HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Hood River Production Program
Species or Hatchery Stock:	Steelhead
Agency/Operator:	Oregon Department of Fish and Wildlife / Confederated Tribes of Warm Springs Reservation of Oregon
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 mykiss, winter run steelhead stock 050
Oncorhynchus mykiss, summer run steelhead stock 050

1.3) Responsible organization and individuals

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

The Hood River steelhead hatchery programs are implemented jointly by Oregon Department of Fish and Wildlife and the Confederated Tribes of the Warm Springs Reservation of Oregon. The Hood River Watershed Group and the Northwest Service Academy/Americorp provides volunteers to assist setup and takedown of portable acclimation facilities. West Fork acclimation sites are on land owned by Longview Fibre Company. The East Fork Irrigation Districts owns and operates the sand trap where the winter steelhead are acclimated.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Powerdale, Parkdale, and Oak Springs O&M (88-053-07), (88-053-08) 3.8 FTE
FY 2001 - $344,139
FY 2002 - $337,318
FY 2003 - $344,366

1.5) Location(s) of hatchery and associated facilities.

Adult Collection:

Powerdale Dam is located on the Hood River at river mile (RM) 4.0. Facilities include an adult trap that intercepts all upstream migrating adult steelhead. Fish can be sorted, removed, or passed upstream at the trap.

Spawning, rearing, acclimation and release:

The Hood River Fish facility is located near Parkdale on Rogers Spring Creek, tributary of the Middle Fork Hood River. Facilities include two adult holding ponds, two acclimation ponds, two Canadian rearing troughs, spawning and incubation facilities.

Egg incubation and rearing:

Oak Springs hatchery is located in the Deschutes River Canyon at RM 47.2, about 3 miles northeast of Maupin, Oregon. Site elevation is 850 feet above sea level (Lewis 1996). Summer and winter steelhead eggs are transferred from Parkdale to Oak Springs Hatchery for incubation and rearing.

Acclimation and release:

East Fork Irrigation acclimation site is located on the East Fork Hood River at RM 10.0. Approximately 30,000 winter steelhead are transported from Oak Springs Hatchery to the acclimation site. Acclimation and volitional release is done in one of the concrete settling ponds for the irrigation diversion. Non-migrants are trucked and released at the mouth of Hood River.

Acclimation and release:

Approximately 30,000 winter steelhead smolts are acclimated at the Parkdale Fish Facility in one of the concrete ponds and volitionally released into Rogers Spring Creek. Non-migrants are trucked to the mouth of Hood River and released.

Acclimation and release:

There are two summer steelhead acclimation sites in the West Fork Hood River. Blackberry Creek (Dry Run Bridge) acclimation site is located on the West Fork Hood River at RM 8.5. Facilities include two portable rectangular pond. The Jones Creek site is located at RM 14.5, and also has a portable acclimation ponds. Approximately 20-30,000 smolts are volitionally released into the West Fork. Non-migrants are trucked and released at the mouth of Hood River.

1.6) Type of program.

The Hood River winter and summer steelhead (stock 050) fish propagation projects are managed by CTWS and ODFW as a "**supplementation**" program.

1.7) Purpose (Goal) of program.

Winter Steelhead Stock 050: Goals 1-3 have priority over Goal 4.

1) Winter steelhead stock 050 will be maintained as an artificial reserve to retain management options in the Hood Basin. This action is intended to be beneficial to the recovery of wild fish.

2) Winter steelhead hatchery stock 050 will be used to increase the abundance of the wild winter steelhead population, with the goal of achieving a self-sustaining wild population size that averages at least 5000 adults to Hood River.
3) Concurrent with the implementation of Goals 1 and 2, this program will be used in a study of the relative reproductive success of wild and hatchery fish in the natural environment. It is expected that this research project will provide valuable information that will be useful in the recovery of wild fish not only in the Hood Basin, but also elsewhere in the Columbia River Basin.
4) A hatchery fish-only sport and tribal harvest will be allowed on winter steelhead hatchery stock 050 adults that are excess to recovery needs.

Summer Steelhead Stock 050: Goals 1-3 have priority over Goal 4.

1) Summer steelhead stock 050 will be maintained as an artificial reserve to retain management options in the Hood Basin. This action is intended to be beneficial to the recovery of wild fish.
2) Summer steelhead hatchery stock 050 will be used to increase the abundance of the wild summer steelhead population, with the goal of achieving a self-sustaining wild population size that averages at least 8,000 adults to Hood River.
3) Concurrent with the implementation of Goals 1 and 2, this program will be used in a study of the relative reproductive success of wild and hatchery fish in the natural environment. It is expected that this research project will provide valuable information that will be useful in the recovery of wild fish not only in the Hood basin, but also elsewhere in Oregon, and the Columbia River Basin.
4) A hatchery fish-only sport and tribal harvest will be allowed on summer steelhead hatchery stock 050 adults that are in excess to recovery needs. However, this action may not start for several years. Concurrent with the implementation of this goal, further use of summer steelhead stock 024 (discussed below) may be phased out.

1.8) Justification for the program.

The Hood River Production Program, steelhead component, will use artificial production of Hood River native stock summer and winter steelhead to increase the numbers of natural spawners and ultimately increase these two populations while maintaining the long-term fitness of the target populations and minimizing the ecological and genetic impacts on non-target populations within the Hood River subbasin.

1.9) List of program "Performance Standards".

Performance standards for the steelhead component of the Hood River Production Program include: 1) Rebuild the naturally self-sustaining run of Hood River summer steelhead with an annual run of 8,000 to Hood River, with a spawner escapement of 2,400 and 5,400 available for in-river sport and tribal fish harvest by 2016; 2) Rebuild the naturally self-sustaining run of Hood River winter steelhead with an annual run of 5,000 to Hood River, with a spawner escapement of 2,400 and 2,400 available for in-river sport and tribal fish harvest by 2016; 3) maintain the genetic character of naturally producing

populations of native and re-established salmonids in the Hood River subbasin; and 4) monitor 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.**

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

1.10.1) "Performance Indicators" addressing benefits.
Smolt to adult survival will be assessed based on monitoring of natural and hatchery smolt emigration from the subbasin and adult returns observed at the Powerdale Fish Facility and in the Hood River sport fishery.

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

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) Downstream migrant traps will be used to estimate numbers of wild rainbow-steelhead moving past selected areas of the Hood River subbasin. Estimates will be used to determine the number of smolts produced in the Hood River subbasin; in the West, Middle, and East forks of the Hood River subbasin; and in Neal Creek, Lake Branch, and Green Point Creek. Data will be used to determine if the HRPP is successfully achieving its defined goal of restoring depressed populations of wild summer and winter steelhead in the Hood River subbasin to levels commensurate with the subbasins current carrying capacity.

1-1-3) A downstream migrant trap will be operated in the mainstem of the Hood River at RM 4.5 to estimate numbers of subbasin hatchery produced summer and winter steelhead moving out of the Hood River subbasin. Data will be used to 1) determine what percentage of the hatchery production groups residualize in the subbasin and 2) better estimate out-of-basin smolt to adult survival rate.

Sub-Objective 2

1-2-1) Wild and subbasin hatchery produced adult summer and winter steelhead will be counted at the Powerdale Fish Facility. Estimates of escapement to the Powerdale Fish Facility 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 1) determine if the HRPP is achieving the programs defined escapement objectives for wild and subbasin hatchery produced summer and winter steelhead, 2) determine if the HRPP is producing a hatchery smolt that has a survival rate similar to that of wild steelhead (see 1-1-1 and 1-1-2), 3) determine if the HRPP is achieving the programs defined smolt-to-adult survival rate (see 1-1-1); and 3) evaluate acclimation facilities to determine if volitionally released acclimated hatchery smolts have a higher smolt-to-adult survival rate than hatchery smolts directly released into the subbasin (see 1-1-3).

Sub-Objective 5

1-5-1) Harvest will be estimated for the fishery below Powerdale Dam to evaluate the effectiveness of the Hood River steelhead supplementation program. 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 11.1 Monitoring and evaluation of "Performance Indicators" presented in Section 1.10**.

Objective 1

Sub-Objective 3

1-3-1) Age structure, mean fork length, mean weight, and mean condition factor are estimated at Oak Springs Hatchery for hatchery summer and winter steelhead smolts destined for release in the Hood River subbasin. Mean estimates are compared between wild steelhead and subbasin hatchery produced summer and winter steelhead (see 1-3-2) to determine if the selected morphometric and meristic characteristics of the subbasin hatchery stocks are the same as, or dissimilar to, estimates for the wild population.

1-3-2) Age structure, mean fork length, mean weight, and mean condition factor are estimated at downstream migrant traps for both pre-smolt and smolt wild steelhead. Mean estimates are compared between wild steelhead and subbasin hatchery produced summer and winter steelhead (see 1-3-1) to determine if the selected morphometric and meristic characteristics of the subbasin hatchery stocks are the same as, or dissimilar to, estimates for the wild population.

1-3-3) Temporal distribution of migration is estimated for pre-smolt and smolt wild steelhead and subbasin hatchery produced summer and winter steelhead sampled at migrant traps located in the Hood River subbasin. Data are used to determine if hatchery smolts have a migration pattern similar to that of wild steelhead smolts.

Sub-Objective 4

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

1-4-2) Temporal distribution of migration is monitored for wild and subbasin hatchery adult summer and winter steelhead escaping to the Powerdale Fish Facility. Data are used to determine if migration timing of the hatchery stocks are similar to that of the wild population.

1-4-3) Spatial distribution of the indigenous population is determined from radio tagged wild adult summer and winter steelhead. Data is used to identify where hatchery summer and winter steelhead should be released into the Hood River subbasin.

1-4-4) Coded wire tags are recovered from summer and winter steelhead sampled at the Powerdale Fish Facility, in the creel, and from adults used for hatchery broodstock. Data are summarized to 1) determine the extent to which non-indigenous stocks stray into the Hood River subbasin, 2) identify the potential for non-indigenous stocks to spawn in the subbasin, and 3) identify if non-indigenous stocks are incorporated into the hatchery broodstock so that eggs can be destroyed.

1-4-5) Out-of-subbasin recoveries of coded wire tagged hatchery summer and winter steelhead are summarized for subbasin hatchery summer and winter steelhead released as smolts in the Hood River subbasin. Hatchery summer steelhead smolts are currently not coded wire tagged prior to release but hatchery production release may be coded wire tagged at some future date. 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.

1-4-6) Out-of-subbasin recoveries of floy tagged fish will be summarized for "recycled" summer and winter steelhead. Data will also be used to monitor the straying rate of "recycled" adults.

Sub-Objective 6

1-6-1) Age structure will be monitored for adult summer and winter steelhead 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 wild or subbasin hatchery components of the adult summer and winter steelhead runs. The selective harvest of specific age categories would ultimately modify the age structure of the population of wild and subbasin hatchery produced summer and winter steelhead escaping to the spawning grounds (see 1-4-1).

Objective 2

2-1) Genetic samples will be collected from pre-smolt and smolt steelhead and cutthroat trout at selected sites in the Hood River subbasin. Data will be used to identify and characterize populations in the Hood River subbasin and to identify guidelines for minimizing the HRPP's impact on indigenous populations of summer and winter steelhead and anadromous and resident cutthroat trout.

2-2) Genetic samples will be collected from all adult summer and winter steelhead passed above Powerdale Dam and for all summer and winter steelhead used for hatchery broodstock. Data will be used to 1) characterize wild and subbasin hatchery populations currently present in the Hood River subbasin, 2) determine the impact past hatchery practices have had on the indigenous population, and 3) monitor any impact the current hatchery program (i.e., the HRPP's) may be having on the indigenous populations.

1.11) Expected size of program.

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

The interim broodstock collection goals (i.e. 2000 to 2002) are:

Winter Steelhead – wild 35, Hood hatchery stock 35, Total 70
Summer Steelhead – wild 40

Long term (potential) broodstock collection goals (i.e. post 2002) are:

Winter Steelhead – wild 45, Hood hatchery stock 45, Total 90
Summer Steelhead – wild 80, Hood hatchery stock 80, Total 160

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

Summer Steelhead

Life Stage	Release Location	Annual Release Level
Eyed Eggs	NA	NA
Unfed Fry	NA	NA
Fry	NA	NA
Fingerling	NA	NA
Yearling	West Fork Hood River	150,000

Winter Steelhead

Life Stage	Release Location	Annual Release Level
Eyed Eggs	NA	NA
Unfed Fry	NA	NA
Fry	NA	NA
Fingerling	NA	NA
Yearling	Middle Fork Hood River	35,000
Yearling	East Fork Hood River	50,000

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.
Tables 1 and 2 present smolt to adult return data for hatchery-reared summer and winter steelhead. There are no smolt to adult survival estimates for wild summer or winter steelhead since it is impossible to distinguish between, or estimate the numbers of summer and winter steelhead emigrating smolts.

Total summer steelhead escapement to Powerdale Dam by origin, run year and age is summarized in Table 3. Total winter steelhead escapement to Powerdale Dam is summarized in Table 4.

The escapement of summer and winter steelhead adult spawners upstream from Powerdale Dam is summarized in Table 5.

1.13) Date program started (years in operation), or is expected to start.

The Hood River Production Program began in 1992.

1.14) Expected duration of program.

This is an ongoing program and there is no specified concluding date.

1.15) Watersheds targeted by program.

This program is targeting the Hood River watershed.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

There were five alternatives considered for the Hood River Production Program

The **preferred alternative** was selected because it included a combination of supplementation , habitat improvement and monitoring and evaluation programs.

Table 1. Adult summer steelhead escapements to the Powerdale Fish Facility by origin, brood year, and ocean age category. Brood years are boldfaced for those years in which brood year specific estimates of escapement are complete. (Percent return[a] is in parentheses. Estimates are based on returns in the 1992-1993 through 1998-1999 run years.) Data source: Olsen and French (2000).

Origin, Stock, Brood Year[b]	Smolts	Ocean Age				Repeat Spawners
		1 Salt	2 Salt	3 Salt	4 Salt	
Wild,						
Hood River,						
1986	--	--	1	0	0	3
1987	--	0	78	55	3	19
1988	--	6	353	65	0	15
1989	--	31	184	37	0	9
1990	--	13	93	20	0	3
1991	--	7	105	14	0	5
1992	--	17	142	7	0	4
1993	--	8	60	13	--	11
1994	--	8	76	0	--	--
1995	--	15	2	--	--	--
Subbasin hatchery,						
Foster,						
1987	79,867	--	--	1 (0.001)	1 (0.001)	--
1988	89,026	--	--	150 (0.17)	3 (0.003)	13 (0.01)
1989	81,795	--	1,512 (1.85)	236 (0.29)	0	7 (0.01)
1990	77,132	48 (0.06)	818 (1.06)	251 (0.33)	0	12 (0.02)
1991	99,973	36 (0.04)	1,361 (1.36)	59 (0.06)	0	12 (0.01)
1992	70,928	11 (0.02)	426 (0.60)	79 (0.11)	0	5 (0.007)
1993	90,042	61 (0.07)	1,251 (1.39)	37 (0.04)	-	19 (0.02)
1994	76,330	7 (0.01)	544 (0.71)	136 (0.18)	--	0 (0)
1995	68,378	9 (0.01)	377 (0.55)	--	--	1 (0.001)
1996	60,993	26 (0.04)	--	--	--	--

[a] Hood River in-river harvest averages 35% of the total hatchery origin fish returning per run year. This table summarized % return to Powerdale Dam and does not include fish harvested in lower Hood River in this percentage figure.

[b] Complete brood returns are available beginning with the 1989 wild and 1990 hatchery broods, as determined based on age structure for adult summer steelhead sampled at the Powerdale Fish Facility. Estimates of escapement for prior brood years do not include adult returns from all possible age categories.

Table 2. Adult winter steelhead escapements to the Powerdale Fish Facility by origin, stock, brood year, and ocean age category. (Percent return[a] is in parentheses. Brood years are bold faced for those years in which brood year specific estimates of escapement are complete. Estimates are based on returns in the 1991-1992 through 1998-1999 run years.) Data source: Olsen and French (2000).

Origin, Stock, Brood Year[b]	Smolts	Ocean Age				Repeat Spawners
		1 Salt	2 Salt	3 Salt	4 Salt	
Wild,						
Hood River,						
1985	--	--	--	--	--	2
1986	--	--	1	17	0	19
1987	--	--	111	93	1	39
1988	--	1	445	131	1	23
1989	--	10	194	88	1	15
1990	--	37	285	46	0	16
1991	--	12	132	37	1	8
1992	--	29	208	39	0	11
1993	--	21	231	53	0	12
1994	--	15	158	38	0	4
1995	--	14	157	--	--	--
1996	--	55	8	--	--	--
Subbasin hatchery,						
Big Creek,						
1987	28,000	--	--	1 (0.004)	--	2 (0.007)
1988	4,890	--	6 (0.12)	7 (0.14)	--	4 (0.08)
1989	36,038	--	276 (0.77)	135 (0.37)	1 (0.003)	11 (0.02)
1990	20,434	--	134 (0.66)	70 (0.34)	--	7 (0.03)
Mixed,[c]						
1991	4,595	6 (0.13)	21 (0.46)	2 (0.04)	--	0
Hood River,[d]						
1992	48,985	0 (0)	77 (0.16)	17 (0.03)	0	1 (0.002)
1993	38,034	11 (0.03)	251 (0.66)	101 (0.27)	0	12 (0.03)
1994	42,860	10 (0.02)	526 (1.23)	117 (0.27)	1 (0.002)	11 (0.02)
1995	50,896	7 (0.01)	245 (0.48)	119 (0.23)	--	4 (0.01)
1996	59,837	3 (0.005)	166 (0.28)	--	--	--
1997	62,135	11 (0.02)	--	--	--	--

[a] Hood River in-river harvest averages 35% of the total hatchery origin fish returning per run year. This table summarized % return to Powerdale Dam and does not include fish harvested in lower Hood River in this percentage figure.

[b] Complete brood returns are available beginning with the 1989 wild and 1990 hatchery broods, as determined based on age structure for adult winter steelhead sampled at the Powerdale Fish Facility. Estimates of escapement for prior brood years do not include adult returns from all possible age categories.

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

[d] Beginning with the 1995 brood release, hatchery smolts were volitionally released from acclimation facilities located in the Hood River subbasin. Hatchery smolts were held at the facilities for one to two weeks prior to release.

Table 3. Adult summer steelhead escapements to the Powerdale Dam trap by origin, run year, and age category. Fish of unknown origin were allocated to origin categories based on scale analysis and the ratio of fish of known origin (*see* **METHODS**). Data source: Olsen and French, 2000.

Origin, Stock, Run Year	Total Escapement	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	491	--	5	0	--	26	309	48	0	6	78	0	1	18
1993-1994	244	--	1	2	--	11	108	53	3	5	44	7	0	10
1994-1995	220	--	0	0	--	5	81	34	0	2	71	12	0	15
1995-1996	132	--	0	0	--	15	82	18	0	2	11	1	0	3
1996-1997	184	--	2	0	--	7	129	14	0	2	23	2	0	5
1997-1998	79	--	1	0	--	8	42	7	0	1	13	0	0	7
1998-1999	132	--	2	0	--	15	75	13	0	0	16	0	0	11
Subbasin hatchery,														
Foster,														
1992-1993	1,725	48	1,512	150	1	--	0	1	--	--	--	--	--	13
1993-1994	1,099	36	817	236	3	--	0	0	--	--	--	--	--	7
1994-1995	1,635	11	1,360	251	0	--	1	0	--	--	--	--	--	12
1995-1996	548	61	420	59	0	--	1	0	--	--	--	--	--	7
1996-1997	1,351	7	1,251	79	0	--	6	0	--	--	--	--	--	8
1997-1998	594	9	544	37	0	--	0	0	--	--	--	--	--	4
1998-1999	557	26	377	136	0	--	0	0	--	--	--	--	--	18
Stray hatchery,														
Unknown,														
1992-1993	5	3	2	0	--	--	--	--	--	--	--	--	--	0
1993-1994	13	1	10	2	--	--	--	--	--	--	--	--	--	0
1994-1995	4	0	1	3	--	--	--	--	--	--	--	--	--	0
1995-1996	5	2	0	2	--	--	--	--	--	--	--	--	--	1
1996-1997	18	1	16	1	--	--	--	--	--	--	--	--	--	0
1997-1998	6	2	4	0	--	--	--	--	--	--	--	--	--	0
1998-1999	10	1	7	2	--	--	--	--	--	--	--	--	--	0

Table 4. Adult winter steelhead escapements to the Powerdale Dam trap by origin, run year, and age category. Fish of unknown origin were allocated to origin categories based on scale analysis and the ratio of fish of known origin (*see* **METHODS**). Data source: Olsen and French, 2000.

Origin, Stock, Run Year	Total Escapement	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	698	--	3	4	0	9	424	76	0	1	111	17	0	1	52
1992-1993	412	--	2	6	0	36	174	123	1	1	20	17	0	0	32
1993-1994	405	--	2	6	0	9	274	79	0	1	17	4	0	0	13
1994-1995	206	--	1	1	0	28	107	34	1	3	9	3	1	0	18
1995-1996	280	--	12	1	1	18	183	29	0	1	22	6	0	0	7
1996-1997	289	--	1	1	0	12	199	34	0	3	24	7	0	1	7
1997-1998	227	--	1	0	0	12	134	42	0	3	20	4	0	0	11
1998-1999	301	--	8	0	0	55	156	38	0	2	23	10	0	0	9
Subbasin hatchery,															
Big Creek,															
1991-1992	296	--	276	7	--	--	6	1	--	--	--	--	--	--	6
1992-1993	210	--	65	135	--	--	0	0	--	--	--	--	--	--	10
1993-1994	138	--	--	63	1	--	69	0	--	--	--	--	--	--	5
1994-1995	10	--	--	--	--	--	--	7	--	--	--	--	--	--	3
Mixed,[a]															
1992-1993	6	6	--	--	--	--	--	--	--	--	--	--	--	--	--
1993-1994	15	--	15	--	--	--	--	--	--	--	--	--	--	--	--
1994-1995	8	--	--	2	--	--	6	--	--	--	--	--	--	--	--
Hood River,															
1993-1994[b]	0	0	--	--	--	--	--	--	--	--	--	--	--	--	--
1994-1995	89	11	77	--	--	0	--	--	--	--	--	--	--	--	1
1995-1996	274	10	247	17	--	0	0	---	--	--	--	--	--	--	0
1996-1997	638	7	523	100	0	0	4	--	--	--	--	--	--	--	4
1997-1998	373	2	237	117	0	0	3	1	--	--	--	--	--	--	13
1998-1999	316	11	166	119	1	1	8	--	--	--	--	--	--	--	10

Table 4 (continued). Adult winter steelhead escapements to the Powerdale Dam trap by origin, run year, and age category. Fish of unknown origin were allocated to origin categories based on scale analysis and the ratio of fish of known origin (*see* **METHODS**). Data source: Olsen and French, 2000.

Origin, Stock, Run Year	Total Escapement	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	
Stray hatchery, Unknown,															
1991-1992	22	0	8	13	--	--	0	--	--	--	--	--	--	--	1
1992-1993	22	0	15	5	--	--	0	--	--	--	--	--	--	--	2
1993-1994	23	1	0	21	--	--	1	--	--	--	--	--	--	--	0
1994-1995	4	1	1	2	--	--	0	--	--	--	--	--	--	--	0
1995-1996	6	0	5	0	--	--	0	--	--	--	--	--	--	--	1
1996-1997	3	0	3	0	--	--	0	--	--	--	--	--	--	--	0
1997-1998	20	1	2	16	--	--	1	--	--	--	--	--	--	--	0
1998-1999	7	0	3	2	--	--	1	--	--	--	--	--	--	--	1

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

[b] The 1993-94 run year is the first run year in which the Hood River stock (1992 brood) would have had the potential for returning as adults to Powerdale Dam. These fish would have returned as age category 1/1 adults. None were sampled at the Powerdale Dam trap.

Table 5. The number of hatchery and wild fish counted at Powerdale Fish Facility Trap and the number collected and spawned for broodstock since the 1992 run year, and the number of spawners escaping upstream from Powerdale Dam. Data source: Olsen and French (2000).

	Powerdale Dam Count		Fish Passed above Dam					
Year	**Wild fish**	**Hatchery stock 050**	**Wild fish**	**Hatchery stock 050 (*stock 13)* (*stock 024*)**	**Number of wild fish collected for brood**	**Number of wild fish spawned, by gender**	**Number of hatchery fish spawned, by gender**	**Total brood stock size, by gender**
Winter Steelhead Stock 050								
1991-92	699	0	622	*(281)*	73	39 (21m/18f)	0	39 (21m/18f)
1992-93	412	0	343	*(11)*	57	36 (20m/16f)	0	36 (20m/16f)
1993-94	406	0	301	*(5)*	79	54 (28m/26f)	0	54 (28m/26f)
1994-95	206	112*	161	5	42	37 (19m/18f)	0	37 (19m/18f)
1995-96	280	280	211	162	71	36 (17m/19f)	17 (12m/5f)	53 (29m/24f)
1996-97	289	641	237	254	48	32 (15m/17f)	24 (14m/10f)	56 (29m/27f)
1997-98	228	392	181	164	43	23 (12m/11f)	18 (8m/10f)	41 (20m/21f)
1998-99	303	303			44	32 (19m/13f)	28 (13m/15f)	60 (32m/28f)
Summer Steelhead Stock 050								
1992-93	492	0	477	*(1,722)*	0	0	0	
1993-94	242	0	228	*(1,106)*	0	0	0	
1994-95	219	0	183	*(1,632)*	0	0	0	
1995-96	131	0	122	*(521)*	0	0	0	
1996-97	178	0	169	*(1,313)*	0	0	0	
1997-98	65	0	64	*(448)*	15	8 (2m/6f)	0	8 (2m/6f)
1998-99	112	0	100	*(4)*	32	24(11m/13f)	0	24(11m/13f)

* = Assumes all returning hatchery steelhead were stock 050. Possibly some older stock 13 may be included in this number.

The **traditional hatchery alternative** was rejected since it would not meet the need for mitigating and protecting self-sustaining anadromous fish populations.

The **supplementation alternative** was rejected because it only addressed hatchery supplementation and monitoring and evaluation. This alternative did not include a habitat improvement component.

The **habitat improvement alternative** was rejected because it only addressed re-building the depressed populations using habitat improvements and monitoring and evaluation programs. There was concern about the near term outlook for these seriously depressed populations and whether they might wink-out before appreciable habitat improvements had provided increases in fish production.

The **no action alternative** was rejected because of the lack of potential action that could have been expected to occur.

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 the hatchery program 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 200 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.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program. This 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 wild summer steelhead adult population enumerated at Powerdale Fish Facility has ranged in size from 65 to 170 in the last five years (Table 5). All summer steelhead arriving at Powerdale Fish Facility 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 Fish Facility has ranged in size from 194 to 274 in the last five years (Table 5). All winter steelhead arriving at Powerdale Fish Facility 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 Fish Facility has ranged from 6 to 28 in the last five years. All bull trout are passed above Powerdale Dam.

- Identify the ESA-listed population(s) that will be directly affected by the program. *Oncorhynchus mykiss,* winter run steelhead stock 050 and *Oncorhynchus mykiss,* summer run steelhead stock 050 are listed as "Threatened."

- Identify the ESA-listed population(s) that may be <u>incidentally</u> affected by the program.
This program could incidentally affect the Hood River Bull trout (*Salvelinus confluentis)* population.

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 adult returns from a single run year.

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.
Summer steelhead adult returns by brood year are summarized in Table 1. Winter steelhead adult returns to Hood River by brood year are summarized in Table 2.

- 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.
Prior to the 1990's hatchery steelhead were allowed to pass Powerdale Dam and enter the natural spawning grounds. Installation of the fish trap at Powerdale Dam in 1991 enabled fish managers to trap and sort all migrating steelhead at the dam. The use of out-of-basin broodstocks was discontinued in the Hood basin above Powerdale Dam in the 1990s. One non-local stock, Skamania summer steelhead (summer stock 024), is still planted below Powerdale Dam to provide a sports fishery. All steelhead passing Powerdale Fish Facility are handled ensuring that all of summer steelhead stock 024 are prevented from moving upstream of the dam. This steelhead sorting provides complete control of the numbers and origin of hatchery steelhead allowed entry into the wild spawning population. Returning Hood River hatchery steelhead (stock 050) will be passed above Powerdale Dam. Since the 1995-96 run year (first returns of stock 050 winter steelhead), the proportion of the total number of winter steelhead passed above the dam that were hatchery fish was 43% (1995-96), 52% (1996-97), and 48% (1997-98). The current protocol is to pass approximately 50% hatchery fish stock 050.

- 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.
These data are summarized in Table 5.

2.2.3) 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 Trap. Fish are tagged with individually numbered external tags, length and 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 a 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.

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 for release to the mouth of Hood River. Male steelhead brood are hand stripped to fertilize eggs. The spawned males are released upstream of Powerdale 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 cause 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, which 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 few of the released adults have fallen back downstream 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 5 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 four following "Take Tables" (Tables 6-9) 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.

Table 6. Estimated listed salmonid take levels of by hatchery activity. Data source: ODFW, unpublished.

Listed species affected: _Summer and Winter Steelhead__ ESU/Population: Lower Columbia / Hood River____ Activity:_ Hood River Production Program – Monitoring and Evaluation _				
Location of hatchery activity:_ Downstream migrant trapping___ Dates of activity:_ Year around _ **Hatchery program operator:_ Oregon Department of Fish and Wildlife**				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	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 7. Estimated listed salmonid take levels of by hatchery activity. Data source: ODFW, unpublished.

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_**				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	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 8. Estimated listed salmonid take levels of by hatchery activity. Data source: ODFW, unpublished.

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_				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	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	<450	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 9. Estimated listed salmonid take levels of by hatchery activity. Data source: ODFW, unpublished.

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_				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	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.

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 steelhead program is designed to increase wild populations while maintaining the genetic integrity of the stocks. Hatchery-reared juveniles are released as yearling acclimated smolts to optimize adult returns while minimizing potential impacts on natural smolts and resident salmonids. Non-migrants are removed from subbasin acclimation ponds and released downstream from Powerdale Dam.

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).

3.3) Relationship to harvest objectives.

Hood River sport steelhead harvest was restricted to hatchery fish only in 1992. Incidental take (i.e., hooking and handling mortality) of ESA listed Hood River steelhead is estimated at less than 10% of the run. Skamania stock summer steelhead arriving at Powerdale Dam are recycled to the mouth of Hood River to enhance angler harvest opportunities. Up to 5,400 summer steelhead and 2,400 winter steelhead could be available for in-river harvest when the HRPP achieves the steelhead objectives. The Hood River co-managers will develop a steelhead and salmon harvest management plan in 2001.

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.
When HRPP objectives are realized, up to 2,400 winter steelhead and 5,400 summer steelhead could be available for in-river harvest. In-river harvest of wild steelhead is prohibited and will likely continue to be prohibited as long as these stocks are listed under ESA. Incidental mortality of wild steelhead associated with hooking and handling is less than 10%.

3.4) Relationship to habitat protection and recovery strategies.

Several probable causes contributed to the depressed status of the Hood subbasin steelhead populations including: 1) adult fish passage problems (marginal and

intermittent passage at the Edward Hines Dam, low flow below Powerdale Dam, poor fish ladder attraction, Dee Irrigation Diversion blockage, Punchbowl Falls barrier); 2) lack of, or in-efficient juvenile fish protection at irrigation diversions East Fork Irrigation Diversion, Farmers Irrigation Diversion, Dee Irrigation Diversion, PacifiCorp diversion at Powerdale Dam); 3) degradation of suitable habitat (gravel and woody debris); and 4) unfavorable natural conditions in the Hood River subbasin (glacial silt events, such as Ladd Creek / West Fork Hood River glacial outburst flood.)

Habitat conditions in Hood River have changed considerably from those described in the previous paragraph. The Edward Hines Dam was removed in the mid-1960's, fish ladders have been built or improved at Powerdale Fish Facility, Punchbowl Falls and Moving Falls. Options to improve passage at Dee Irrigation 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 Fish Facility and Farmers Irrigation Diversion and will be a condition of FERC re-licensing for the project. A new fish screen has been installed at Dee Irrigation Diversion, which meets NMFS standards.

3.5) Ecological interactions.

The steelhead production project could potentially negatively impact bull trout (listed as threatened) and cutthroat trout (candidate species) because of increased numbers and competition. This potential problem is being addressed with the aggressive acclimation program for all hatchery-reared steelhead smolts coupled with the transportation of non-migrants to the lower Hood River, below Powerdale Dam.

The bull trout and cutthroat trout will benefit from the habitat improvement projects (i.e. in-stream and streamside habitat restoration, fish passage, and improved flows) that are an integral part of the Hood River Production Program.

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 Parkdale Fish Facility has three sources of water available for all or portions of the facility operation. Rogers Spring Creek provides high quality water with a constant temperature of 38 to 40°F. Middle Fork Hood River provides a seasonally variable temperature water that ranges from the low 30's to the mid-50's. A small well provides supplemental water at a temperature of 46 to 48°F. The spring and river water sources can be used independently or they can be mixed to achieve a desired temperature regime or specific imprinting for acclimating smolts.

The Middle Fork water source is the same water source that the naturally spawning salmonids utilize in this portion of the Hood River system. The Rogers Spring Creek is a tributary to the lower Middle Fork Hood River and so naturally mixes with the Middle Fork water.

Oak Springs Fish Hatchery, as the name implies, has a large series of natural springs that provide a large volume of high quality spring water at a constant temperature of 53°F. This water is chilled to 43°F for use in the hatchery incubators. This hatchery has been in operation for more than fifty years and has never experienced any water quality or quantity deficiencies. The water quality is monitored at this station.

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.

The Parkdale Fish Facility uses a relatively small amount of water for a small number of fish. The water is used in a once through scenario and there is no identified need for any effluent treatment. All three water sources originate at locations that are inaccessible to anadromy.

The Oak Springs Fish Hatchery water supply is a series of large springs located well up the near vertical Deschutes River canyon wall. The hatchery utilizes 50 cfs in their supply system, which is secured with a State of Oregon water right. The springs are non-fish bearing and the intake is fitted with coarse screen for debris control only. Two effluent settling ponds with capacities of 9,600 and 9,000 cubic feet are used to meet NPDES permit 0300J water quality standards before water is discharged into the Deschutes River.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Steelhead broodstock are collected at the Powerdale Fish Facility, located at RM 4.0 on Hood River. Construction of this facility was completed in 1997. Fish are captured after they ascend a fish ladder and jump over a finger weir into an 8x50 foot channel. Fish are manually crowded into a fish lift where they are brought into the sorting and processing building. Fish are routed into an anesthetic tank prior to any handling. Fish selected for broodstock are loaded into a portable fish transportation tank while still anesthetized.

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

Broodstock are hauled to the Parkdale Fish Facility using a 500 gallon fiberglass tank with an aeration system 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 the Powerdale Fish Facility and are held in one of the 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 of the two sources. Pond water temperatures and depths are continually monitored by the Global Monitoring System (GMS). Flow meters monitor pond flows. The upper end of each pond is fitted with slotted aluminum screen systems. The spray bars deliver approximately 50 gpm to each pond 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 at the Parkdale Fish Facility 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 sources as the adult holding ponds. Gravity fed water from the Rogers Spring or 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 stocks 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.

At Oak Springs Fish Hatchery the steelhead eggs are incubated in Marisource isolation type incubators. The water supply to the incubator can be chilled to adjust the incubation period.

5.5) Rearing facilities.

Steelhead rearing at Oak Springs Fish Hatchery begins in fiberglass "Canadian" style containers that range in length from 9 to 21 feet. When the fish reach 200 per pound they are transferred to 30 foot diameter circular concrete ponds. The final rearing occurs in 46x8 foot concrete ponds.

5.6) Acclimation/release facilities.

Acclimation and release sites were chosen in each of the three forks of the Hood River subbasin. These sites were picked because of their close proximity to prime spawning and rearing habitat. On the West Fork, a portable pond is used to acclimate summer steelhead near Blackberry Creek (RM 9.0). Another pond at this site is used for spring chinook acclimation. The tributary provides 400 gpm water supply to the pond. Blackberry Creek also has an impassible falls at the mouth, which means that steelhead homing back to the West Fork in this area will be unable to enter Blackberry Creek. The portable pond was purchased from ModuTank, Inc. located in Long Island, New York. 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.

The Middle Fork Hood River site at Parkdale Fish Facility has two 8x80 foot acclimation ponds, which are typically adjusted to a depth of four feet. The water source is the same as that for the adult holding ponds. Water is delivered by gravity through underground pipes. Either Middle Fork or Rogers Spring 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, winter steelhead smolts are held here during acclimation for several weeks prior to a volitional release.

Acclimation of winter steelhead smolts on the East Fork Hood River occurs at the East Fork Irrigation District's sand trap located at RM 6.0. The sand trap consists of a series of five rectangular concrete ponds, each with a shallow and deep end, designed to capture glacial sand that washes down the canal after water is diverted from the East Fork. With East Fork Irrigation District approval, one of the ponds was modified with screens and stoplogs so fish could be held and acclimated. The stoplogs provide the same type of release as described at Parkdale Fish Facility.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

There have been no significant losses of steelhead thus far in this supplementation program.

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 Parkdale Fish Facility and Oak Springs Fish Hatchery are staffed full time. Both facilities have sophisticated alarm systems that alert staff to problems with water supply.

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 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. Beginning in 1992 all Hood River winter steelhead brood were collected from wild Hood River stock captured in the Powerdale Fish Facility (RM 4.0).

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 (RM 4.0).

6.2) Supporting information.

6.2.1) History.

Winter steelhead stock 050 was founded in 1991 by collecting wild Hood River winter steelhead. The first collection effort in 1991 was done by angling and was not very successful. The first effective year of broodstock collection was in 1992 and used the Powerdale Fish Facility, located at Powerdale Dam, Hood River (RM 4.0). Each year since 1992, the broodstock has been sub-sampled from throughout the Hood River wild winter steelhead run , which passes the dam en route to the natural production areas above the dam. Most of the Hood River winter steelhead population spawns in this upper basin production area. All of the fish passing the dam are collected in the trap. Candidates for winter steelhead stock 050 are selected randomly throughout the run. The broodstock consisted of 100% wild fish from 1991 to 1995, and has included a proportion of returning hatchery fish stock 050 since 1996. The number of wild and hatchery winter steelhead counted at Powerdale Fish Facility and the number of fish taken for brood, by gender, since the founding of the stock is provided in Table 5.

The first year of broodstock collection for summer steelhead stock 050 was in the 1997-98 run year, with the first spawning in the spring of 1998. The broodstock is collected at

Powerdale Fish Facility, located at Powerdale Dam, Hood River (RM 4.0). The broodstock has been sub-sampled from the total Hood River wild summer steelhead population that passes the dam en route to the natural production areas above the dam. All of the fish passing the dam are collected in the trap. Candidates for summer steelhead stock 050 are selected from throughout the wild run with an effort to stratify the selection by run time. The broad run and spawn timing for these summer steelhead, coupled with the very small wild population size, has made the initial brood collection and successful spawning for this stock very challenging. Currently the broodstock is 100% wild fish and the first returns of hatchery fish have yet to occur. The number of wild summer steelhead counted at Powerdale Fish Facility and the number of fish taken for brood, by gender, since the founding of the stock is provided in Table 5.

6.2.2) Annual size.

Hood River Production Program protocols specify that the fish collected for hatchery broodstock will not exceed 25% of the natural population. Similar numbers of wild and Hood stock hatchery winter steelhead are collected for broodstock. Only naturally produced summer steelhead are currently collected for broodstock. However, hatchery origin Hood stock summer steelhead will also begin to be incorporated into the hatchery brood in numbers similar to the natural origin broodstock in the coming years.

Table 5 summarizes the Hood River summer and winter steelhead broodstock collection to date. This table also summarizes the sex ratio of the fish spawned, by brood year.

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

Winter steelhead broodstock consisted of 100% wild fish from 1991 to 1995, and has included a portion of returning stock 050 hatchery fish since 1996 (Table 5). For the 1996 through 1999 brood years the winter steelhead broodstock has averaged 58.6% wild fish. The summer steelhead broodstock currently is composed of 100% wild fish. The number of wild winter and summer steelhead counted at Powerdale Fish Facility, the number taken for the broodstock, and the actual spawning population sizes are provided in Table 5. Oregon Department of Fish and Wildlife policy limits the take for broodstock to 25% or less of a wild population in an effort to protect wild populations from the impact of removing fish for the purposes of developing and maintaining a hatchery broodstock. An average of 17.4% of the wild winter steelhead population counted at Powerdale Fish Facility has been taken for broodstock for the 1991-92 through 1998-99 run years, with a range of 10.4% to 25.4%. Summer steelhead broodstock collection accounted for an average 25.9% of the wild summer steelhead counted at Powerdale Fish Facility for the 1997-98 to 1998-99 run years, with a range of 23.1% to 28.6%. After the two broodstocks are founded, a minimum of one generation of smolts will be the progeny of 100% wild parents followed by a minimum of one generation of smolts that are the progeny of 50% wild and 50% stock 050 hatchery fish, the long-term goal is for the broodstock to be composed of 30% wild and 70% stock 050 hatchery fish.

6.2.4) Genetic or ecological differences.

There are no known genotypic, phenotypic or behavioral differences between the wild Hood River summer and winter steelhead collected for broodstock and the wild summer

and winter steelhead passed above Powerdale Dam for natural production. Age structure of returning hatchery steelhead (stock 050) will be different from returning naturally produced steelhead. All hatchery steelhead smolts are released as yearlings, wild steelhead smolts have up to four fresh water life history patterns. Wild steelhead smolts range from 1-year to 4-year smolts, but are predominately 2-year smolts and secondarily 3-year smolts. To date there is no indication that ocean age, 1 to 4 years, is different for hatchery and wild Hood River steelhead. However, the difference in freshwater age means the total age of hatchery and wild steelhead adults will be different.

6.2.5) Reasons for choosing.

Hood River summer and winter steelhead were selected for the new hatchery broodstocks because they are the best representation of the wild indigenous summer and winter steelhead populations in the Hood River subbasin.

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.

Hood River summer and winter steelhead were chosen to found these new broodstocks because they are the best representation of the wild indigenous summer and winter steelhead populations in the Hood River subbasin. Broodstock are collected from throughout the respective runs to help insure that all genetic attributes are represented in the hatchery stock and they are genetically similar to the natural stock.

SECTION 7. BROODSTOCK COLLECTION

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

Returning adult summer and winter steelhead are collected for the hatchery broodstock.

7.2) Collection or sampling design.

The broodstock is collected at Powerdale Fish Facility, located at RM 4.0 below all of the natural production area in the Hood subbasin for both wild populations. All of the fish entering the upper basin are captured in the trap, allowing for precise bio sampling from the available fish. Broodstock are randomly selected throughout the steelhead runs. The factors limiting supplementation in the Hood Basin are small wild populations and new broodstocks that must consist entirely or substantially of wild fish. There is also a limit on the take of wild fish for broodstock. These factors produce very small broodstocks that introduce potential random deviation from the phenotypic distributions of the wild fish.

There are two options for designing a broodstock selection regime to avoid bias when all possible fish are available for selection. One alternative is to select the broodstock at

random from the total available fish. However, when the sample size is quite small, as in the case of the Hood River programs, this protocol may produce by random chance a sample with a skewed distribution for any particular trait. For example, if a broodstock of only 36 fish are taken from a wild population of 300 fish that has a run timing across three months, by chance all 36 fish could be selected from the first half of the run. While this is a random outcome, the sample is not representative of the distribution from which it was drawn. A second way to select the broodstock is to stratify the small sample across the known distribution of one or more traits, such as run timing. This approach is not random but it produces a sample with a character distribution for the stratified trait that is more similar to that of the total population.

The broodstocks in the Hood are selected using both methods. The selection is stratified across run timing, but is random according to all other possible phenotypes. Stratification across run time is done by estimating the wild population size in advance, selecting a maximum broodstock size within the limit on take of wild fish, and then distributing the take evenly across the run. In a winter steelhead run, typically every 15^{th} male and female passing Powerdale Fish Facility are selected and collected for the brood, although the actual take varies from year to year. If hatchery fish are used in the broodstock, they are sampled according to the same protocol for that year. The wild summer steelhead are sampled less frequently. Beginning and ending dates for summer and winter steelhead counted at Powerdale Fish Facility are presented in Tables 10 and 11. The number of wild fish collected for broodstock, their disposition, and the number spawned is presented in Table 12.

7.3) Identity.

(a) Methods for identifying target populations (if more than one population may be present).
Wild fish are identified based on lack of marks or tags. The Powerdale Fish Facility is in a location where only one wild summer steelhead and one wild winter steelhead population would be encountered.

(b) Methods for identifying hatchery origin fish from naturally spawned fish.
All hatchery steelhead released in the Hood subbasin are differentially marked to distinguish between hatchery and wild fish, and between the different stocks of hatchery fish. See section 9.7 for details on the marking program.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):
The interim broodstock collection goals (i.e. 2000 to 2002) are:

Winter Steelhead – wild 35, Hood hatchery stock 35, Total 70
Summer Steelhead – wild 40

Long term (potential) broodstock collection goals (i.e. post 2002) are:

Winter Steelhead – wild 45, Hood hatchery stock 45, Total 90

Summer Steelhead – wild 80, Hood hatchery stock 80, Total 160

These goals assume a 1:1 sex ratio.

Table 10. Bimonthly counts of adult summer steelhead captured at the Powerdale Dam trap by origin and run year. Bimonthly counts are reported for March through December. The bimonthly count in which the median date of migration occurred is boldfaced for completed run years (i.e., the 1992-1993 through 1998-1999 run years). Data source: Olsen and French (2000).

Origin,	March		April		May		June		July		August		September		October		November		December		Jan-	
Run Year	01-15	16-31	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	16-30	01-15	16-31	May	Total
Wild																						
1992-1993	0	1	12	6	7	21	31	68	49	**49**	37	18	17	55	25	24	38	12	2	1	4	477
1993-1994	0	1	10	5	8	21	13	21	25	**26**	14	10	8	5	11	8	1	1	10	0	30	228
1994-1995	0	1	3	4	9	7	22	25	**32**	33	11	1	4	8	2	7	5	0	0	0	9	183
1995-1996[a]	0	0	0	0	2	1	4	6	37	**19**	16	2	5	5	2	8	0	8	0	0	7	122
1996-1997	0	0	0	1	3	3	12	17	31	**32**	14	6	6	5	17	10	7	0	0	1	5	170
1997-1998	0	0	0	0	1	1	1	4	6	6	**14**	2	4	7	9	2	8	0	0	0	0	65
1998-1999	0	0	0	1	3	2	6	13	15	17	**7**	5	5	7	7	4	3	13	1	0	10	119
1999-2000[b]	0	0	1	0	1	5	7	6	19	28	11	5	0	8	8	2	35	8	2	0	--	146
Subbasin hatchery,																						
1992-1993	0	8	48	82	131	190	136	**279**	253	220	136	28	26	55	24	10	15	4	1	4	19	1,669
1993-1994	0	1	13	38	83	120	75	151	**188**	166	114	33	23	8	16	10	0	1	11	0	19	1,070
1994-1995	0	4	13	79	124	164	269	**299**	324	167	26	10	13	17	17	12	12	4	0	0	20	1,574
1995-1996[a]	0	0	4	0	5	12	30	31	**211**	101	52	13	15	5	9	4	1	10	0	2	6	511
1996-1997	0	2	39	29	123	153	**305**	188	259	120	26	15	3	3	9	7	4	0	0	1	7	1,293
1997-1998	0	0	0	11	36	59	23	66	**109**	68	112	21	17	25	9	3	2	0	0	0	3	564
1998-1999	0	2	2	21	20	25	88	60	**111**	103	16	12	19	15	5	7	2	10	0	0	7	525
1999-2000[b]	0	0	3	9	2	31	20	64	75	121	65	20	3	3	7	2	10	1	0	0	--	436
Stray hatchery,																						
1992-1993	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4	5
1993-1994	0	0	0	1	0	0	2	2	**3**	0	0	3	0	0	1	0	0	0	1	0	1	14
1994-1995	0	0	0	0	0	**2**	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	4
1995-1996[a]	0	0	0	0	0	0	0	1	1	**2**	0	0	0	0	0	0	1	1	0	0	0	6
1996-1997	0	0	0	0	0	0	2	1	2	0	0	2	0	0	**1**	4	1	0	0	0	2	15
1997-1998	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**2**	2	1	0	0	0	0	6
1998-1999	0	0	0	0	0	0	0	0	0	1	0	0	2	**5**	1	0	0	0	0	0	1	10
1999-2000[b]	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	--	2
Unknown,																						
1992-1993	1	2	1	0	3	4	1	3	8	4	4	1	**4**	17	2	4	7	0	0	1	3	70
1993-1994	0	0	0	0	1	0	0	8	**15**	3	2	3	1	1	1	0	0	0	0	2	7	44
1994-1995	0	0	1	5	6	11	17	**16**	16	9	1	0	11	0	1	1	2	0	0	0	1	98
1995-1996[a]	0	0	0	0	0	0	1	4	14	**6**	13	0	0	1	0	1	0	5	0	0	1	46
1996-1997	0	0	1	0	2	6	14	5	**14**	17	5	1	3	2	1	3	0	0	0	0	1	75
1997-1998	0	0	1	0	4	4	2	5	**7**	4	9	1	2	1	1	0	2	0	1	0	0	44
1998-1999	0	0	0	4	5	3	3	3	4	**6**	2	0	0	1	2	2	2	3	1	1	3	45
1999-2000[b]	0	0	0	0	0	1	2	2	12	8	2	0	0	1	0	1	3	1	8	0	--	41

[a] Powerdale Dam trap was inoperative from 11-13 Nov 1995 and from 20-24 Nov 1995 because of flood damage and from 28 Nov 1995 – 27 Feb 1996 for modifications to the adult fish ladder.

[b] Preliminary estimates. Summaries are complete through 31 December 1999.

Table 11. Bimonthly counts of upstream migrant adult winter steelhead captured at the Powerdale Fish Facility, by origin and run year. Counts are boldfaced for the bimonthly period in which the median date of migration occurred in each origin category. Data source: Olsen and French (2000).

Origin,	September		October		November		December		January		February		March		April		May		June		July		
Run Year	01-15	16-30	01-15	16-31	01-15	16-30	01-15	16-31	01-15	16-31	01-15	16-29	01-15	16-31	01-15	16-30	01-15	16-31	01-15	16-30	01-15	16-31	Total
Wild																							
1991-92	0	0	0	0	0	0	0	0	0	24	28	32	75	98	**153**	149	88	29	2	0	0	0	678
1992-93	0	0	0	0	0	0	0	4	0	2	3	0	28	61	99	**78**	86	30	3	2	0	0	396
1993-94	0	0	0	0	0	0	0	0	4	7	0	6	23	25	77	**128**	76	21	11	0	0	0	378
1994-95	0	0	0	0	0	0	0	0	0	0	9	0	6	2	55	15	**52**	44	10	1	0	0	194
1995-96	0	0	0	0	0	0	0	0	0	0	0	0	17	4	93	**40**	69	36	11	0	0	0	270
1996-97	0	0	0	0	0	0	0	2	1	0	3	13	5	22	52	**72**	68	33	3	0	0	0	274
1997-98	0	0	0	0	1	0	0	0	1	1	6	0	7	12	23	**107**	36	8	5	1	0	0	208
1998-99	0	0	0	0	0	0	0	0	13	0	4	2	8	32	47	**121**	22	33	7	2	0	0	291
Subbasin hatchery,																							
1991-92	0	0	0	0	0	0	0	5	11	94	**54**	42	30	5	2	2	0	0	0	0	0	0	245
1992-93	0	0	0	0	0	0	2	13	0	31	44	0	**39**	31	17	13	3	0	0	0	0	0	193
1993-94	0	0	0	0	0	0	0	0	25	31	8	**36**	32	6	3	2	0	0	0	0	0	0	143
1994-95	0	0	0	0	0	0	0	0	0	6	28	**18**	11	4	22	3	6	1	0	0	0	0	99
1995-96	0	0	0	0	0	2	0	0	0	0	0	0	19	8	93	**47**	66	21	3	0	0	0	259
1996-97	0	0	0	0	0	0	0	0	0	1	2	38	20	54	129	**171**	141	51	7	0	0	0	614
1997-98	0	0	0	0	5	1	0	0	1	0	6	4	26	48	82	**142**	26	5	1	0	0	0	347
1998-99	0	1	3	6	3	4	0	0	9	0	4	0	6	63	**75**	90	12	23	1	2	0	0	302
Stray hatchery,																							
1991-92	0	0	0	0	0	0	0	0	0	2	2	1	5	**4**	7	1	0	0	0	0	0	0	22
1992-93	0	0	0	0	0	0	0	0	0	1	2	0	2	**9**	7	1	0	0	0	0	0	0	22
1993-94	0	0	0	0	0	0	0	0	1	0	0	0	1	2	**11**	6	0	0	0	0	0	0	21
1994-95	0	0	0	0	0	0	0	0	0	0	0	1	**1**	1	0	0	1	0	0	0	0	0	4
1995-96	0	0	0	0	0	0	0	0	0	0	0	0	**3**	1	2	0	0	0	0	0	0	0	6
1996-97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**1**	0	1	0	3
1997-98	0	0	0	0	0	0	0	0	0	0	1	1	0	**8**	3	4	2	0	0	0	0	0	19
1998-99	0	0	0	0	0	0	0	0	2	0	0	0	0	**4**	1	0	0	0	0	0	0	0	7

Table 12. Number of wild Hood River steelhead collected for broodstock, spawned, released, and died, for the summer and winter steelhead stock 050 broodstock development program. Data source: Olsen and French (2000).

Run Year	Summer Steelhead					Winter Steelhead				
		Spawned &		Unspawned			Spawned &		Unspawned	
	Collect	Released	Died	Released	Died	Collect	Released	Died	Released	Died
1992-93						58	31	6	18	3
1993-94						79	52	2	21	4
1994-95						43	36	1	6	0
1995-96						65	36	1	22	6
1996-97						48	31	2	6	9
1997-98	16	9	0	1	6	43	23	0	9	11
1998-99	34	21	2		1	44	31	1	12	0

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

The Hood River Production Program broodstock collection data are summarized in Table 5.

Table 13. Hood River Summer Steelhead – actual numbers and sex ratio of steelhead spawned. Data source: ODFW, unpublished.

Brood Year	Adults			Green Eggs	Juveniles
	Females	Males	Jacks		
1998	7	2	NA	30,218	19,532
1999	14	11	NA	52,675	33,899
2000	13	9	NA	52,384	

Table 14. Hood River Winter Steelhead – actual numbers and sex ratio of steelhead spawned. Data source: ODFW, unpublished.

Brood Year	Adults			Green Eggs	Juveniles
	Females	Males	Jacks		
1991	3	1	NA	11,858	4,600
1992	18	21	NA	53,308	48,985
1993	16	18	NA	62,150	38,034
1994	26	28	NA	95,043	42,898
1995	18	19	NA	63,793	51,022
1996	25	29	NA	85,497	60,318
1997	26	28	NA	91,000	62,136
1998	21	20	NA	80,620	50,915
1999	28	33	NA	96,525	66,056
2000	20	20	NA	83,510	--

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

The Powerdale Fish Facility intercepts all migrating adult steelhead. Non-indigenous steelhead are not passed above the dam, but are removed or recycled downstream to enhance harvest opportunities. Only wild steelhead and some returning indigenous hatchery steelhead (stock 050) are passed upstream. Since the 1995-96 year, the proportion of the total number of winter steelhead passed above the dam that were hatchery fish was 43% (1995-96), 52% (1996-97), and 48% (1997-98). The composition of steelhead spawners (i.e., natural and hatchery) passed upstream from Powerdale Dam is currently a minimum of 50% wild and 50% hatchery winter steelhead, and 100% wild summer steelhead. The percentage of natural and hatchery spawners in future years will be determined by the fishery co-managers based on the review of potential genetic risk. Fish retained for broodstock are transferred to the Parkdale Fish Facility where they are held for spawning. Broodstock not used for spawning are released alive back to the Hood River above Powerdale Dam.

7.6) Fish transportation and holding methods.

Steelhead collected for broodstock are transported from the Powerdale Fish Facility to the Parkdale Fish Facility. Transportation requires approximately 30 minutes. Fish are anesthetized with carbon dioxide gas in a water solution prior to handling. The anesthetized fish are loaded into a portable fish transportation tank where they revive from the CO_2.

7.7) Describe fish health maintenance and sanitation procedures applied.

Once fish are transferred to the adult holding ponds they receive regular treatments with a formalin solution to prevent fungal infection. The fish are held in cold spring water, which helps to prevent disease or parasite problems.

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 IHN virus

7.8) Disposition of carcasses.

Spawned and unspawned steelhead 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.

The Hood River steelhead supplementation programs include a number of features that are designed to minimize adverse genetic or ecological effects to the listed natural fish, including:

1) Broodstock selection will not exceed 25% of the natural population measured at Powerdale Fish Facility.
2) Broodstock are collected randomly throughout the length of the run.
3) A 1:1 sex ratio is the target for the spawning of hatchery broodstock.
4) Hatchery-reared juveniles are not graded for size during rearing.
5) All the hatchery progeny are externally marked for ease of monitoring and evaluation.
6) Hatchery-reared smolts are acclimated for one to two weeks prior to volitional release into the subbasin. Non-migrant smolts are transported and released downstream from Powerdale Dam.

SECTION 8. MATING

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

8.1) Selection method.

Broodstock is collected from wild and hatchery (winter steelhead) or wild only (summer steelhead) from throughout the run. Program targets are: 1) fish are paired at random from ripe fish, 2) fish are spawned with a single other individual, and 3) fish are spawned only once.

8.2) Males.

Backup males have been collected to insure that there are ripe males available for spawning with ripe females. Backup males also help insure that a segment of the run is represented in the hatchery egg take if the primary male were to die. Repeat spawners may be selected in the random brood selection process. If selected, these fish would be treated as any other male brood.

The target sex ratio for this program is 1 male for every 1 female. Actual sex ratios are reported in Table 5. Winter steelhead spawning sex ratio averaged 1.2 males per female, range 1.0 to 1.6. Summer steelhead spawning sex ratio has been 0.3 and 0.7 males per female for the 1998 and 1999 brood years, respectively.

8.3) Fertilization.

The steelhead protocols include the goal of 1:1 sex ratios and one male one female family units. Gametes may be pooled, but only after the results of the IHN viral sampling verifies negative results.

ODFW has a department-wide fish disease control and prevention program. This program is documented in the Oak Springs hatchery operational plan (Nandor 1995) and observed throughout the steelhead incubation and rearing process. Prior to spawning, anesthetized adults are dried and wiped down with an iodine solution. Ovarian fluid and sperm samples are collected during spawning and later analyzed for the presence of IHN virus. Green eggs are water-hardened in an iodine antiseptic solution. The eggs are rinsed and treated with another iodine solution bath prior to initiation of the incubation process.

8.4) Cryopreserved gametes.

Cryogenically preserved gametes are not used in these hatchery programs.

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.

Oak Springs Fish Hatchery has only reared Hood stock summer and winter steelhead for the 1999 brood year. The 1999 egg take for winter steelhead totaled 105,338 eggs. There was 77% survival to ponding. The mortality includes 11,356 eggs that were culled from the original egg take. The 1999 egg take for summer steelhead totaled 52,985 eggs. There was a 65% survival to ponding. The egg mortality includes 13,258 eggs that were culled from the production when it was learned that one male that had been spawned was of hatchery origin.

9.1.2) Cause for, and disposition of surplus egg takes.

Extra steelhead eggs are typically collected in order to compensate for egg-to-smolt mortality. Surplus eggs, culled eggs and surplus fish are all disposed of by burial.

9.1.3) Loading densities applied during incubation.

Egg sizes are not routinely monitored. Standard flows are set at 4 gpm through the isolation incubation Marisource trays and 5 gpm on the standard incubation Marisource trays. Summer and winter egg densities are determined by spawning / family group sizes. Egg densities are never higher than 1 female per incubation trap or 5,000 to 6,000 eggs per tray.

9.1.4) Incubation conditions.

Incubation of steelhead eggs begins either on 38 to 40° spring water at the Parkdale Fish Facility, or chilled, 43° water at Oak Springs Fish Hatchery. The eggs are chilled to retard development and allow later egg takes to catch up with the earlier eggs. Influent and effluent dissolved oxygen levels at Oak Springs Fish Hatchery have not been previously monitored, but are now being monitored.

Silt management is not an issue because both incubation sites use clean spring water.

9.1.5) Ponding.

Steelhead fry are ponded at between 994 and 1,095 temperature units. Fry are inspected daily beginning at 950 temperature units, and are ponded when an estimated 90% of the fry are buttoned up. Lengths and weights have not been sampled at ponding. The ponding rates can range from mid-May to late June. Ponding is forced, swim up is volitional, and feeding begins when an estimated 90% of the fry have surfaced in the pond. This usually occurs within four days of ponding.

9.1.6) Fish health maintenance and monitoring.
Incubating eggs are treated daily with a formalin solution at a rate of 1:600 for 10 to 15 minutes until hatching to prevent fungus. After ponding, fish are regularly monitored monthly for any obvious disease or parasite problems by a certified ODFW pathologist. ODFW fish pathologists routinely monitor the fish during their rearing cycle and prescribe any therapeutic treatments deemed necessary.

Hood River steelhead have been reared at Oak Springs Fish Hatchery for one brood year. There has been no egg yolk-sac malformation, or fry or fingerling deformities or disease problems.

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.
Broodstock are selected from throughout the entire steelhead run. Fish are spawned on a 1:1 sex ratio with one male and one female parent per family group. Incubation water supply systems at Parkdale and Oak Springs utilize spring water sources where water quality is not an issue of concern.

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..
Summer steelhead mortality by life stage in the hatchery for the 1999 brood year included 8.8% egg loss and 1.0% fry loss. Winter steelhead mortality by life stage in the hatchery for the 1999 brood year included 16.6% egg loss and 1.3% fry loss.

9.2.2) Density and loading criteria (goals and actual levels).
Steelhead densities in the Canadian troughs are kept below 5 pounds of fish per gpm inflow, and 10 pounds per cubic foot of water volume. Steelhead transferred to 30 foot diameter circular ponds are kept at densities below 6 pounds of fish per gpm inflow and 7 pounds per cubic foot of volume. Steelhead later transferred to the 46x8 foot raceway ponds are kept at densities of 8.3 pounds per gpm of inflow and 2 pounds per cubic foot of volume. All the water used in the various containers for the steelhead rearing is single use water with no re-use.

9.2.3) Fish rearing conditions
Monitoring of Oak Springs Fish Hatchery water influent and effluent water was not done for the 1999 steelhead brood year production, but will be done for the 2000 brood year production.

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, weight and condition factor data on the 1999 brood year Hood stock summer and winter steelhead production was determined immediately prior to transfer to Hood subbasin acclimation facilities in April 2000.

There were two raceway ponds of Hood stock winter steelhead and one raceway of Hood stock summer steelhead. Table 15 summarizes the length, weight and condition factor for these three groups of fish.

Table 15. Length, weight and condition factor data for 1999 brood year summer and winter steelhead prior to release from Oak Springs Fish Hatchery in 2000. Data source: Olsen and French (2000).

Steelhead Stock	Pond #	Mean Length	Mean Weight	Condition Factor
StW	L-1	181.0 mm	64.99 grams	1.055
StW	L-2	180.6 mm	62.87 grams	1.031
StS	L-3	194.8 mm	78.56 grams	1.035

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.
Hood River stock summer and winter steelhead have been reared at Oak Springs Fish Hatchery for only one year. No growth rate or energy reserve data has been collected.

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*).
Winter steelhead reared at Oak Springs Fish Hatchery are started on Moore-Clark Nutra starter diets and fed Nutra up through the 2.5 mm-sized feed. From that point the fish are fed Moore-Clark Amino Balanced, and Silver Cup Steelhead diets. The total amount of feed to both raceway ponds of brood year 1999 steelhead was 4,744 pounds. The cumulative food conversion was 0.78.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.
Fish health of rearing juvenile summer and winter steelhead 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.
Steelhead reared at Oak Springs Fish Hatchery are subject to minimal human disturbance. All feeding is automated. 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 minimized during the 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.
Hatchery-reared Hood stock summer and winter steelhead are the progeny of parents selected from throughout the run year. There is no size grading of juveniles during the yearling rearing program. Human interactions with the rearing steelhead is minimal. The fish are acclimated in ponds with natural cover added and the Parkdale Fish Facility has camouflaged pond walls designed to simulate the natural stream environment. Fish are allowed to volitionally migrate from the acclimation ponds into the Hood River system.

SECTION 10. RELEASE

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

10.1) Proposed fish release levels.

Table 16. Hood River Winter Steelhead proposed hatchery-reared releases in the Hood subbasin. Data source: ODFW, unpublished.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	NA	NA	NA	NA
Unfed Fry	NA	NA	NA	NA
Fry	NA	NA	NA	NA
Fingerling	NA	NA	NA	NA
Yearling	50,000	5/pound	April	East Fork Hood River
Yearling	35,000	5/pound	April	Middle Fork Hood River

Table 17. Hood River Summer Steelhead proposed hatchery-reared releases in the Hood subbasin. Data source: ODFW, unpublished.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	NA	NA	NA	NA
Unfed Fry	NA	NA	NA	NA
Fry	NA	NA	NA	NA
Fingerling	NA	NA	NA	NA
Yearling	150,000	5/pound	April	West Fork Hood River

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

Summer Steelhead
Stream, river, or watercourse: West Fork Hood River
Release point: RM 14.0
Major watershed: Hood River
Basin or Region: Columbia River

Summer Steelhead
Stream, river, or watercourse: West Fork Hood River
Release point: RM 8.6
Major watershed: Hood River
Basin or Region: Columbia River

Winter Steelhead
Stream, river, or watercourse: East Fork Hood River
Release point: RM 6.0
Major watershed: Hood River
Basin or Region: Columbia River

Winter Steelhead
Stream, river, or watercourse: Middle Fork Hood River
Release point: RM 3.5
Major watershed: Hood River
Basin or Region: Columbia River

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

Table 18. Hood River stock summer steelhead releases, 1999 and 2000. Data source: ODFW, unpublished.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1999							19,513	5.7
Average							19,513	5.7

Table 19. Hood River releases of Skamania stock summer steelhead. Data source: Olsen and French (2000).

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1992							100,008	5.2
1993							71,268	6.3
1994							90,042	4.8
1995							76,542	5.3
1996							63,826	5.3
1997							61,002	5.3
1998							64,928*	5.4
1999							62,218*	6.4
Average							73,729	5.5

* Note: All Skamania stock summer steelhead released downstream from Powerdale Dam (R.M. 4.0).

Table 20. Hood River Winter Steelhead releases 1992 – 2000. Data source: Olsen and French (2000).

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1992							4,600	4.6
1993							48,985	5.8
1994							38,034	5.8
1995							42,898	5.4
1996							44,916	5.4
1997							59,837	7.1
1998							61,217	6.5
1999							42,677	5.8
Average							42,896	5.8

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

Steelhead smolts are transported to Hood River acclimation ponds beginning in early April. The volitional release of steelhead smolts is generally complete by early May. Release of steelhead smolts from acclimation ponds is based on the following criteria: 1) smolt readiness in terms of appearance, crowding at the pond outlet, etc. and 2) release

time that corresponds to natural smolt outmigration. 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.

Steelhead are transported from Oak Springs Fish Hatchery to acclimation ponds in the Hood River subbasin. Fish are in transit about two hours. Temperatures are regulated to match the receiving water. Transport trucks are equipped with oxygen to super-saturate truck water.

10.6) Acclimation procedures.

Release of steelhead smolts from acclimation ponds is based on the following criteria: 1) smolt readiness in terms of appearance, crowding at the pond outlet, etc. and 2) release time that corresponds to natural smolt outmigration. 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 22 provides release information.

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

One hundred percent of the summer and winter steelhead smolts are marked with distinctive external fin and/or maxillary bone clips that enable fish managers to distinguish fish from individual releases groups by brood year. Specific broods of summer and winter steelhead smolts may be partially, or entirely, coded wire tagged and fin-clipped.

10.8) 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. There have not been any surplus fish.

10.9) 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 an emergency.

Table 21. Hood River stock hatchery winter steelhead acclimated in the East Fork and Middle Fork Hood River drainage, 1996-2000 releases.[a] Data source: Olsen and French (2000).

Drainage, Location, Release year, Release group	Date transferred to raceway	Number transferred to raceway	Fish/lb at transfer	Number of days acclimated	Mortalities[b] in acclimation raceway	Number[c] volitionally released	Number[d] trucked	Total[e] released
East Fork,								
Toll Bridge Park,								
1996,								
Group 1	Apr 1-4	24,057	5.7	9-12	26	24,031		24,031
Group 2	Apr 22-24	26,965	5.0	8-10	92	20,885	5,988	26,873
EFID Sand Trap,								
1997,								
Group 1	Apr 11-15	27,740	5.7	6-10	29	27,711		27,711
Group 2	Apr 29	32,578	8.3	6	452	32,126		32,126
1998,								
Group 1	Apr 7	29,510	5.2	7	0	29,510		29,510
Group 2	Apr 21	32,626	7.5	7	0	31,707	919 (1)	32,625
1999,								
Group 1	Apr 6	13,439	5.6	9	4	12,430	1,005 (1)	13,434
Group 2	Apr 29	13,630	5.8	6	2,052	10,572	1,006 (1)	11,577
2000,								
Group 1	Apr 12	14,599	7.3	5	1	13,852	746	14,598
Group 2	Apr 25-26	16,558	7.8	5-6	20	15,694	844	16,538
Middle Fork,								
Parkdale Fish Facility,								
1999,								
Group 1	Apr 6-7	10,012	5.5	8-9	2	9,859	153	10,010
Group 2	Apr 28	9,975	6.0	7	7	9,816	152	9,968
2000,								
Group 1	Apr 11	15,912	7.3	6	8	15,279	625 (50)	15,854
Group 2	Apr 25	16,235	7.7	6	20	15,578	637 (50)	16,165

[a] In the release year 1999, 1,792 smolts were direct released by truck from Oak Springs Hatchery personnel (ODFW) into the mainstem Hood River below Powerdale Dam.

[b] Of the total 481 mortalities in 1997, 442 were the result of sampling smolts which did not emigrate volitionally from the acclimation raceway. Of the total 2,052 mortalities recorded in 1999 at the EFID Sand Trap, 1,992 fish were the result of hauling fish to the acclimation site and 123 were from seining and holding fish for the Coanda screen testing.

[c] Of the total 59,837 released in 1997, 2,545 did not emigrate volitionally of which 2,103 were forced out into the East Fork Hood River.

[d] Number trucked indicates hatchery winter steelhead which did not emigrate volitionally from the acclimation raceways and were hauled and released near the mouth of the Hood River. In parentheses are mortalities from fish truck liberations.

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

Table 22. Hood River stock hatchery summer steelhead acclimated in the West Fork Hood River drainage, 1999-2000. 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[a] volitionally released	Number[b] trucked	Total released
West Fork, Blackberry Creek, 1999,								
Group 1	Apr 2	19,532	5.5	13	19	15,616	3,897	19,513
2000,								
Group 1A	Apr 6	18,165	6.2	7	19	15,611	2,535	18,146
Group 1B	Apr 21-24	15,775	5.2	3-6	31	13,541	2,203	15,744

[a] Hatchery summer steelhead that were volitionally released from the acclimation raceways.
[b] Number trucked indicates hatchery summer steelhead which did not emigrate volitionally from the acclimation raceways and were hauled and released near the mouth of the Hood River.

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 steelhead smolts are the progeny of parents that were collected at random throughout the respective steelhead run. The juvenile steelhead are not graded for size while in the fish hatchery. The smolts are acclimated prior to release into the Hood River system. The smolts volitionally migrate from the acclimation ponds during approximately the same period that naturally produced smolts are emigrating from the system. To reduce potential interaction between naturally produced smolts and other resident salmonids non-migrants are not forced from the acclimation ponds, but are transported for release near the mouth of Hood River.

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 are conducting a mark and recapture program at selected sites located in the Hood River subbasin. The program is 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 are 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 and 2) re-introducing a naturally producing population of spring chinook salmon. Data are also 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**) , are used to determine if acclimation facilities significantly increase hatchery smolt to adult survival rates. Estimates are summarized annually in a research progress report. Ancillary life history, morphometric, and meristic data collected at the migrant trap (see **Sub-Objective 3**) are also 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 are counting upstream migrant jack and adult anadromous salmonids at an adult migrant trap located in the mainstem Hood River at Powerdale Dam (RM 4.0). Counts are 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 are 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 are primarily used to determine if the biological fish objectives for the HRPP are being achieved but are also used to develop models for predicting future run sizes based on in-season estimates of escapement to Powerdale Dam. Estimates are summarized annually in a research progress report. Ancillary life history, morphometric, and meristic data collected at the adult migrant trap (see **Sub-Objective 4**) are also 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 are 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 are also bio-sampled at all HRPP satellite hatchery facilities prior to release in the Hood River subbasin. Age structure of downstream migrants is determined, and freshwater age specific data is collected on smolt and pre-smolt migration timing, mean fork length (mm), and condition factor. Information is 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 are 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.

Upstream migrant jack and adult anadromous salmonids are sampled at an adult migrant trap located in the mainstem of the Hood River at Powerdale Dam (RM 4.0). Age structure of upstream migrants is determined and freshwater/ocean age specific data are 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, are also monitored. Information is 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 are summarized annually in a research progress report.

Spawning ground surveys are 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 are radio tagged in selected years to monitor spatial distribution of adult holding and spawning. Approximately 30 adults are 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.

A creel program below Powerdale Dam is conducted 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 are primarily 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 are also 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 Indians upon full implementation of the HRPP. Data are 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.

Harvested jack and adult anadromous salmonids are sampled in fisheries located in the mainstem Hood River below Powerdale Dam (RM 4.0). Age structure of fish sampled in the creel are determined and freshwater/ocean age specific data are collected on the temporal distribution of harvest, mean fork length (mm), and sex ratio. Estimates obtained from the fishery are 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 are 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 population structure 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 modifying 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 investigates 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. The last of the samples will be analyzed in FY 2000 and a final report prepared 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 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%; a side compartment was 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 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 12. RESEARCH

12.1) Objective or purpose.

The Hood River Production Program 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 programs 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.

One of the Hood River Production Program goals is to restore depressed populations of wild summer and winter steelhead in the Hood River subbasin to levels commensurate with the subbasins current carrying capacity. 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 are trapped at rotary-screw traps (i.e., migrant trap) 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 maximize both the flow into the trap and the amount of stream the trap will fish. Because of seasonal variation in streamflow, traps are periodically 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 is sampled on a daily basis. Sampling is typically conducted in the morning to reduce temperature related stress. All fish are 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) are 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 are 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 is sampled for scales, measured to the nearest millimeter fork length, and weighed to the nearest 0.1 gram. Scale samples are mounted on glass slides and sent to the ODFW's research laboratory in Corvallis, Oregon, where experienced ODFW staff analyze the scales and determine freshwater age using methods described by Borgerson et al. (1992). Data is recorded in a database.

Downstream migrant salmonids are sampled at the mainstem migrant trap to monitor temporal distribution of migration from the Hood River subbasin. Estimates of migration timing are based on bi-weekly counts at the migrant trap. Bi-weekly counts are not 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 are 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 is 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 are 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 are

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) is 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 traps, and the corresponding confidence limits, are documented in Olsen et al. (1999).

Downstream migrants are marked with a panjet needle-less injector. The panjet is 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 is 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 is 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 are 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 4.0 in the mainstem Hood River. The fish trap 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 finger weir design.

Beginning in late 1995, and continuing through early 1997, a new trapping facility was constructed at Powerdale Dam. The new trapping facility utilized 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 temporarily 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 were 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 five to seven days per week, 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 is checked in the morning in order to minimize potential handling stress associated with sampling fish during the afternoon when water temperatures are typically higher. Fish are introduced into an anesthetic tank supplied with CO_2 before they are handled.

Jack and adult salmonids are identified by species, classified by sex, and examined for injuries. Injuries are 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 are missing and the skin is scratched. An open wound is one in which the skin is broken. Net marks are 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 is 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.

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 has 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 may be radio tagged and released above Powerdale Dam. 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, are 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, will be allocated into specific age categories using the ratio's observed in the corresponding category of wild, subbasin hatchery, and stray hatchery fish in which they were assigned.

Fall chinook salmon and coho salmon (*Oncorhynchus kisutch*) are classified as either a natural or hatchery produced fish 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 indicate that the greater percentage of fish (approximately 75% or more) are 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 are determined for both strata. Sampling days are categorized as either a weekend-holiday or week day and total catch is 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 is 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 early March through early October.

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

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

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

Egg Collection and Incubation
Steelhead eggs are collected from 1:1 sex ratio matings. Eggs are water-hardened in an iodine antiseptic solution. Family groups are kept separate until viral samples from parent ovarian fluid and sperm has been analyzed. Water-hardened eggs are transported to Oak Springs Fish Hatchery in a portable cooler. Eggs arriving at Oak Springs Fish Hatchery are rinsed in an iodine antiseptic solution before family groups are placed in

individual incubation trays. Family groups of eggs may be pooled with other family groups if the viral samples are negative.

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 then 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, then the water is aerated with a portable aerator.

Adult Trapping
The Powerdale Fish Facility is operated five to seven days to minimize holding mortality. The 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 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 6-9).

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 23. The number and disposition of ESA listed adult summer and winter steelhead sampled at the Powerdale Fish Facility are summarized in Table 24 and Table 25, 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.

Adult Trapping
An upstream migrant adult fish trap was installed at Powerdale Dam in December 1991. Powerdale Dam, which is owned and operated by PacifiCorp, is located at RM 4.0 in the mainstem Hood River. The temporary fish trap 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. This temporary fish trap was replaced by the Powerdale Fish Facility in 1997.

Table 23. 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. Data source: Olsen and French, unpublished.

	Rainbow-steelhead			Hatchery Winter Steelhead			Hatchery Summer Steelhead		
Year	Number Caught	Mort.[a]	Percent Mort.	Number Caught	Mort.	Percent Mort.	Number Caught	Mort.	Percent 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.

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 may allow us to drop certain tasks currently being implemented in the subbasin. Hopefully, models can be developed that will be able to estimate wild steelhead smolt production based on the numbers of fish passed above Powerdale Dam. The downstream migrant traps would still need to be operated to evaluate selected performance indicators but the potential elimination of certain tasks could help to 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 26). 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 24. 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: ODFW, unpublished.

	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 25. 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: ODFW, unpublished.

	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.

Table 26. 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%; a side compartment was 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 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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Weintraub, Nancy. 1996. Hood River Fisheries Project – Draft Environmental Impact Statement (DOE/EIS-0241). Bonneville Power Administration, Portland, Oregon.

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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:_____