolts are transported and released near the mouth of Hood River to minimize potential interaction with naturally produced smolts. Table 14 summarizes the 1999 Hood River hatchery smolt releases, which represents a typical year's hatchery releases. Smolt releases in the Middle Fork Hood River are below the most important bull trout rearing habitat.

Table 14. Hood River steelhead and spring chinook salmon smolt releases, 1999. Data source: Olsen and French (2000).

Species	Release Site	Acclimation Period	No. Volitionally Released	Non-migrants
Spring Chinook	W. F. Hood R., RM 8.6	3/30 – 4/8/99	22,232	
	W. F. Hood R., RM 8.6	4/13 – 4/20/99	23,415	6,175
	W. F. Hood R., Rivermile 14	3/30 – 4/8/99	12,937	
	W. F. Hood R., Rivermile 14	4/13 – 4/20/99	13,104	13,119
	M.F. Hood R., RM 3.5	3/30 – 4/12/99	30,195	214
		Total Release	**101,883**	**19,508**
Summer Steelhead	W. F. Hood R., RM 8.6	4/2 – 4/15/99	15,616	3,897
Winter Steelhead	E. F. Hood R., RM 6.0	4/6 – 4/15/99	12,430	
	E. F. Hood R., RM 6.0	4/29 – 5/5/99	10,572	2,009
	M. F. Hood R., RM 3.5	4/6 – 4/14/99	9,857	
	M. F. Hood R., RM 3.5	4/28 – 5/5/99	9,816	305
		Total Release	**42,675**	**2,314**

- Identify the ESA-listed population(s) that will be directly affected by the program.
The native Hood River spring chinook salmon population was extirpated in the late 1960's. The goal of this program is to re-establish a naturally self-sustaining spring chinook salmon population in the Hood River subbasin using the adjacent subbasin stock (Deschutes River) as the donor stock. Neither the Hood nor Deschutes river stocks of spring chinook are federally listed.

- Identify the ESA-listed population(s) that may be incidentally affected by the program.
The three ESA listed fish stocks found in the Hood River Subbasin that could be incidentally affected by this spring chinook salmon re-introduction program include summer and winter steelhead and bull trout. The natural population targeted for integration is the naturally produced spring chinook that has resulted from prior hatchery releases and natural spawning from returning hatchery-origin adults.

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds.
Hood River summer steelhead have approached or are at the "Critical Population Threshold". Four of the last five years the number of naturally produced adults arriving at Powerdale Fish Facility has been less than 150 fish. However, with up to ten different life history patterns, the status of the population should not be based on a single year's adult return.

The Hood River winter steelhead and bull trout populations are considered to be above the "Viable Population Threshold." The winter steelhead adult migrant counts at Powerdale Fish Facility have exceeded 200 fish each of the last five years.

The Hood River bull trout population is comprised of resident and fluvial population components. The estimated total population appears to be above the Critical Population Threshold.

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.
The Hood River spring chinook are not an ESA listed population. Table 1 summarizes the hatchery spring chinook progeny-to-adult data that are available. Similar data for naturally produced spring chinook is not available because of the small numbers of naturally produced juvenile migrants that have been captured in the subbasin.

Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.
Spawning escapement estimates are available for Hood River Subbasin ESA listed salmonids since 1992. Table 15 summarizes spawner escapement upstream from Powerdale Dam (RM 4.0).

Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.
Table 15 summarizes spawner escapement upstream from Powerdale Dam (RM 4.0).

Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.
All adult anadromous migrants are trapped and bio-sampled at the Powerdale Fish Facility. Fish are tagged with individually numbered external tags, length, weight data, and scales are collected from each fish. Steelhead also have a small piece of the caudal fin removed for genetics monitoring. Fish are spilled from a "fish lift" directly into an anesthetic tank, equipped with an carbon dioxide system, prior to handling. At least 75% of the wild steelhead are passed upstream of Powerdale Dam to continue their migration and spawn naturally.

Table 15. Hood River spawner escapement upstream from Powerdale Dam, 1991-2000 run years. Data source: Olsen and French (2000).

		Origin			Broodstock			
Stock	Year	Natural	Subbasin Hatchery	Stray Hatchery	Collected	Spawned	Mortality	Total Escapement
Spring Chinook								
	1992	38	414	1	--			453
	1993	45	463	2	--			510
	1994	34	266	10	--			310
	1995	20	64	8	--			92
	1996	99	15	17	--			131
	1997	87	290	7	110			274
	1998	86	30	4	46			74
Summer Steelhead								
	1992-93	492	1,722	5	--			2,219
	1993-94	242	1,106	14	--			1,362
	1994-95	219	1,632	4	--			1,855
	1995-96	131	521	6	--			658
	1996-97	178	1,313	15	--			1,506
	1997-98	64	0 (448)*	(6)*	16	9	3	68
	1998-99	131	0 (596)*	--	34	25	9	104
	1999-00	197	0 (511)*	--	35	22	2	173
Winter Steelhead								
	1991	622	0 Hood stock	0	18	4	14	996
	1992	343	0 Hood stock	0	105	39	9	412
	1993	301	5	0	59	34	12	319
	1994	161	5	0	79	54	16	175
	1995	211	162	0	43	37	6	373
	1996	237	254	0	89	54	9	517
	1997	187	164	0	83	54	8	372
	1998	181	164	0	80	41	11	373
	1999	258	187	0	75	51	0	469
Bull Trout								
	1992	6	N/A	N/A	--	--	--	6
	1993	2	N/A	N/A	--	--	--	2

1994	11	N/A	N/A	--	--	--	11
1995	11	N/A	N/A	--	--	--	11
1996	18	N/A	N/A	--	--	--	18
1997	6	N/A	N/A	--	--	--	6
1998	18	N/A	N/A	--	--	--	18
1999	28	N/A	N/A	--	--	--	28

* Fish were recycled to the mouth of Hood River.

Fish randomly selected for the hatchery supplementation program are placed in a portable fish liberation tank and transported to the Parkdale Fish Facility. The broodstock are held in ponds specifically designed for holding adult salmon and steelhead. Brood fish are anesthetized periodically to determine the stage of sexual maturity. Mature steelhead females are air-spawned alive. After a minimum 24-hour recovery period the females are transported and released near the mouth of Hood River. Male steelhead brood are hand stripped to fertilize eggs. The spawned males are released upstream of Powerdale Dam to give them an opportunity to contribute to natural spawning in the subbasin.

Bull trout migrants observed in the Powerdale Fish Facility are also bio-sampled, tagged and released upstream of the dam.

Downstream migrant "screw traps" are operated in the mainstem and major tributaries from March through October to monitor and estimate total natural and hatchery smolt emigration. These traps typically sample 5 to 10% of the downstream migrants passing a particular trap. Captured migrants are held in a live-box before they are anesthetized, bio-sampled and released. A small number of captured migrants are marked and released upstream to provide trap efficiency data.

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.
Hatchery broodstock collection occurs as one task during the operation of the Powerdale Fish Facility. Powerdale Dam may result in some migration delay for adult salmonids that have difficulty locating the fish ladder entrance. The ability of fish to find the ladder entrance is inversely proportional to river discharge. Fish appear to be trapped in the fish facility crowding alley well before they realize they have been captured. The trap operation does not appear to delay upstream migration.

Fish processed through the Powerdale Fish Facility are handled and may result in slight scale loss or abrasions, and rarely a mortality. Listed fish released upstream of the dam have a quiet recovery area in which to recuperate from the handling and anesthetic. Fish must be thoroughly revived before they can find their way into the main portion of the Powerdale Dam forebay. During nine years of trap operation at this site very few of the released adults have been swept back over Powerdale Dam. This indicates the fish generally are continuing their upstream migration. Similarly there is no indication that handling of listed fish at Powerdale Fish Facility has resulted in any spawning delays.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.
Table 15 presents a summary of the annual number of steelhead collected for broodstock and the adult mortality associated with the summer and winter steelhead hatchery supplementation process. In nine years the number of winter steelhead broodstock mortalities have ranged from 0 to 16 fish. The winter steelhead broodstock is generally comprised of approximately 50% wild Hood River stock and 50% Hood River stock hatchery-reared progeny.

In three years the number of summer steelhead pre-spawning mortalities has ranged from 2 to 9 fish. Pre-spawning mortality for summer and winter steelhead has dropped dramatically since fish have been held in the cold water at the Parkdale Fish Facility.

There are no bull trout collected for a hatchery program in the Hood River subbasin.

Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).
Please see the following "Take Tables" (Tables 16-20) for winter steelhead, summer steelhead and bull trout.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.
Powerdale and Parkdale Fish Facility physical components and fish handling procedures will be modified immediately if any appreciable steelhead or bull trout mortality is observed. Project personnel will immediately notify PacifiCorp if any steelhead or bull trout mortalities appear related to Powerdale Dam operation or facilities.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.
The hatchery program will be operated consistent with the ESU-wide plan, with the exception of age class at release. Fish will be released as yearlings rather than as sub-yearlings as specified in the ESU-wide plan, to maximize smolt-to-adult survival rates given extremely low run sizes the past four years.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.
This program operates under the Hood River Master Plan, Hood River/Pelton Ladder Master Agreement, Hood River EIS and the Salmon and Steelhead Production Plan for the Hood River Subbasin (System Plan).

Table 16. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: _Summer and Winter Steelhead__ ESU/Population: Lower Columbia / Hood River____ Activity:_ Hood River Production Program – Monitoring and Evaluation (natural and hatchery smolt emigration)_				
Location of hatchery activity:_ Downstream migrant trapping___ Dates of activity:_ Year around _ **Hatchery program operator:_ Oregon Department of Fish and Wildlife**				
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	<10,000	NA	NA
Collect for transport b)	0	0	NA	NA
Capture, handle, and release c)	<500	<10,000	NA	NA
Capture, handle, tag/mark/tissue sample, and release d)	0	0	NA	NA
Removal (e.g. broodstock) e)	-	-	NA	NA
Intentional lethal take f)	-	100 (EPA)	NA	NA
Unintentional lethal take g)	<50	< 120	NA	NA
Other Take (specify) h)	-	0	NA	NA

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Table 17. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: _Winter Steelhead__ ESU/Population: Lower Columbia / Hood River____ Activity:_ Hood River Production Program – Supplementation of wild population_				
Location of hatchery activity:_ Powerdale Fish Facility / Parkdale Fish Facility___ Dates of activity:_ Year around _ **Hatchery program operator:_ Oregon Department of Fish and Wildlife / Confederated Tribes of Warm Springs Reservation of Oregon_**				
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	<85,000	70,000	1,000	0
Collect for transport b)	<85,000	65,000	<100	<20
Capture, handle, and release c)	-			NA
Capture, handle, tag/mark/tissue sample, and release d)	-	65,000	1,000	NA
Removal (e.g. broodstock) e)	-	-	<100	NA
Intentional lethal take f)	-	0	0	NA
Unintentional lethal take g)	-	0	<20	NA
Other Take (specify) h)	<15,000 mortality	5,000 mortality	0	NA

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Table 18. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: _Summer Steelhead_ ESU/Population:_ Lower Columbia / Hood River__ Activity:_ Hood River Production Program_- Supplementation of the wild population_				
Location of hatchery activity: Powerdale Fish Facility / Powerdale Fish Facility_____ Dates of activity:__ Year around_____ Hatchery program operator:_ Oregon Department of Fish and Wildlife / Confederated Tribes of Warm Springs reservation of Oregon_				
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	10,000	<500	0
Collect for transport b)	52,384	0	<50	0
Capture, handle, and release c)	0	0		0
Capture, handle, tag/mark/tissue sample, and release d)	0	0	<450	0
Removal (e.g. broodstock) e)	0	0	<50	0
Intentional lethal take f)	0	0	0	0
Unintentional lethal take g)	0	0	<10	0
Other Take (specify) h)	0	0	0	0

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Table 19. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Bull Trout____ ESU/Population:_ Lower Deschutes / Hood River Activity:__ Hood River Production Program_				
Location of hatchery activity:_ Powerdale Fish Facility_ Dates of activity: _May through October___ Hatchery program operator:_Oregon Department of Fish and Wildlife_				
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	0	0	0
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	0	0	0
Capture, handle, tag/mark/tissue sample, and release d)	0	0	28	0
Removal (e.g. broodstock) e)	0	0	0	0
Intentional lethal take f)	0	0	0	0
Unintentional lethal take g)	0	0	0	0
Other Take (specify) h)	0	0	0	0

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Table 20. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Bull Trout____ ESU/Population:_ Lower Deschutes / Hood River Activity:__ Hood River Production Program_- M&E				
Location of hatchery activity:_ Downstream migrant trapping_ Dates of activity: _May through October___ Hatchery program operator:_Oregon Department of Fish and Wildlife_				
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	0	0	0
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	<50	0	NA
Capture, handle, tag/mark/tissue sample, and release d)	0	0	0	NA
Removal (e.g. broodstock) e)	0	0	0	NA
Intentional lethal take f)	0	0	0	NA
Unintentional lethal take g)	0	0	0	NA
Other Take (specify) h)	0	0	0	NA

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

3.3) Relationship to harvest objectives.

Spring chinook yearlings are being released into the Hood River to re-introduce a self-sustaining population. In-river harvest will not be considered until there are sufficient adults returning to Hood River to satisfy recovery and broodstock needs. A spring chinook harvest plan for HRPP will be developed within the next few years. With full implementation of the HRPP there will be approximately 1,300 spring chinook available for harvest.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available. Hood River spring chinook sport harvest has been closed by emergency regulation in 1999 and 2000 because of low escapement predictions. Prior to that time, creel census results for 1996, 1997 and 1998 showed catch at 55, 73 and 24 fish, respectively. Under full implementation of the spring chinook hatchery program (250,000 smolt release) there should be 1,300 spring chinook available for harvest. Summer steelhead angling occurs during the time spring chinook are in Hood River. It is possible a few listed Hood River wild summer steelhead could sustain an incidental mortality after they are released. However, under Oregon state regulations, harvest of unmarked steelhead is not allowed in Hood River.

The Zone 6 Columbia River Tribal subsistence, ceremonial and commercial fisheries will benefit from the re-establishment of a Hood River spring chinook salmon population.

3.4) Relationship to habitat protection and recovery strategies.

Native spring chinook salmon were extirpated in Hood River in the 1960's. Several probable causes contributed to their demise including: 1) adult fish passage problems (low flow below Powerdale Dam, poor fish ladder attraction, Dee Diversion blockage and the Punchbowl Falls barrier); 2) lack of, or inefficient juvenile fish protection at irrigation canals (Farmers Irrigation Diversion, Dee Irrigation Diversion, PacifiCorp diversion at Powerdale Dam); 3) degradation of sufficient suitable habitat (gravel and woody debris poor); and 4) unfavorable natural conditions in the Hood River subbasin (glacial silt events, such as Ladd Creek / West Fork Hood River glacial outburst flood, and winter flood events that wash out egg deposition or destroy newly emerged fry).

Habitat conditions in Hood River have changed considerably from those described in the previous paragraph. Adult fish ladders have been built or improved at Powerdale Dam, Punchbowl Falls and Moving Falls. Options to improve passage at the Dee Irrigation District diversion are moving ahead, and one of the conditions of re-licensing the Powerdale Hydroelectric Project is to provide adequate fish passage flows in the bypass reach below Powerdale Dam.

Juvenile fish passage improvements are in the planning stages at Powerdale Dam and Farmers Irrigation Diversion (RM 11.6) and will be a condition of FERC re-licensing for the Powerdale Project. A new fish screen, which meets NMFS standards, has been installed at Dee Irrigation Diversion.

3.5) Ecological interactions.

Interactions between migrating hatchery spring chinook smolts and listed Hood River steelhead likely would be minimal since the hatchery spring chinook leave the stream quickly. These are smolts that are acclimated and volitionally released. Non-migrants that do not leave the acclimation ponds are subsequently transported and released near the mouth of Hood River.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

The Hood River spring chinook program involves three facilities with different water supplies. The facilities include Parkdale Fish Facility, Round Butte Fish Hatchery, and Pelton Ladder. Currently, the Hood River spring chinook program is in transition, from using broodstock returning to the Pelton Ladder trap on the Deschutes to one of taking broodstock at the Powerdale Fish Facility on the lower Hood River. Fish are held and spawned at Parkdale Fish Facility. Until enough fish return to the Hood for escapement and broodstock needs, fish in the Deschutes will continue to be used in the program.

Parkdale Fish Facility has two different water supplies, spring-fed water at a constant 39-40°F and Middle Fork water that varies from 33-55°F. Parkdale uses both water supplies at different times of the year depending on the purpose, such as lower water temperatures to hold adult brood and reduce disease potential, or elevated water temperatures to allow maturation of adults. Generally, water temperatures are set to reflect those found in the West Fork and Middle Fork. Parkdale has a state water right for its withdrawal, a NPDES permit is not needed because it is below the minimum standard, and a NMFS criteria fish screen for the Middle Fork water is currently in the planning stages.

The current spring chinook broodstock is held and spawned, and incubation and rearing is completed at Round Butte Fish Hatchery on the Deschutes River. Once the Hood broodstock is held, spawned and eggs eyed at Parkdale, only the rearing program will be carried out at Round Butte Fish Hatchery. Round Butte Fish Hatchery's water supply is from a spring with a water temperature of 55°F. The facility has secured a NPDES permit.

The old Pelton Fish Ladder on the Deschutes River approximately eight miles downstream from Round Butte Fish Hatchery, is used for final rearing (November-March) of yearling spring chinook. The ladder rearing cells have warmer winter water temperatures and abundant natural food, which provides accelerated growth for juveniles. Water supply for Pelton Ladder is from Deschutes River water stored in Lake Simtustus.

The entire 125,000 spring chinook smolts are acclimated in the West Fork and Middle forks of Hood River.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Risk of take at the Parkdale Fish Facility is minimized because listed fish are not present in the reach of Rogers Spring upstream from the water diversion. An 8000 gallon fish waste tank is used to capture fish refuse from the spawn/incubation building. That material is periodically pumped into a sludge truck. A NMFS criteria screen will be built the summer of 2000 at the Rogers Spring diversion, although listed steelhead are not found in this section of stream.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Plans are (when sufficient adults return to Powerdale Fish Facility) to collect spring chinook broodstock at the Powerdale Fish Facility, located at RM 4.0 in Hood River. Construction of this facility was completed in 1997. Fish are captured after they ascend at fish ladder and jump over a finger weir into a 6x50 foot channel. Fish are manually crowded into a fish lift where they are brought into the sorting and processing building. Spring chinook are sorted and either passed or taken for brood. Broodstock will not exceed 25 percent of the run.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Broodstock are hauled to Parkdale Fish Facility using a 500 gallon fiberglass tank with an aeration system and mounted on a one ton flatbed pickup. Up to 10 fish can be hauled safely per trip.

5.3) Broodstock holding and spawning facilities.

All of the broodstock used at Parkdale Fish Facility are delivered from Powerdale Fish Facility and held in one of two 8x40 foot concrete holding ponds. Water depth can be adjusted for desired depths. Under normal operation the ponds are four feet deep. These brood ponds are supplied with water from either the Middle Fork Hood River or Rogers Creek. The water is delivered underground and is gravity fed. Water can be adjusted for desired flows, but are normally set for 400 gpm for each pond. Each pond can be supplied with water from either source or receive a mixture from the two sources. Pond water temperatures and depths are continually monitored by the Global Monitoring System (GMS). Flow meters monitor pond inflow. The upper end of each pond is fitted with slotted aluminum screen systems. Spray bars deliver approximately 50 gpm to each pond for fish security and sun shading, and can utilize water from either source. The adult ponds are painted camouflage and shade cloth is attached to the perimeter railing. Adult salmon and steelhead are held in these ponds until they are spawned and/or released back to the Hood River. No adverse critical habitat is lost between the intake diversion and the discharge back to Rogers Spring.

The spawning building at Parkdale Fish Facility is located in close proximity to the adult holding ponds. The spawning building is approximately 18x18 feet. It is constructed of split face concrete block and has a metal roof. The building has electrical supply and is plumbed with hot and cold water. All the necessary supplies for spawning are located in this building. Emergency pumps to operate adult pond spray bars are located in this building. Adult broodstock are handled and sorted prior to spawning in this building. A floor drain diverts spawning refuse to the 8,000 gallon fish waste tank (FWT).

5.4) Incubation facilities.

The incubation room is approximately 16x16 feet. It is a continuation of the spawning building and is constructed exactly as the spawning building. The building receives the same water from the same sources as the adult holding ponds. Gravity fed water from Rogers Spring Creek or the Middle Fork Hood River supplies the Marisource vertical stack incubators. There are presently four stacks of incubators with eight trays per stack. Booster pumps and a GMS sensitive head box are plumbed to the incubators. An additional aluminum head box and four more stacks of Marisource vertical incubators have been acquired for possible future incubation needs. Discharge water from the incubators is returned back to Rogers Creek. The two floor drains are plumbed to the 8,000 gallon FWT. Green eggs can be incubated and hatched and held to the swim-up stage.

5.5) Rearing facilities.

Experimental rearing has been carried out on a limited basis, mainly to compare growth and smolt quality with Round Butte Hatchery. Presently any fish rearing done at this facility will have to be done in the smolt acclimation ponds. There are two 8x80 foot concrete acclimation ponds. These ponds are typically adjusted to a depth of four feet. Rearing of spring chinook fry may occur from July when fish are about 100 fish/lb. until April the following year when fish are approximately 20 fish/lb. Ponds are adjusted to furnish desired flows. See 5.6) for further information.

5.6) Acclimation/release facilities.

Three acclimation and release sites were chosen in the Hood River subbasin. Two sites are located in the West Fork and one site at the Parkdale Fish Facility on the Middle Fork. These sites were chosen because of their close proximity to prime spawning and rearing habitat. The West Fork sites are at Blackberry Creek (RM 8.6) and at Jones Creek (RM 14.0). Three portable ponds are used at the two West Fork Hood River acclimation sites.

This Parkdale Fish Facility has two 8x80 foot acclimation ponds, which are typically adjusted to four-foot depths. Water is supplied from the same sources as the adult holding ponds. Water is delivered by gravity through underground pipes. Either Rogers Spring or Middle Fork Hood River water, or a combination of the two, can be used for acclimation. Water depths and temperatures are constantly monitored by the GMS, flow meters also monitor water flows. Maximum flows are set at 750 gpm per pond. The upper ends of the ponds are fitted with slotted aluminum screens. The lower ends of the ponds are fitted with double slotted screens; slotted dam board channels control the depth

of the ponds. Both ponds are painted camouflage. Typically smolts are held here during acclimation for several weeks prior to a volitional release.

At Blackberry Creek, two acclimation ponds (RM 21.0) are supplied with about 400 gpm water from the nearby creek. This tributary has an impassible falls at its mouth. The strategy is to allow spring chinook to home back to the West Fork in this area but not allow them to enter Blackberry Creek. The Jones Creek acclimation site (RM 26.5) has a single ModuTank Pond set up. The water supply is from Jones Creek, a small tributary of the West Fork that is intermittent during the summer. Adults will probably home to the West Fork near Jones Creek but will not enter the tributary because flows are too low. Parkdale Fish Facility acclimates spring chinook smolts at one of its 8x80 concrete camouflage colored ponds.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.
In April 2000, the hatchery water supply was contaminated with a suspected roadside herbicide or an orchard spray. About 3,000 of the 10,000 spring chinook sac fry died in the starter tank. These allegations have not been substantiated; however, protective measures are being taken to prevent any further water quality problems of this type.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.
The fish facility is staffed full-time, 24 hours per day. A computerized alarm system allows instantaneous notice of a system failure. Parkdale Fish Facility also has a backup generator in case of an electrical failure that would affect its operation.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.
The Hood River spring chinook salmon re-introduction program used Carson stock spring chinook for Hood subbasin releases from 1986 to 1992. Deschutes stock spring chinook have been the designated donor stock since 1993. The Deschutes stock has been available from Round Butte and Warm Springs National fish hatcheries.

The Hood River winter steelhead supplementation project, contained within the Hood River Production Program, began with an angler brood collection program for wild winter steelhead from the lower mainstem Hood River in 1991. Since 1992, all the Hood River winter steelhead brood have been collected from wild Hood River stock captured in the Powerdale Fish Facility.

The Hood River summer steelhead supplementation project, contained within the Hood River Production Program, began in 1998 with wild summer steelhead adults collected at the Powerdale Fish Facility.

6.2) Supporting information.

6.2.1) History.

Hood River spring chinook were extirpated in the late 1960's. The Hood River spring chinook salmon re-introduction program used Carson stock spring chinook for Hood subbasin releases from 1986 to 1992. Deschutes stock spring chinook have been the designated donor stock since 1993. The Deschutes stock has been available from Round Butte and Warm Springs National fish hatcheries.

The Deschutes stock has two components. The Round Butte Fish Hatchery component was founded from spring chinook captured in the Pelton Fish Trap located on the Deschutes River at RM 100.0. This hatchery stock has been periodically supplemented with fish or eggs from the Warm Springs National Fish Hatchery stock.

The Warm Springs National Fish Hatchery stock originating from wild spring chinook arriving at the hatchery diversion dam fish trap. The stock has been comprised primarily of hatchery origin adult spawners, but some wild adults have been periodically included into the hatchery production egg takes.

6.2.2) Annual size.

Up to 25% of the returning natural and hatchery origin spring chinook arriving at the Powerdale Fish Facility will be collected for hatchery broodstock. The total number of spring chinook collected for broodstock will not exceed 110 fish (55 females and 55 males) for the short term. For the long term the number of brood collected could increase to 220 fish (110 females and 110 males) if it is determined that the number of smolts released should be increased to 250,000.

6.2.3) Past and proposed level of natural fish in broodstock.

Spring chinook broodstock were collected from the Hood River subbasin (Powerdale Fish Facility) in 1997 and 1998. Ninety unmarked, naturally produced, fish were included in the 110 fish collected for broodstock in 1997; 36 unmarked, naturally produced, fish were included in the 42 fish collected in 1998. Broodstock for other years originated from Round Butte or Warm Springs National fish hatcheries.

6.2.4) Genetic or ecological differences.

There are no known differences between the hatchery stock and the natural stock. This may be associated with the short time period involved with the Hood River Production Program efforts to re-establish a Hood River population.

6.2.5) Reasons for choosing.

The Deschutes stock of spring chinook was selected as the donor stock for the re-establishment of spring chinook in the Hood subbasin because of its proximity to the Hood subbasin and the similarities of stream habitat in the Deschutes and Hood River tributaries. The Deschutes stock is found in the lower Deschutes subbasin, which borders the Hood subbasin along a portion of the southern and eastern boundaries. The Deschutes stock is a small race of chinook that historically has utilized the small headwater tributary streams in the Warm Springs River system. These small headwater

streams are located on the east face of the Cascade Mountains in a physical setting that is very similar to the upper Hood River tributaries. Because of these obvious habitat similarities and the availability of adults and eggs the Deschutes stock was selected as the donor stock.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

The indigenous Hood River spring chinook were extirpated in the late 1960's. The naturally produced spring chinook in the Hood subbasin are the progeny of introduced Deschutes stock.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

The Hood River Production Plan includes the provision for collecting broodstock for hatchery production from fish processed through the Powerdale Fish Facility. In the near future approximately 110 brood fish are needed to meet the production objective of 125,000 spring chinook smolts. If the projected Hood River adult run of spring chinook is expected to be less than 300 fish, eggs may be provided from Round Butte or Warm Springs fish hatcheries.

7.2) Collection or sampling design.

Spring chinook salmon are processed at the Powerdale Fish Facility (Hood River, RM 4.0) from late April through September. The Powerdale Fish Facility includes a finger weir trap that captures 100% of the chinook migrating through the Powerdale Dam fish ladder. Broodstock are collected randomly from throughout the run to avoid truncating the return of hatchery reared progeny.

7.3) Identity.

At this early stage of the Hood River spring chinook salmon re-introduction project the donor and the natural population are assumed to be essentially identical. The hatchery-reared Hood River spring chinook have distinctive external fin and/or maxillary bone clips that distinguish them from the unmarked naturally produced fish.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

Approximately 110 spring chinook adult broodstock must be collected to achieve the current project smolt production goal of 125,000 smolts. The broodstock sex ratio is assumed to be approximately 1:1, although this is difficult to verify during broodstock collection because of the lack of distinctive sex-related external characteristics.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

A total of 110 and 42 spring chinook were collected for hatchery broodstock from the Hood River run in 1997 and 1998, respectively. The broodstock for the other Hood River

production releases have originated at Round Butte or Warm Springs National fish hatcheries.

Year	Adults Females	Males	Jacks	Eggs	Juveniles
1997	60	50	0	183,428	121,391
1998	24	18	0	25,256	Unknown
1999	NA	NA	NA	NA	NA

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.
Spring chinook salmon are collected for hatchery broodstock at the Powerdale Fish Facility. Only appropriate numbers of fish are collected for broodstock. The naturally and hatchery produced fish not selected for broodstock are passed upstream to spawn naturally.

7.6) Fish transportation and holding methods.
Spring chinook broodstock collected at the Powerdale Fish Facility are transported as green fish to holding ponds at the Parkdale Fish Facility.

7.7) Describe fish health maintenance and sanitation procedures applied.
Spring chinook broodstock receive two prophylactic injections of erythromycin antibiotic to help reduce the likelihood that bacterial kidney disease will result in adult pre-spawning mortalities or infection of the progeny. Broodstock receive regular treatments with formalin to prevent / control fungus *(Saprolegnia parasitica)* outbreaks. The spawning area and equipment are routinely disinfected with an iodine solution to prevent disease outbreaks. Green eggs are water-hardened in an iodine solution to prevent disease or viral contamination. Ovarian fluid and sperm samples are collected and cultured for BKD or other virus. High BKD titer samples will result in the culling of the eggs from those adults.

7.8) Disposition of carcasses.
Spawned and unspawned spring chinook carcasses are frozen and used later for stream enrichment in the East, Middle and West fork of Hood River. The timing of the carcass placement is designed to provide maximum potential benefit to the juvenile salmonids and the ecosystem. Placement generally occurs in late spring or early summer, when the likelihood of significant freshets is minimal.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.
This is a non-issue since the naturally produced spring chinook in the Hood River subbasin are assumed to be genetically identical to the hatchery stock being used in this re-introduction project. The naturally produced Hood River spring chinook are not an

ESA-listed population. The indigenous Hood River spring chinook population was extirpated by the late 1960's.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

The annual spring chinook run size is estimated based on the previous year's jack and 4-year-old counts made at the Powerdale Fish Facility. Collection of spring chinook broodstock is random throughout the whole run. Individual fish are collected at a given ratio throughout the run. Fish are spawned randomly as they ripen.

8.2) Males.

There will be no backup male broodstock. Jacks will be included in the broodstock and will be used as any adult male in the production egg takes.

8.3) Fertilization.

Spring chinook are spawned using a 1:1 (male to female) ratio. The individual family groups of eggs are kept separate to facilitate culling if either or both parent has a high titer for BKD virus.

Parents are wiped down with an iodine solution and bled prior to spawning. Ovarian fluid and sperm samples are collected for viral analysis. Fertilized eggs are water-hardened in an iodine solution prior to placement in incubators.

8.4) Cryopreserved gametes.

Cryopreservation of spring chinook gametes is not used in the Hood River Production Program.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

Broodstock are selected at random from throughout the spring chinook run. Spawning is done randomly based on availability of ripe fish. Matings are done on a 1:1 sex ratio (i.e. one male and one female).

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

The Hood River spring chinook re-introduction program has used eggs taken as part of Round Butte Hatchery production in all but two years, 1997 and 1998. For this reason,

breakout of number of eggs taken for the Hood River Program and the green-to-eyed egg survival rate is not possible. The overall green-to-eyed egg survival rate at Round Butte Hatchery ranges from 90% to 95%.

9.1.2) Cause for, and disposition of surplus egg takes.
Extra spring chinook eggs are typically collected in order to compensate for egg-to-smolt mortality and culling associated with BKD treatment. Surplus eggs, culled eggs and surplus fish are all disposed of by burial.

9.1.3) Loading densities applied during incubation.
Spring chinook eggs average size is approximately 80 to 90 eggs per ounce at the egg take. The fish egg incubators typical water flow is 4.5 gallons per minute. Each incubator tray typically receives 7,500 spring chinook eggs.

9.1.4) Incubation conditions.
The water supply to the fish incubators is monitored for temperature, dissolved oxygen and flow. The incubating eggs are held on water that is 40 to 41°F; the dissolved oxygen for the influent water ranges from 10 to 11 ppm. There is no data available on the DO for the effluent water.

9.1.5) Ponding.
Fry are physically relocated from the incubator trays to starting ponds when the fry are 100% buttoned up. This occurs with approximately 1,550 to 1,700 temperature units. At the time of ponding the spring chinook fry size is typically 1,200 fish per pound. The lengths are not taken when the fry are first ponded.

9.1.6) Fish health maintenance and monitoring.
Incubating eggs are treated daily with a formalin drip to prevent or control fungus and "soft shell". The incidence of yolk-sac malformation is typically less than 0.1 percent (i.e. < 1 per 1,000 eggs).

Egg moralities are first removed with an automated egg picker. Any remaining egg mortalities are handed picked from groups of incubating eggs.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.
Eggs are incubated on spring and/or well water only to reduce disease and siltation risks.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..
It is impossible to present specific juvenile survival data, since the production groups of spring chinook salmon are mixed for at least half the rearing cycle at Round Butte Fish Hatchery. However the fry-to-fingerling survival is typically greater than 90%. The fingerling to smolt survival generally is greater than 95%. The overall fry to smolt survival is more than 85%.

9.2.2) Density and loading criteria (goals and actual levels).
The criteria for Round Butte Fish Hatchery raceway fish densities and loading differs considerably from the criteria for the Pelton Ladder rearing cells. The fingerling remain in the hatchery ponds from January through October. The majority of the fingerling complete rearing in the ladder cells from December through March. The pond loading goals are 5 pounds of fingerling per gallon per minute and 8 pounds per gallon per minute for smolts. The pond density goals are 2 pounds of smolts per cubic foot of pond water, and 1 pound of fingerling per cubic foot of water. The ladder rearing cells density criteria is 0.45 pounds of pre-smolts per cubic foot of pond. The density criteria in the cells is 2.8 pounds of pre-smolts per gallon of water per minute.

9.2.3) Fish rearing conditions
The Round Butte Fish Hatchery rears fish on constant 51°F spring water. The dissolved oxygen level remains constant at 10 to 11 ppm. The Parkdale Fish Facility has constant and variable temperature water supplies. The constant temperature water ranges from 38° to 40°F, while the variable temperature water ranges from 32° to 55° seasonally.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.
Length and weight data are collected for inclusion in monthly pond reports. The condition factor measurements are made shortly before liberation.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.
Once the fry have been ponded their weight generally doubles each of the subsequent months until they are released.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).
Spring chinook juveniles reared at Round Butte Fish Hatchery are fed a dry fish feed diet at a rate and frequency that varies with fish size. For the first 90 days following ponding the fish are fed 8 to 12 times per day. For the next 90 days they are fed 4 to 6 times per day. For the next 2 months they are fed 3 times per day. When the fish are transferred to the ladder rearing cells the feeding rate and frequency varies as the result of an on-going feeding study. One cell is fed 5 days per week, 4 cells are fed 2 days per week and one cell is fed 2 days every 14 days. The last 6 weeks, the juveniles in the ladder rearing cells are fed on demand 2 days per week prior to release.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.
Fish health of rearing juvenile spring chinook is monitored monthly by ODFW fish pathologists. The fish pathologists diagnosis disease problems and prescribe the appropriate treatments to eliminate or control the disease. An iodine antiseptic is routinely use to sanitize hatchery equipment and prevent the incidence or spread of disease.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.
The only index of smolt development collected at the hatchery is the condition factor data collected prior to liberation.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.
Pre-smolt chinook are reared for four months in the semi-natural rearing environment of the old Pelton Fish Ladder. There is abundant natural feed in the ladder, which is supplemented with commercial dry fish feed on a much reduced feeding schedule. The rearing densities are very light for pre-smolts in the ladder cells.

Fish transported to acclimation facilities in the Hood River subbasin experience natural-colored pond walls and/or in-water structure to simulate natural rearing conditions. Human contact is generally minimized during the ladder rearing and acclimation.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.
Fish will be reared to sub-yearling smolt size to mimic the natural fish emigration strategy and to minimize the risk of domestication effects that may be imparted through rearing to yearling size. Fish are reared for a minimum of four months in the semi-natural conditions of the old Pelton Fish Ladder and human contact is minimized.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	125,000 (interim), 250,000 (full program after 2002)	12/lb – 95,000; 20/lb – 30,000	April-early May	30,000 in Middle Fork; 95,000 in West Fork

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: 30,000 spring chinook smolts in Rogers Spring Creek (Middle Fork Hood River); 95,000 in West Fork Hood River

Release point: 30,000 in Middle Fork Hood River at RM 19.0; 95,000 in West Fork, ½ at RM 21.0 (Blackberry Creek Acclimation) and ½ at RM 26.5 (Jones Creek Acclimation)

Major watershed: Hood River

Basin or Region: Columbia

10.3) Actual numbers and sizes of fish released by age class through the program.

Release year	Eggs/ Un-fed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1996							129,211	9.8
1997							101,093	8.2
1998							124,783	9.8
1999							121,419	7.0
Average							119,127	8.7

10.4) Actual dates of release and description of release protocols.

Spring chinook smolts are transported to Hood River acclimation ponds beginning in early April. The volitional release of chinook smolts is generally complete by early May. Release of spring chinook smolts from acclimation ponds is based on the following criteria: 1) smolt readiness in terms of appearance, crowding outlet, etc. and 2) release time that corresponds to natural smolt outmigrants. Smolts are volitionally released for about two weeks. No migrants are forced out of the ponds. Non-migrants are subsequently trucked and released in the lower ¼ mile of Hood River. Table 21 provides release information.

10.5) Fish transportation procedures, if applicable.

Spring chinook are transported from the Pelton Ladder to acclimation ponds in the Hood River subbasin. Fish are in transit about three hours. Temperatures are regulated to the same temperatures as the receiving water. Transport trucks are equipped with oxygen to supersaturate truck water.

10.6) Acclimation procedures.

Three acclimation and release sites were chosen in the Hood River subbasin. Two sites are located in the West Fork and one site at the Parkdale Fish Facility on the Middle Fork. These sites were chosen because of their close proximity to prime spawning and rearing habitat. The West Fork sites are at Blackberry Creek and at Jones Creek. The ModuTank portable ponds measure 11'9"x49'3"x4'9" and have a capacity of 19,500

gallons. These polypropylene-lined steel ponds are equipped with standpipes for water level regulation.

Table 21. Deschutes River stock spring chinook salmon acclimated in the Middle Fork and West Fork Hood River drainage, 1996-2000. (RA = reared and acclimated at the release location.) Data source: Olsen and French (2000).

Drainage, Release Location, Release Year, Release Group[a],	Date Transferred to Raceways	Number Transferred to Raceways	Fish/lb at Transfer	Number of Days Acclimated	Mortalities in Acclimation Raceway	Number[b] Volitionally Released	Number[c] Trucked	Total[d] Released
West Fork,								
Blackberry Creek,								
1996,								
Group 1	Apr 8-10	85,080	10.1	6-8	180	84,900		84,900
Group 2	Apr 22-23	44,838	9.5	7-8	527	44,311		44,311
1997,								
Group 1	Apr 7-8	46,446	8.0	6-7	679	45,767		45,767
Group 2	Apr 16-17	56,380	8.4	4-5	1054	55,326		55,326
1998,								
Group 1	Apr 1-2	63,130	9.8	8-9	1073	62,057		62,057
Group 2	Apr 15-16	55,485	9.7	7-8	944	54,541		54,541
1999,								
Group 1	Mar 30-Apr 1	25,474	7.5	7-9	155	22,232	3,087	25,319
Group 2	Apr 13	26,837	6.7	7	334	23,415	3,088	26,503
2000,								
Group 1	Apr 4-5	33,343	7.6	5-6	61	30,277	3,005	33,282
Group 2	Apr 18-19	31,410	6.4	5-6	358	28,222	2,830	31,052
Jones Creek,								
1998,								
Group 1	Apr 16	8,245	9.7	6	60	8,185		8,185
Group 2								
1999,								
Group 1	Mar 30-Apr 1	19,982	7.6	7-9	462	12,937	6,583 (7)	19,513
Group 2	Apr 13	19,991	6.7	7	309	13,104	6,578 (7)	19,675
2000,								
Group 1	Apr 4-5	20,085	8.3	5-6	216	17,420	2,449 (4)	19,865
Group 2	Apr 18-19	19,529	6.3	5-6	959	16,189	2,381 (4)	18,566
Middle Fork,								
Parkdale Fish								
Facility,								
1999,								
Group 3	Mar 29	30,600	6.4	14	191	30,195	214	30,409
2000,								
Group 3A	Apr 3	15,334	6.7	7	12	15,293	29	15,322
Group 3B	Apr 20	15,176	5.7	5	12	15,136	28	15,164
Group 4	Mar 20	4,170	14.9	RA	10	4,126	34	4,160

[a] Groups 1-3 were finish reared at Pelton Ladder and Round Butte Hatchery in the Deschutes River subbasin and group four was finish reared at the Parkdale Fish Facility in the Hood River subbasin. Group one was transferred from Pelton Ladder cell # 4, group two was transferred from Pelton Ladder cell # 5, and group three was transferred from a pond at RBH.

[b] Hatchery spring chinook salmon that were volitionally released from the acclimation raceways.

[c] Number trucked indicates hatchery spring chinook salmon which did not emigrate volitionally from the acclimation raceways and were hauled and released near the mouth of the Hood River. In parentheses is mortalities from fish truck liberations.

[d] Mortality from the number trucked was subtracted from the total released.

At Blackberry Creek, two acclimation ponds (RM 21.0) are supplied with about 400 gpm water from the nearby creek. This tributary has an impassible falls at its mouth. The strategy is to allow spring chinook to home back to the West Fork in this area but not allow them to enter Blackberry Creek. The Jones Creek acclimation site (RM 26.5) has a single pond. The water supply is from Jones Creek, a small tributary of the West Fork that is intermittent during the summer. Adults will probably home to the West Fork near Jones Creek but will not enter the tributary because flows are too low. Parkdale Fish Facility acclimates spring chinook smolts in one of its 8x80 foot concrete camouflage colored ponds.

Spring chinook are normally brought to the acclimation ponds during the first week of April. Fish are held at the site for about 6-9 days before they are volitionally allowed to move out of the ponds. The volitional release lasts about one week. All acclimation ponds, including the Parkdale Fish Facility, have habitat structures placed in each pond to provide cover for fish. At the beginning of release, the vertical standpipe that regulates the pond level is gradually lowered over a period of several days. The first lowering is to about three foot of pond depth, then finally to two foot after about five days. The standpipe is fitted with a hopper to allow fish to easily find the outlet. The process of holding fish, acclimating and releasing them is repeated when the second group of fish is brought from Pelton Ladder to the ponds. All remaining fish that did not move out of the ponds during the first release are held with the second group and given a second chance to move out volitionally. Densities are checked to ensure they are at acceptable levels. At Parkdale, fish are released following the same schedule and procedure followed at the portable pond sites. However, instead of a standpipe to regulate the pond level, stoplogs are used.

Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All smolts are 100 percent coded wire tagged (CWTed), with differential marks alternating between AdLVCWT and AdRVCWT every other year for fish released into the West Fork. Releases from Parkdale Fish Facility (Middle Fork) are 100 percent marked, alternating between AdRMCWT and AdLMCWT.

10.7) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Releases have been within the programmed and approved levels.

10.8) Fish health certification procedures applied pre-release.

Fish must be certified by ODFW pathologists prior to release.

10.10) Emergency release procedures in response to flooding or water system failure.

In the event of a water system failure, fish would be forced from the pond. Standby pumps are ready at each acclimation site to re-circulate water during the emergency.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

The purpose of the spring chinook hatchery program is to re-introduce a self-sustaining population. Juveniles are released in the prime spring chinook habitat with the intent of them homing back to this site. Interaction of hatchery spring chinook and natural spring chinook and summer steelhead juveniles should be minimized using the acclimation and volitional release and trucking to the mouth any remaining non-migrants. Screw trap information has shown the hatchery spring chinook smolts move very quickly out of the subbasin.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

Objective 1. Determine abundance, distribution , and life history patterns of anadromous and resident fishes in the Hood River subbasin.

Sub-Objective 1. Determine abundance of downstream migrant anadromous salmonids leaving the Hood River subbasin.

Null Hypothesis 1: Implementation of the HRPP has not significantly increased wild steelhead smolt production in the Hood River subbasin.
Alternative: Implementation of the HRPP has significantly increased wild steelhead smolt production in the Hood River subbasin.
Null Hypothesis 2: Implementation of the HRPP has not successfully re-introduced a naturally producing population of spring chinook salmon in the Hood River subbasin.
Alternative: Implementation of the HRPP has successfully re-introduced a naturally producing population of spring chinook salmon in the Hood River subbasin.
Null Hypothesis 3: Hatchery acclimation facilities have not significantly increased numbers of hatchery smolts leaving the Hood River subbasin.
Alternative: Hatchery acclimation facilities have significantly increased numbers of hatchery smolts leaving the Hood River subbasin.

We propose conducting a mark and recapture program at selected sites located in the Hood River subbasin. The program will be used to estimate numbers of pre-smolt and smolt wild steelhead and salmon and smolt hatchery summer and winter steelhead leaving the Hood River subbasin and migrating from major forks and selected tributary streams. Data will be used to monitor wild steelhead and salmon smolt production and to determine if the HRPP is successful in 1) restoring depressed populations of wild summer and winter steelhead in the Hood River subbasin to levels commensurate with the subbasins current carrying capacity and 2) re-introducing a naturally producing population of spring chinook salmon. Data will also be used to determine if acclimation facilities significantly increase the numbers of hatchery smolts leaving the Hood River subbasin and, in conjunction with estimates of escapement (see **Sub-Objective 2**) and harvest (see **Sub-Objective 5**) ,

will be used to determine if acclimation facilities significantly increase hatchery smolt to adult survival rates. Estimates will be summarized annually in a research progress report. Ancillary life history, morphometric, and meristic data collected at the migrant trap (see **Sub-Objective 3**) will also be summarized in the annual progress report.

Sub-Objective 2. Determine abundance of upstream migrant jack and adult anadromous salmonids in the Hood River subbasin.

Null Hypothesis 1: Summer and winter steelhead and spring chinook salmon subbasin escapement goals have not been achieved subsequent to implementation of the HRPP.

Alternative: Summer and winter steelhead and spring chinook salmon subbasin escapement goals have been achieved subsequent to implementation of the HRPP.

Null Hypothesis 2: Summer and winter steelhead and spring chinook salmon spawner escapement goals have not been achieved subsequent to implementation of the HRPP.

Alternative: Summer and winter steelhead and spring chinook salmon spawner escapement goals have been achieved subsequent to implementation of the HRPP.

We propose counting upstream migrant jack and adult anadromous salmonids at an adult migrant trap located in the mainstem Hood River at Powerdale Dam (RM 4.5). Counts will be used in conjunction with estimates of harvest (see **Sub-Objective 5**) to estimate escapements of wild and hatchery produced summer and winter steelhead; natural and hatchery produced spring and fall chinook salmon; and natural and hatchery produced coho salmon to the Hood River subbasin. Numbers passed above Powerdale Dam will be used to estimate subbasin spawner escapement because no fisheries currently exist above the dam and only limited anadromous salmonid spawning occurs below Powerdale Dam. Data will primarily be used to determine if the biological fish objectives for the HRPP are being achieved but will also be used to develop models for predicting future run sizes based on in-season estimates of escapement to Powerdale Dam. Estimates will be summarized annually in a research progress report. Ancillary life history, morphometric, and meristic data collected at the adult migrant trap (see **Sub-Objective 4**) will also be summarized in the annual progress report.

Sub-Objective 3. Determine selected life history patterns for juvenile anadromous salmonids in the Hood River subbasin.

Null Hypothesis 1: Implementation of the HRPP has significantly altered selected life history patterns of indigenous populations of anadromous salmonids in the Hood River subbasin.

Alternative: Implementation of the HRPP has not significantly altered selected life history patterns of indigenous populations of anadromous salmonids in the Hood River subbasin.

Null Hypothesis 2: Implementation of the HRPP has significantly altered selected morphometric and meristic characteristics of indigenous populations of anadromous salmonids in the Hood River subbasin.

Alternative: Implementation of the HRPP has not significantly altered selected morphometric and meristic characteristics of indigenous populations of anadromous salmonids in the Hood River subbasin.

We propose bio-sampling downstream migrant rainbow-steelhead and salmon at a migrant trap located near RM 4.5 in the mainstem of the Hood River and at other selected sites in the subbasin. Hatchery smolts will also be bio-sampled at all HRPP satellite hatchery facilities prior to release in the Hood River subbasin. Age structure of downstream migrants will be determined, and freshwater age specific data will be collected on smolt and pre-smolt migration timing, mean fork length (mm), and condition factor. Information will be used to determine if any of the selected parameters are changing subsequent to implementation of the HRPP and to what extent changes may be due to implementation of the hatchery supplementation component of the HRPP. Data will be summarized annually in a research progress report.

Sub-Objective 4. Determine selected life history patterns for jack and adult anadromous salmonids escaping to the Hood River subbasin.

Null Hypothesis 1: Implementation of the HRPP has significantly altered the life history patterns of indigenous populations of anadromous salmonids in the Hood River subbasin.

Alternative: Implementation of the HRPP has not significantly altered the life history patterns of indigenous populations of anadromous salmonids in the Hood River subbasin.

Null Hypothesis 2: Implementation of the HRPP has significantly altered the morphometric and meristic characteristics of indigenous populations of anadromous salmonids in the Hood River subbasin.

Alternative: Implementation of the HRPP has not significantly altered the morphometric and meristic characteristics of indigenous populations of anadromous salmonids in the Hood River subbasin.

We propose sampling upstream migrant jack and adult anadromous salmonids at an adult migrant trap located in the mainstem of the Hood River at Powerdale Dam (RM 4.0). Age structure of upstream migrants will be determined and freshwater/ocean age specific data will be collected on jack and adult migration timing, mean fork length (cm), mean weight (kg), fecundity, and sex ratio. In-subbasin straying rates of non-indigenous stocks of anadromous salmonids, and out-of subbasin straying rates of salmonids marked and released in the Hood River subbasin with either a floy tag or coded wire tag, will also be monitored. Information will be used to determine if any of the above selected parameters are changing subsequent to implementation of the HRPP and to what extent changes may be due to implementation of the hatchery supplementation component of the HRPP. Data will be summarized annually in a research progress report.

Spawning ground surveys will be conducted for spring chinook salmon to determine if the newly re-introduced population is distributing itself throughout the presumed limits of the original native population.

Wild, natural, and hatchery produced components of the salmon and steelhead runs escaping to Powerdale Dam will be radio tagged in selected years to monitor spatial distribution of adult holding and spawning. Approximately 30 adults will be tagged from each of these components of the spring and fall chinook salmon, coho salmon, and summer and winter steelhead runs. Radio tagged fish will be tracked from ground and from helicopters.

Sub-Objective 5. Determine harvest and catch contribution of wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon.

Null Hypothesis 1: Summer and winter steelhead and spring chinook salmon subbasin harvest goals have not been achieved subsequent to implementation of the HRPP.

Alternative: Summer and winter steelhead and spring chinook salmon subbasin harvest goals have been achieved subsequent to implementation of the HRPP.

We propose conducting a creel program below Powerdale Dam to estimate harvest of wild (i.e., catch and release) and hatchery produced summer and winter steelhead; natural and hatchery produced spring and fall chinook salmon; and natural and hatchery produced coho salmon in the Hood River subbasin. Data will primarily be used to determine if the biological fish objectives for the HRPP are being achieved but will also be used to monitor the fisheries impact on listed stocks of wild steelhead. Data will also be used, in conjunction with estimates of escapement at Powerdale Dam, to develop stock recruitment curves and estimates of escapement to the Hood River subbasin (see **Sub-Objective 2**). Harvest goal's have not been established at this time but will be developed jointly by the Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon upon full implementation of the HRPP. Data will be summarized annually in a research progress report.

Sub-Objective 6. Determine selected life history patterns of jack and adult anadromous salmonids harvested in the Hood River subbasin.

Null Hypothesis 1: Subbasin fisheries are selectively modifying life history patterns of wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon.

Alternative: Subbasin fisheries are not selectively modifying life history patterns of wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon.

Null Hypothesis 2: Subbasin fisheries are selectively modifying the morphometric and meristic characteristics of wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon.

Alternative: Subbasin fisheries are not selectively modifying the morphometric and meristic characteristics of wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon.

We propose sampling jack and adult anadromous salmonids harvested in fisheries located in the mainstem Hood River below Powerdale Dam (RM 4.0). Age structure of fish sampled in the creel will be determined and freshwater/ocean age specific data will be collected on the temporal distribution of harvest, mean fork length (mm), and sex ratio. Estimates obtained from the fishery will be compared to estimates obtained at Powerdale Fish Facility (see **Sub-Objective 4**) to determine if the fishery is selectively harvesting jack and adult fish from unique components of the wild, natural, and hatchery runs. Selectively harvesting fish from unique components of the wild, natural, and hatchery runs has the potential for altering either the genetic diversity or genetic composition of indigenous populations of anadromous salmonids. Data will be summarized annually in a research progress report.

Objective 2. Identify the population genetic structure, systematics, and distribution of genetically unique steelhead, cutthroat, and resident rainbow trout populations in the Hood River subbasin and determine whether past hatchery programs have affected this structure.

Null Hypothesis 1: Both species are independent, entirely reproductively isolated breeding units.
Alternative: Some level of hybridization is occurring between *O. clarki* and *O. mykiss*.
Null Hypothesis 2: The Hood River subbasin is occupied only by coastal subspecies of the two species (*O.m. irideus and O.c. clarki*)
Alternative: Inland subspecies (*O.m. gairdneri* and *O.c. lewisi*) or some undescribed subspecies are at least partly present.
Null Hypothesis 3: Each species is a completely homogenized, randomly breeding group. There are no unique populations or isolated gene pools within subspecies of *O. mykiss* and *O. clarki* in the Hood River subbasin.
Alternative: There are isolated gene pools within subspecies of *O. mykiss* and *O. clarki* in the Hood River subbasin.
Null Hypothesis 4: Past hatchery programs for *O. mykiss* have not resulted in inter-breeding between hatchery and wild populations in the subbasin.
Alternative: Past hatchery programs for *O. mykiss* have resulted in inter-breeding between hatchery and wild populations in the subbasin.

The proper management of wild fish species requires a good understanding of the population structure and pattern of biodiversity present in the system. This is particularly critical if a management action may modify or manipulate the structure of that system. The management activity most likely to modify population structure is artificial propagation. Hatchery programs have the unique capacity to significantly impact indigenous populations of fish by modify the fitness of individuals and causing gene flow between populations.

This study provides important baseline information about *O. mykiss* and *O. clarki* population structure and the possible influence of past hatchery practices that is important for good management in the Hood River subbasin. As a consequence of this study the population structure of the two species in this subbasin will be clarified. The Hood River subbasin is located in a geographical area of great complexity for these species. The subbasin is on the boundary of two subspecies of *O. mykiss* (inland and coastal) and on the periphery of the *O. clarki* subspecies (coastal). Both conditions can contribute to exceptional patterns of diversity. Hatchery broodstocks from both *O. mykiss* subspecies have been used in the subbasin, along with an *O. clarki* stock from elsewhere in the subspecies distribution. Further, it has become apparent that the two species hybridize in the subbasin and in adjacent areas.

This study will investigate aspects of the biodiversity of *O. mykiss* and *O. clarki* within the Hood River subbasin, but also from adjacent subbasins from the Willamette to the Deschutes. Isolated sampling in the Hood River subbasin alone would not be meaningful. Samples from adjacent subbasins are necessary in order to put the complex genetic variation observed within the Hood River subbasin into proper context across a wider distribution of the species.

Genetic samples were collected from wild and hatchery summer and winter steelhead and from resident rainbow and cutthroat trout from 1994-96. Most samples have been analyzed to date. We propose analyzing the last of the samples in FY 2000 and preparing a final report which characterizes populations in the Hood River subbasin and the impact of past hatchery practices.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.
The Monitoring and Evaluation (M&E; i.e., research) component of the Hood River Production Program is currently funded entirely by the Bonneville Power Administration. It is anticipated that the M&E program will be funded for at least the next five years.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Juvenile Trapping
Migrant traps will be sampled daily to minimize mortality associated with trapping stress. Pre-smolt and smolt salmonids collected for bio-sampling will be held in water oxygenated with a portable aerator when large numbers of downstream migrants are caught in the trap. The live box on the mainstem migrant trap was also modified from its original dimensions in order to further minimize stress related mortality associated with the trapping of downstream migrants. The live box was enlarged by about 80% and had a side compartment added to provide some separation of migrants in the live box and to provide an area of reduced turbulence. The number of downstream migrant wild and hatchery steelhead and resident rainbow trout that are marked and released above the trap, to estimate recapture rates at the migrant traps, is limited to a relatively small percentage of the total number caught. This is done to minimize handling mortality.

Adult Trapping
The adult trap at Powerdale Fish Facility will be operated five to seven days a week to minimize holding mortality. The trapping facility was designed in a manner that minimizes stress related mortality associated with the handling of fish for counting and bio-sampling. Anadromous salmonids can quickly be sampled and transported to selected locations via a network of tubes located in the sampling area. The tubes are designed to efficiently and safely move fish to either 1) a recovery pond above Powerdale Dam that has an outlet to the mainstem of the Hood River, 2) holding pens located at the Powerdale Fish Facility, or 3) a liberation truck that can be used either to "recycle" fish through the sport fishery, or to transport broodstock to the HRPP's Parkdale facility.

Harvest Estimates
The creel is conducted throughout the entire year to estimate harvest in the fishery located below Powerdale Dam. There are no risk aversion protocols associated with implementing the creel program.

SECTION 12. RESEARCH

12.1) Objective or purpose.

The Hood River Production Program (HRPP) is composed of six separate BPA funded projects (i.e., Project Numbers 95-007-00, 89-029-00, 93-019-00, 88-053-03, 88-053-04, and 98-021-00). The six projects primarily provide funding for three broad categories of activities. These include hatchery supplementation, habitat restoration, and monitoring and evaluation studies. The hatchery supplementation component of the HRPP is funded under Project Numbers 95-007-00, 89-029-00, 93-01-900, and 88-053-03. These projects provide funding for the hatchery program's broodstock collection, adult holding and spawning, egg incubation, juvenile rearing, marking and coded wire tagging, and acclimation and release of hatchery smolts. The habitat restoration component of the HRPP is funded under Project #98-021-00. This project provides funding for several habitat improvement projects primarily designed to increase in-basin egg-to-smolt survival. The monitoring and evaluation component of the HRPP is primarily funded under Project Numbers 88-053-03 and 88-053-04. Jack and adult anadromous salmonids escaping to the Powerdale Fish Facility are bio-sampled and counted with funding provided under Project # 93-019-00.

The research component of the HRPP provides funding to monitor and evaluate the various actions taken by the five other BPA funded projects collectively involved in implementing the HRPP. Information gathered from the monitoring and evaluation projects will be used to evaluate the HRPP relative to the programs performance goals and to provide information critical to implementing the program in a biologically sound manner. More specifically, the research component of the HRPP will provide the quantitative data critically needed by fishery managers to 1) determine if the biological fish objectives for the HRPP have been achieved, or are achievable and 2) optimize the benefits associated with the HRPP, and 3) minimize the HRPP's impact on ESA listed species (and other indigenous populations of fish) in the Hood River subbasin.

12.2) Cooperating and funding agencies.

The research component of the HRPP is entirely funded by Bonneville Power Administration under Project Number 88-053-03 to the Confederated Tribes of the Warm Springs Reservation of Oregon and Project Numbers 88-053-04 and 93-019-00 to the Oregon Department of Fish and Wildlife.

12.3) Principle investigator or project supervisor and staff.

Principal investigator for the Confederated Tribes of the Warm Springs Reservation of Oregon is Michael Lambert. Principal investigators for the Oregon Department of Fish and Wildlife are Erik Olsen (Project #88-053-04) and Jim Newton (Project #93-019-00).

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

The Hood River Production Program (HRPP) has two goals. They are to 1) re-establish spring chinook salmon to the Hood River subbasin and 2) restore depressed populations of wild summer and winter steelhead in the Hood River subbasin to levels commensurate with the subbasin's current carrying capacity. The spring chinook salmon population is not effected by the Endangered Species Act because an indigenous population no longer exists in the subbasin. Both summer and winter steelhead are ESA listed species. The

indigenous population of wild adult winter steelhead escaping to the Hood River subbasin has fluctuated widely since 1991. The indigenous population of wild summer steelhead escaping to the Hood River subbasin has declined since 1991 and appears to be well below the presumed carrying capacity of the subbasin.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

METHODS

Juvenile Trapping

Downstream migrant anadromous salmonids will be trapped at rotary-screw traps (i.e., migrant traps) located in the mainstem Hood River (RM 4.5); in the West (RM 4.0), Middle (RM 1.3), and East (RM 1.0) forks of the Hood River; Neal Creek (RM 0.5), a tributary to the mainstem Hood River at RM 4.6; and in Lake Branch (RM 0.25) and Green Point Creek (RM 1.0), which are tributaries to the West Fork of the Hood River. Migrant traps are located at sites that will maximize both the flow into the trap and the amount of stream the trap will fish. Because of seasonal variation in streamflow, traps will periodically be repositioned in the stream channel in order to optimize trapping efficiency. The mainstem migrant trap is fished to a maximum depth of 1.2 meters, and the West, Middle, and East fork and Lake Branch migrant traps are fished to a maximum depth of 0.8 meters. The migrant traps fish approximately 8%, 9%, 14%, 16%, 20%, 10%, and 20% of the stream channels width in the mainstem, West Fork (WFk), East Fork (EFk), Middle Fork (MFk), Neal Creek, Lake Branch, and Green Point Creek, respectively.

The rotary-screw traps funnel downstream migrants into a live box that will be sampled on a daily basis. Sampling will typically be conducted in the morning to reduce temperature related stress. All fish will be anesthetized with MS 222 (Tricaine Methanesulfonate), sorted by species, examined for fin and maxillary mark combinations, and counted. Counts of downstream migrant rainbow-steelhead (rb-st) will be made for two size categories; they include fish greater than or equal to 150 mm fork length and fish less than 150 mm fork length. Counts of downstream migrant juvenile wild chinook and coho salmon will be made for three size categories; they include fish less than 50 mm fork length, fish 50-69 mm fork length, and fish greater than 69 mm fork length. A random sample of fish will be sampled for scales, measured to the nearest millimeter fork length, and weighed to the nearest 0.1 gram. Scale samples will be mounted on glass slides and sent to the ODFW's research laboratory in Corvallis, Oregon, where experienced ODFW staff will analyze the scales and determined freshwater age using methods described by Borgerson et al. (1992). Data will be recorded on a computerized data entry form and keypunched into a computer database.

Downstream migrant salmonids will be sampled at the mainstem migrant trap to monitor temporal distribution of migration from the Hood River subbasin. Estimates of migration timing will be based on bi-weekly counts at the migrant trap. Bi-weekly counts will not be adjusted for seasonal variation in trap efficiency because recapture rates are typically too low to make it possible to accurately estimate trap efficiency for unique time periods.

Rainbow-steelhead will be used to indirectly estimate steelhead smolt migration timing because no accurate methodology exists to visually identify rainbow trout from downstream migrant steelhead smolts. To estimate migration timing for steelhead

smolts, it will be necessary to define a cutoff date in which the majority of smolts should have migrated past the trapping facilities. Based on the distribution of bi-weekly catches of migrant rb-st, the ending date for the steelhead smolt migration was fixed at 31 July.

Mark:recapture methodologies will be used to estimate numbers of wild, natural, and hatchery produced anadromous salmonid smolts migrating from the Hood River subbasin. Estimates of smolt production for wild and naturally produced salmonids will be limited to the upper size category because outmigrant smolts are believed to predominately be the larger size fish. A pooled Petersen estimate with Chapman's modification (Ricker 1975) will be used to estimate numbers of downstream migrants, by species and size category. Approximate 95% confidence intervals (C.I.) will be calculated according to methodologies described by Seber (1973; as cited by Lindsay et al. 1986) and Ott (1977; as cited by Lindsay et al. 1986). Formulas for estimating the number of downstream migrants passing each rotary screw trap, and the corresponding confidence limits, are documented in Olsen et al. (1999).

Downstream migrants will be marked with a panjet needle-less injector. The panjet will be used to shoot a narrow high speed stream of colored dye at selected fins. This process permanently marks the fin with a unique color by infusing a small amount of the colored dye below the epidermal layer. The dye color will be changed every two weeks to uniquely mark fish for defined time intervals during the sampling period. Additionally, a small piece of the top or bottom lobe of the caudal fin is removed from fish sampled at the mainstem migrant trap. This unique mark is added only to migrants marked at the mainstem migrant trap and subsequently released above the trap for recapture. This mark was used to provide another mechanism for identifying migrants that were color marked at the mainstem migrant trap but subsequently lost the color mark because it was poorly applied. Unique dye color and marked fin combinations will be assigned to each trap so that the origin of recaptures at the mainstem migrant trap can be determined.

Adult Trapping

An upstream migrant adult fish trap (Powerdale Fish Facility) was installed at Powerdale Dam in December 1991. Powerdale Dam, which is owned and operated by PacifiCorp, is located at RM 4.5 in the mainstem Hood River. Powerdale Fish Facility was installed in the uppermost pool of an existing fish ladder located on the east bank of the mainstem Hood River. The stop-log water intake control of the fish ladder was modified to allow water to flow through a submerged orifice into the ladder. A removable bar grate with one inch spaces between bars blocked the submerged orifice to prevent fish from exiting the top pool of the ladder. A fyke, installed at the entrance to the uppermost pool, prevented fish from backing down the ladder after they entered the uppermost pool. A wood slat cover was put on the trap to prevent fish from jumping out of the trap and a lock on the cover prevented poaching. A false floor of wood slats was installed at the bottom of the trap to reduce the depth of the trap from about 4.5 feet to about 2 feet. This modification facilitated removal of the fish. In June 1992, the submerged fyke was replaced with a finger weir because it was observed that spring chinook salmon would avoid swimming through the submerged fyke and would often try to jump over it. There was no delay in migration timing, or other abnormal fish behavior, observed with the new design.

Beginning in late 1995, and continuing through early 1997, a new trapping facility was constructed at Powerdale Dam. The new trapping facility utilizes the existing fish ladder

on the east bank of Powerdale Dam to divert upstream migrant jack and adult salmonids into a temporary holding area. Fish are crowded from the temporary holding area into a fish lock where they are then elevated into the working area of the trapping facility. In the working area of the trapping facility, fish are transitioned from the fish lock to a staging tank; from the staging tank to an anesthetic tank; and from the anesthetic tank to the sampling area. A network of tubes, located in the sampling area, are then used to transfer fish from the working area to either 1) the adult holding pens (primarily used for holding hatchery broodstock), 2) the mainstem Hood River above Powerdale Dam, or 3) a portable fish liberation tank. Prior to transfer, each jack and adult salmonid has a uniquely numbered floy tag inserted below the base of the dorsal fin. All mini-jack spring chinook salmon are tagged with a floy tag.

The Powerdale Fish Facility was checked on a daily basis from December 1991 to January 1997, except during the winter when low stream temperatures typically slow upstream migration. The new trapping facility, which was fully operational beginning in February 1997, is checked every one to three days depending on the numbers of jack and adult salmonids escaping to the facility. The flexibility to sample the new trapping facility at a lower rate was made possible by the increased capacity for holding adults. Generally, the trap will be checked in the morning in order to minimize potential handling stress associated with sampling fish during the afternoon when water temperatures are typically higher.

Jack and adult salmonids will be identified by species, classified by sex, and examined for injuries. Injuries will be categorized as either a predator scar, net mark, hook scar, or a scrape. Predator scars include both closed and open wounds. A closed wound is typically an "M" shaped marine mammal scar where scales were missing and the skin was scratched. An open wound is one in which the skin is broken. Net marks will be distinguished by a raw, rubbed mark on the leading edge of the dorsal fin. Generally, marks from the net twine can be seen encircling the fish. Hook scars include both fresh and healed wounds. Fresh hook scars are identified as any wound in the area of the mouth in which the skin is torn or abraded. Healed hook scars are identified based on missing maxillaries or a deformed jaw. A wound will be classified as a scrape if the skin is either scratched or abraded, the scales are missing, or the wound does not appear to be the result of a predator.

Spring and fall races of chinook salmon are distinguished based on run timing, external coloration, and general appearance. Summer and winter races of steelhead are distinguished based on fin and maxillary mark combinations, external coloration, degree of scale tightness and scale erosion, state of sexual maturity relative to the time of year, external parasite load, color of gill filaments, and general appearance. Fish are anesthetized with CO_2 before the physical examination. Subsequent to the physical examination, each fish is measured to the nearest 0.5 cm fork length, weighed to the nearest 0.1 kg, and haa a numbered floy tag inserted below the base of the dorsal fin. Additionally, a small piece of the anal fin the size of a dime is removed from all summer and winter steelhead passed above Powerdale Dam and from all summer and winter steelhead utilized for broodstock. Fin samples are stored in a uniquely numbered vial filled with alcohol. In selected years, a random sample of approximately 30 adult fish from each of the wild, natural, and hatchery components of the spring and fall chinook salmon, coho salmon, summer and winter steelhead, and bull trout runs escaping to the Powerdale Fish Facility will be radio tagged and released above Powerdale Dam. Not all

components will be sampled in any given year and sampling of any given component of the run will occur on only a periodic basis (i.e., limited to potentially every fourth to seventh run year). All field data are entered into a database.

Fecundity is estimated for natural and hatchery spring chinook salmon and wild and hatchery summer and winter steelhead from adults used as hatchery broodstock. Female spring chinook salmon are strip spawned and fecundity is estimated using a volumetric displacement technique. Female steelhead used for hatchery broodstock are air spawned and the number of eggs per female is estimated with a volumetric displacement technique. Fecundity estimates for steelhead are not adjusted to account for potential egg retention.

Scale samples are collected from all jack and adult salmonids sampled at the Powerdale Fish Facility. Samples are collected from the key scale area on each side of the fish and placed into uniquely numbered scale envelopes. Scale samples are later mounted on gummed cards and sent to the ODFW's research laboratory in Corvallis, Oregon, where an acetate impression is made of each card. Impressions are viewed by microfiche. Experienced ODFW staff analyze the impressions and determine origin (wild or hatchery) and life history (freshwater and ocean ages) using methods described by Borgerson et al. (1992).

Summer and winter races of adult steelhead are classified as wild or hatchery fish based on fin and maxillary clip combinations and scale analysis. Scale analysis is used in all cases to determine if unmarked fish are of wild or hatchery origin. Unmarked wild summer and winter steelhead are assumed to be returns from wild production in the Hood River subbasin. Hatchery summer steelhead marked with a single adipose clip are assumed to be returns from subbasin hatchery production releases of Skamania stock summer steelhead. These production releases were entirely marked with a single adipose clip prior to release in the Hood River subbasin. Hatchery summer steelhead, with mark combinations other than a single adipose clip, are classified as stray hatchery fish. Returns of differentially marked Hood River stock summer steelhead will return beginning with the 2000-2001 run year. Hood River stock hatchery summer steelhead smolts were first released in 1999 (1998 brood).

Unmarked hatchery winter steelhead returning from brood releases, made prior to the 1989 brood release, were assumed to be returns from subbasin hatchery production. This assumption was made because, prior to the 1989 brood release, all hatchery winter steelhead production was released unmarked into the Hood River subbasin. Hatchery production releases in the Hood River subbasin were first marked beginning with the 1989 brood release. The entire hatchery production release from the 1989 brood, as well as all subsequent hatchery brood releases, were marked prior to release in the Hood River subbasin. With the exception of the 1993 and 1994 brood releases, alternate brood releases were marked with a unique fin and maxillary mark combination. Marked hatchery winter steelhead are classified as either a subbasin or stray hatchery fish based on mark combination and age.

Scale analysis periodically identifies unmarked steelhead as hatchery fish and marked steelhead as wild fish (i.e., origin unknown). The latter group includes marked wild and natural strays and Hood River stock wild steelhead which either had deformed fins or had the fins removed by sport fishers. Fin removal by fishers has been observed in the Hood

River subbasin. The former group includes steelhead that were either mis-classified as hatchery fish or were unmarked hatchery fish. Unmarked hatchery steelhead are believed to primarily be returns from subbasin hatchery production releases because of problems associated with poor marking of hatchery smolts, a problem primarily associated with the hatchery winter steelhead program. Numbers of adult steelhead in both of these groups was typically low.

Steelhead of unknown origin are not used in estimating the migration timing, sex ratio, or age structure of wild, subbasin hatchery, and stray hatchery fish in order to minimize the potential for biasing estimates by incorporating non-indigenous stocks into the sample populations. For purposes of estimating escapement, however, all marked wild steelhead are allocated as wild fish and all unmarked hatchery steelhead are allocated as Hood River subbasin hatchery production. Steelhead with regenerated scales, as well as those for which no scale samples were taken, will be classified as wild, if they were unmarked, and as either subbasin or stray hatchery fish, based on mark combination. Steelhead, for which the age was unknown, are allocated into specific age categories using the ratios observed in the corresponding category of wild, subbasin hatchery, and stray hatchery fish in which they were assigned.

Spring chinook salmon are classified as natural or hatchery fish based on fin and maxillary mark combinations and scale analysis. Scale analysis is used in all cases to determine if a fish was of natural or hatchery origin. Unmarked naturally produced spring chinook salmon are classified as returns from natural subbasin production. Unmarked hatchery spring chinook salmon returning from the 1986-90 and the 1993 broods were assumed to be returns from subbasin hatchery production releases. This assumption was made because only a percentage of these brood releases were marked prior to release in the Hood River subbasin. Hatchery production releases from the 1991 brood, and from brood releases subsequent to the 1993 brood release, were entirely marked. Marked hatchery spring chinook salmon are classified as either a subbasin or stray hatchery fish based on mark combination and age. Migration timing, sex ratio, age structure, and escapements are estimated using the same methods described for summer and winter steelhead.

Fall chinook salmon and coho salmon (*Oncorhynchus kisutch*) are classified as either natural or hatchery produced based on fin and maxillary mark combinations and scale analyses. Unmarked fall chinook and coho salmon, classified as a wild fish based on scale analysis, are classified as returns from subbasin natural production. Unmarked and marked fall chinook and coho salmon, classified as a hatchery produced fish based on scale analysis, are classified as strays because no hatchery fall chinook or coho salmon are released into the Hood River subbasin. Migration timing, sex ratio, age structure, and escapements are estimated using the same methods described for summer and winter steelhead.

Harvest Estimates

Creel surveys are conducted on the Hood River from 1 January through 31 December to estimate harvest of spring and fall chinook salmon, coho salmon, and summer and winter steelhead. Prior to 1 April 1998, the survey area extended from the mouth of the Hood River to the reach of stream which could be visually observed from atop Powerdale Dam; a distance of approximately 0.3 miles above Powerdale Dam. The creel was restricted to this reach of stream because the large number of geographically diverse access points and

low effort made it logistically difficult, and economically unfeasible, to accurately estimate harvest above the dam. Punch card estimates also indicated that the greater percentage of fish (approximately 75% or more) were harvested below Powerdale Dam. The fishery above Powerdale Dam was closed to the harvest of salmon and steelhead on 1 April 1998. Three sites are predominately utilized by fishers to gain access to the Hood River below Powerdale Dam.

Two levels of stratification (day type and two week period) are used in summarizing the data and estimates of catch, catch rate, and effort will be determined for both strata. Sampling days are categorized as either a weekend-holiday or week day and total catch are summarized by two week periods (bi-monthly) that encompass the first through the fifteenth and the sixteenth through the end of each month. Total number of days sampled in any given two week period will range from 40-80% of the weekdays and 40-100% of the weekend-holiday days.

Effort (i.e., total hours fished) for each sample day is estimated by developing a pressure curve, from periodic pressure counts, and calculating the area under the curve. The first and last pressure counts are considered as zero points and are assigned as one half hour before sunrise and one half hour after sunset. Pressure counts are conducted three to four times during the day. Times are determined by dividing the sampling day into either three or four equal length periods and conducting a pressure count at the point when angler numbers appear to be the highest during the period. The direction of surveyor travel for the first pressure count will be randomly selected. Subsequent pressure counts are made in the opposite direction of the previous count. Anglers are interviewed throughout the day to obtain catch rate information on both fishers that have completed angling as well as for those that have not completed angling. The catch rate is estimated as fish per angler hour. Formulas for estimating bi-monthly harvest of jack and adult salmonids, and their corresponding confidence limits, are documented in Olsen et al. (1999).

12.6) Dates or time period in which research activity occurs.

Juvenile Trapping
Migrant traps are operated daily from around early March through early October.

Adult Trapping
The adult trap at Powerdale Fish Facility is operated five to seven days a week throughout the entire year.

Harvest Estimates
The creel is conducted throughout the entire year to estimate harvest in the fishery located below Powerdale Dam.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

Egg Take and Incubation
Spring chinook are spawned at a 1:1 sex ratio. Individual family groups are maintained separately in the incubation trays until the viral samples from the parents have been analyzed. All eggs are water-hardened in an iodine antiseptic solution after fertilization.

Infertile or dead eggs are removed mechanically and manually from the viable eggs after they reach the "eyed stage" of development.

Juvenile Trapping
Migrant traps are sampled daily to minimize holding mortality. Pre-smolt and smolt salmonids are typically held in sampling containers for less than an hour to count and bio-sample. If large numbers of salmonids are caught at a given migrant trap, water in the sampling containers is aerated with a portable aerator while the fish are being counted and bio-sampled. Salmonids that are to be released above the trap are quickly transported in large coolers filled with water. If significant numbers of salmonids are being transported upriver, the water is aerated with a portable aerator.

Adult Trapping
The adult trap at Powerdale Fish Facility is operated five to seven days per week to minimize holding morality. The Powerdale Fish Facility was designed to facilitate the counting and bio-sampling of jack and adult salmonids and to minimize total handling time. A network of tubes located in the facility are designed to quickly, safely, and with a minimum of stress, transport jack and adult salmonids to one of three locations. They include 1) a recovery pond above Powerdale Dam, 2) holding ponds located at the Powerdale Fish Facility, and 3) liberation trucks.

Harvest Estimates
The creel has no protocols associated with the care and maintenance of ESA listed species.

12.8) Expected type and effects of take and potential for injury or mortality.

Juvenile Trapping
Migrant traps are used to sample downstream migrant pre-smolt and smolt salmonids. The migrant trap located in the mainstem of the Hood River samples approximately 3-8% of the downstream migrant salmonids passing the location of the trap. Trapping efficiencies at other migrant traps range from 10-25% depending on fluctuations in streamflow and numbers passing the trap site. Potential for seriously injuring downstream migrants either as a consequence of trapping or handling of the fish appears to be minimal. This assumption is based on past years operation of the migrant traps. The physical appearance of the downstream migrants sampled from the migrant traps indicate that only a very small percentage of migrants may be injured as a consequence of trapping and handling prior to release. The percentage of mortalities relative to the total number caught is also fairly low (see **Section 12.9**)

All migrant traps combined annually catch approximately 2-6 kelts (i.e., spawned out adult steelhead) drifting out of the subbasin. Most of these adults are still alive when the traps are sampled and these fish are immediately returned to the river. It is unknown whether or not the additional stress associated with trapping and handling decrease the kelts' chances for survival to return and spawn in another run year.

Adult Trapping
The adult trap at Powerdale Fish Facility samples all fish escaping to Powerdale Dam. The trapping facility has limited potential for injuring fish. The trapping facility is designed to facilitate counting and bio-sampling in a manner that will minimize handling

mortalities. Data from past years (see Section 12.9) indicate that handling mortality will be fairly low and that post-release survival should be fairly high. The handling and tagging of fish at Powerdale Fish Facility may increase the likelihood that fish will develop fungus related problems subsequent to release. The extent to which this may or may not be a serious problem is unknown.

Harvest Estimates
The creel program has no sampling risks associated with the take of ESA listed species.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take tables" (Table 16-20).

The number of ESA listed pre-smolt and smolt steelhead sampled at all downstream migrant traps, along with the number of mortalities, is summarized in Table 22. The number and disposition of ESA listed adult summer and winter steelhead sampled at the Powerdale Fish Facility are summarized in Table 23 and Table 24, respectively. The combined handling and trapping mortality at the migrant traps ranged from 0.73-2.48% of the total number of rainbow-steelhead caught at the traps. Run year specific estimates of handling and trapping mortality at the Powerdale Fish Facility ranged from approximately 0-4.5% for adult wild summer steelhead and 0-3.5% for adult wild winter steelhead.

12.10) Alternative methods to achieve project objectives.
There are currently no alternatives to evaluating performance indicators identified in **Section 1.10 List of program "Performance Indicators," designated by "benefits" and "risks."** However, data collected by the research component of the HRPP will be used to develop models that will allow us to drop certain tasks currently being implemented in the subbasin. We hope to develop models that are able to estimate wild steelhead smolt production based on the numbers of fish passed above Powerdale Dam.

Table 22. Combined catch of rainbow-steelhead and hatchery summer and winter steelhead at migrant traps located in the Hood River subbasin and total number of all mortalities. (ODFW, un-published data on June 22, 2000, Mid-Columbia District, The Dalles, Oregon)

	Rainbow-Steelhead			Hatchery Winter Steelhead			Hatchery Summer Steelhead		
	Number		Percent	Number		Percent	Number		Percent
Year	Caught	Mort.[a]	Mort.	Caught	Mort.	Mort.	Caught	Mort.	Mort.
1994	7,400	54	0.73	2,994	94	3.14	1,883	250	13.28
1995	1,413	35	2.48	2,149	31	1.44	3,245	67	2.06
1996	1,512	35	2.31	4,037	15	0.37	5,492	109	1.98
1997	4,653	54	1.16	7,810	437	5.60	2,001	116	5.80
1998	4,766	119	2.50	3,515	119	3.39	21	1	4.76
1999	2,826	23	0.81	3,398	19	0.56	966	7	0.72

a Numbers include fish killed for genetic analysis and for samples requested by the Environmental Protection Agency.

Table 23. Disposition of adult summer steelhead collected at the Powerdale Fish Facility. Counts of wild and hatchery adult summer steelhead may include mis-classified marked and unmarked winter steelhead, respectively. Origin (i.e., wild or hatchery) was determined based on scale analysis. Data source: Olsen and French (2000).

	Returns to Powerdale Dam		Broodstock collection				Numbers Passed Above Powerdale Dam		Numbers Recycled Below Powerdale Dam		Mortalities	
			By Origin		By Sex							
Run Year	Wild	Hatchery	Wild	Hatchery	Males	Females	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery[b]
1992-1993	491	1,730	--	--	--	--	491	1,723	--	5	--	2
1993-1994	244	1,112	--	--	--	--	242	1,106	1	4	1	2
1994-1995	220	1,639	--	--	--	--	219	1,634	--	1	1	4
1995-1996	132	553	--	--	--	--	131	521	1	28	--	4
1996-1997	184	1,369	--	--	--	--	179	1,315	2	50	3	4
1997-1998	79	600	13	3	5	11	63	449	2	142	1	6
1998-1999	132	567	31	3	13	21	100	4	--	549	1	11
1999-2000[a]	183	490	33	--	12	21	145	2	5	469	--	16

[a] Preliminary data.

[b] Estimate includes fish killed for coded wire tags and recaptured "recycled" fish that were not suitable for further recycling through fishery below Powerdale Dam.

Table 24. Disposition of adult winter steelhead collected at the Powerdale Fish Facility. Counts of wild and hatchery adult winter steelhead may include mis-classified marked and unmarked summer steelhead, respectively. Origin (i.e., wild or hatchery) was determined based on scale analysis. Data source: Olsen and French (2000).

	Returns to Powerdale Dam		Broodstock Collection				Numbers Passed Above Powerdale Dam		Numbers Recycled Below Powerdale Dam		Mortalities	
			By Origin		By Sex							
Run Year	Wild	Hatchery	Wild	Hatchery	Males	Females	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery[b]
1991-1992	698	318	70	35	50	55	621	282	--	--	7	1
1992-1993	412	238	57	1	30	28	343	11	3	223	9	3
1993-1994	405	176	78	1	34	45	301	5	13	167	13	3
1994-1995	206	111	42	1	23	20	161	5	2	98	1	7
1995-1996	280	280	65	24	46	43	211	162	1	88	3	6
1996-1997	289	641	46	37	42	41	237	254	3	308	3	42
1997-1998	227	393	39	41	34	46	182	163	4	163	--	11
1998-1999	301	323	41	35	33	43	258	187	1	82	1	19
1999-2000[a]	926	301	48	46	41	53	876	222	1	24	1	9

[a] Preliminary data.

[b] Estimate includes fish killed for coded wire tags; recaptured "recycled" fish that were not suitable for further recycling through fishery below Powerdale Dam; and whole fish samples collected for the Environmental Protection Agency.

12.10) Alternative methods to achieve project objectives.

There are currently no alternatives to evaluating performance indicators identified in **Section 1.10 List of program "Performance Indicators," designated by "benefits" and "risks."** However, data collected by the research component of the HRPP will be used to develop models that will allow us to drop certain tasks currently being implemented in the subbasin. We hope to develop models that are able to estimate wild steelhead smolt production based on the numbers of fish passed above Powerdale Dam. The downstream migrant traps would still require operation to evaluate selected performance indicators, but the elimination of certain tasks could reduce the injury and mortality rates on wild steelhead that are specifically associated with marking and bio-sampling.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

The Hood River subbasin supports populations of both bull trout and anadromous cutthroat trout. The bull trout population is located in the upper drainage of the Middle Fork of the Hood River and populations of anadromous and resident forms of cutthroat trout are predominately located in the East and Middle fork drainages of the Hood River subbasin; the mainstem of the Hood River; and in selected tributaries to the mainstem of the Hood River. The Powerdale Fish Facility and the downstream migrant traps catch both bull trout and sea run cutthroat trout (Table 25). Number caught at the Powerdale Fish Facility ranged from 0-3 adult anadromous cutthroat trout and 6-28 adult bull trout. Numbers caught at the downstream migrant traps ranged from 13-43 and smolt anadromous cutthroat trout and 0-29 smolt bull trout. No mortality of either species has occurred at the Powerdale Fish Facility. No bull trout, and only two cutthroat trout, have been killed in the entire six years of sampling at the downstream migrant traps.

Table 25. Numbers of bull and cutthroat trout caught in the Hood River subbasin at downstream migrant traps and the Powerdale Fish Facility. Data source: Olsen and French (2000).

	Bull Trout		Cutthroat Trout	
Year	Migrant Traps	Powerdale Fish Facility	Migrant Traps	Powerdale Fish Facility
1994	1	11	17	0
1995	0	11	13	0
1996	6	18	25	0
1997	13	6	18	3
1998	29	18	43	0
1999	1	28	30	0

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Juvenile Trapping
Migrant traps are sampled daily to minimize mortality associated with trapping stress. Pre-smolt and smolt salmonids collected for bio-sampling are held in water oxygenated with a portable aerator when large numbers of downstream migrants are caught in the trap. The live box on the mainstem migrant trap was also modified from its original dimensions in order to further minimize stress related mortality associated with the trapping of downstream migrants. The live box was enlarged by about 80% and had a side compartment added to provide some separation of migrants in the live box and to provide an area of reduced turbulence. The number of downstream migrant wild and hatchery steelhead and resident rainbow trout that are marked and released above the trap, to estimate recapture rates at the migrant traps, is limited to a relatively small percentage of the total number caught. This is done to minimize handling mortality.

Adult Trapping
The adult trap at Powerdale Fish Facility is operated five to seven days a week to minimize holding mortality. The trapping facility was designed in a manner that minimizes stress related mortality associated with the handling of fish for counting and bio-sampling. Anadromous salmonids can quickly be sampled and transported to selected locations via a network of tubes located in the sampling area. The tubes are designed to efficiently and safely move fish to either 1) a recovery pond above Powerdale Dam that has an outlet to the mainstem of the Hood River, 2) holding pens located at the Powerdale Fish Facility, or 3) a liberation truck that can be used either to "recycle" fish through the sport fishery, or to transport broodstock to the HRPP's Parkdale facility.

Harvest Estimates
The creel is conducted throughout the entire year to estimate harvest in the fishery located below Powerdale Dam. There are no risk aversion protocols associated with implementing the creel program.

SECTION 13. ATTACHMENTS AND CITATIONS

REFERENCES

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____