HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Klickitat River-Skamania Summer Steelhead Outplant
Species or Hatchery Stock	Summer Steelhead/Oncorhynchus mykiss
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Klickitat Subbasin/Columbia Gorge Province
Date Submitted	nya
Date Last Updated	August 16, 2004

Section 1: General Program Description

1.1 Name of hatchery or program.

Klickitat River-Skamania Summer Steelhead Direct Plant

1.2 Species and population (or stock) under propagation, and ESA status.

Summer Steelhead Oncorhynchus mykiss

ESA Status: Not listed and not a candidate for listing

1.3 Responsible organization and individuals.

Name (and title):	Richard Johnson
	Washougal-Skamania Hatcheries Complex Manager
Agency or Tribe:	Washington Department Fish and Wildlife
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.

Co-operators	Role
National Marine Fisheries Service	Manager of Mitchell Act Funds

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

Funding Sources
Mitchell Act

Operational Information	Number
Full time equivalent staff	4
Annual operating cost (dollars)	$463,581

Staff and Annual Operating Costs are interchangeable and used for Skamania Summer Steelhead and Winter Steelhead Related-Programs

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Skamania Hatchery- North Fork Washougal River
Broodstock collection location (stream, RKm, subbasin)	Skamania Hatchery/N.F. Washougal River/RKm 2.4/Washougal
Adult holding location (stream, RKm, subbasin)	Skamania Hatchery/N.F. Washougal River/RKm 2.4/Washougal
Spawning location (stream, RKm, subbasin)	Skamania Hatchery/N.F. Washougal River/RKm 2.4/Washougal
Incubation location (facility name, stream, RKm, subbasin)	Skamania Hatchery/N.F. Washougal River/RKm 2.4/Washougal; and Vancouver Hatchery/Off-Stream Near Vancouver, WA/Columbia Lower
Rearing location (facility name, stream, RKm, subbasin)	Skamania Hatchery/N.F. Washougal River/RKm 2.4/Washougal; and Vancouver Hatchery/Off-Stream Near Vancouver, WA/Columbia Lower

1.6 Type of program.

Isolated Harvest

1.7 Purpose (Goal) of program.

- Release 100,000 hatchery summer steelhead annually from the Skamania Hatchery into the Klickitat River.
- The goal is to mitigate for activities within the Columbia River basin, which has reduced salmonid populations.
- The purpose is to provide maximum sport harvest under the selective fishery regulations (retention of adipose-clipped fish only) while eliminating a directed harvest on wild winter steelhead.

1.8 Justification for the program.

- The Skamania summer steelhead program including direct out plants to Region 5 streams is funded through the Mitchell Act via National Marine Fisheries Service (NMFS) for the purpose of mitigation for lost fish production due to development within the Columbia River Basin.
- The WDFW is required under U.S. vs. Oregon treaty obligations to release harvestable steelhead into the Klickitat River.
- The program is authorized under the Columbia River Fisheries Development Program and Columbia River Fish Management Plan.
- To provide selective fisheries WDFW protects listed fish and provides harvest opportunity through the Fish Management and Evaluation Plan (FMEP 2002). The objectives of the WDFW's FMEP are based on the WDFW Wild Salmonid Policy (1997). In that policy, it states that harvest rates will be managed so that 1) spawner abundance levels abundantly utilize available habitat, 2) ensure that the number and distribution of locally adapted spawning populations will not decrease, 3) genetic diversity within populations is maintained or increased, 4) natural ecosystem processes are maintained or restored, and 5) sustainable surplus production above levels needed for

abundant utilization of habitat, local adaptation, genetic diversity, and ecosystem processes will be managed to support fishing opportunities. In addition, fisheries will be managed to ensure adult size, timing, distribution of the migration and spawning populations, and age-at-maturity are the same between fished and unfished populations. By following this policy, fisheries' impacts to listed steelhead, chinook salmon, and chum salmon in the Lower Columbia River (LCR) Evolutionary Significant Unit (ESU) will be managed to promote the recovery of these species and not at rates that jeopardize their survival or recovery.

- For programs designed for selective steelhead harvest, WDFW tries to minimize natural escapement of hatchery fish to protect the genetic diversity of wild stocks and minimize impact on listed fish. The most commonly used approach for steelhead management is to maximize the difference between hatchery and wild stocks, so that if hatchery fish spawn, they are not likely to interbreed with wild spawners. Strategies used by WDFW to limit genetic and ecological risks include: 1) limit the number of hatchery spawners by providing intense selective fisheries, and maintaining high trapping efficiency at the hatcheries or adult traps that remove hatchery fish prior to spawning; 2) advance the spawning timing of Chambers Creek and Skamania type steelhead stocks, so these fish spawn 3 months earlier than wild stocks, minimizing interbreeding between these two groups; 3) keep hatchery steelhead spawners in the lower river away from prime wild steelhead spawning areas through lower river releases and acclimation; 4) since the reproductive success of Chambers Creek stock is 11% of wild winter steelhead and Skamania stock is 18% of wild summer steelhead, the few fish that do survive to spawn will produce few offspring (WDFW Kalama River Research Project); 5) use hatchery management practices, acclimation, timing, and lower river releases to limit steelhead residualism and the competition and predation that can occur when steelhead smolts residualize; and 6) follow the Integrated Hatchery Operations Team (IHOT 1995) guidelines to limit disease risks from hatchery steelhead.

In order to minimize impact on listed fish by WDFW facilities operation and the Klickitat summer steelhead program, the following Risk Aversion are included in this HGMP:

Table 1. Summary of risk aversion measures for the Klickitat summer steelhead program.

Potential Hazard	**HGMP Reference**	**Risk Aversion Measures**
Water Withdrawal	4.2	Not applicable to this direct plant from Skamania Hatchery to the Klickitat River. All of these risks aversions are available in the Skamania Summer Steelhead HGMP.
Intake Screening	4.2	
Effluent Discharge	4.2	
Broodstock Collection & Adult Passage	7.9	
Disease Transmission	7.9, 10.11	*Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	See also 2.2.3, 10.11	Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish.

1.9 List of program "Performance Standards".

See section 1.10.

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

1.10.1 Benefits:

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Assure that hatchery operations support Columbia River fish Mgt. Plan *(US v Oregon)*, production and harvest objectives	Contribute to the harvest of hatchery summer steelhead on the Klickitat River. (current 10 yr. average is 1,218 fish, all programs combined). Contribution of this program cannot be identified independently.	Survival and contribution to fisheries will be estimated for each brood year released. Work with co-managers to manage adult fish returning in excess of broodstock need.
Maintain outreach to enhance public understanding, participation and support of Washington Department of Fish & Wildlife (WDFW) hatchery programs	Provide information about agency programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts may include festivals, classroom participation, stream adoptions and fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program. Record on-station organized education and outreach events.
Program contributes to fulfilling tribal trust responsibility mandates and treaty rights	Follow pertinent laws, agreements, policies and executive and judicial orders on consultation and coordination with Native American tribal governments	Participate in annual coordination meetings between the co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process).
Implement measures for broodstock management to maintain integrity and genetic diversity. Maintain effective population size.	A minimum of 100 adults are collected throughout the spawning run in proportion to timing, age and sex composition of return	Annual run timing, age and sex composition and return timing data are collected. Adhere to WDFW spawning guidelines. (WDFW 1983)
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish	Use mass-mark (adipose-fin clip) for selective fisheries with additional groups Ad+CWT and CWT only for evaluation purposes	Returning fish are sampled throughout their return for length, sex, mark and
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Necropsies of fish to assess health, nutritional status, and culture conditions	WDFW Fish Health Section inspect adult broodstock yearly for pathogens and parasites and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy
	Inspection of adult broodstock for pathogens and parasites	At spawning, lots of 60 adult broodstock are examined for pathogens
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites	Control of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy.

1.10.1 Risks:

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Minimize impacts and/or interactions to ESA listed fish	Hatchery operations comply with all state and federal regulations. Hatchery juveniles are raised to smolt-size (5.0 – 5.5 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. Mass mark production fish to identify them from naturally produced fish (except CWT only groups)	As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, instream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented.
Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring	NPDES permit compliance WDFW water right permit compliance	Flow and discharge reported in monthly NPDES reports.
Water withdrawals and instream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.	Barrier and intake structure compliance assessed and needed fixes are prioritized.
Hatchery operations comply with ESA responsibilities	WDFW completes an HGMP and is issued a federal and state permit when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvests are monitored by agencies and tribes to provide up to date information.

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

At Skamania Hatchery, 200 males and 200 females are needed to reach Region 5 production goals and on-station broodstock needs. Egg take goal is 450,000 (FBD 2004). The to the Klickitat River is a portion of that level.

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

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	100,000 FBD	5.0-5.5	April – May	Klickitat	16.1, 29.0, 40.3 and 45.1	Klickitat	Columbia Gorge

1.12 Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Fish are released for harvest only and no escapement is intended for this program. Smolt-to-adult survival rates are not available. Average yearly catch since 1985 has been 1253 sport caught steelhead and for the past eight years average yearly tribal catch has been 443 fish (WDFW Historical Database).

Return Year	Sport Harvest	Tribal Harvest (Includes an unknown number of wild fish)	Smolt Releases
1989/90	767	Na	50,000
1990/91	992	Na	115,800
1991/92	764	Na	120,400
1992/93	1,162	Na	116,600
1993/94	1,185	Na	80,700
1994/95	807	595	80,800
1995/96	832	482	126,500
1996/97	585	272	119,100
1997/98	1,011	500	124,900
1998/99	545	259	123,700
1999/00	572	59	118,500
2000/01	1,310	172	101,800
2001/02	3,479	712	99,900
2002/03	3,048	1,014	103,200

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

Outplants to the Klickitat River started in 1983.

1.14 Expected duration of program.

The program is on going with no planned termination but the Yakima/Klickitat Fisheries Project (YKFP) Transition Plan calls for phasing out Skamania Hatchery stock and shifting to supplementation of naturally spawning Klickitat stock.

1.15 Watersheds targeted by program.

Klickitat Subbasin/Columbia Gorge Province

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

1.16.1 Brief Overview of key issues

The Skamania Hatchery summer steelhead program produces smolts for planting in many regional streams. Skamania stock summer steelhead are released into the Klickitat River to continue a summer steelhead sport fishery and contribute to tribal harvest while eliminating a directed harvest on wild summer steelhead.

1.16.2 Potential Alternatives to the Current Program

For future out-plants to the Klickitat River, the Yakima/Klickitat Fisheries Project (YKFP) Transition Plan (Oshie and Ferguson, 1998) calls for phasing out Skamania Hatchery stock and shifting to supplementation of naturally spawning Klickitat stock. Implementation of this new effort would be conducted at the Klickitat Hatchery.

Section 2: Program Effects on ESA-Listed Salmonid Populations

2.1 List all ESA permits or authorizations in hand for the hatchery program.

Program is described in the "Biological Assessment for the Operation of Hatcheries Funded by the National Marine Fisheries Service" (March 99). Also, statewide Section 6 consultation with USFWS for interactions with Bull Trout, and concurrent with this HGMP to satisfy Section 7 consultations: During 2004, WDFW is writing HGMP's to cover all stock/programs produced at Washougal Complex including; Columbia River chum, fall chinook, coho, summer and winter run steelhead

2.2.1 Descriptions, status and projected take actions and levels for ESA-listed natural populations in the target area.

The following ESA listed natural salmonid populations occur in the subbasin where the program fish are released:

ESA listed stock	Viability	Habitat
Summer Steelhead-Natural	L	L
Winter Steelhead-Natural	L	L
Bull Trout	Unk	Unk
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

Identify the ESA-listed population(s) that will be <u>directly</u> affected by the program.
None.
Identify the ESA-listed population(s) that may be <u>incidentally</u> affected by the program.

Lower Columbia River Steelhead *(Oncorhynchus mykis*s), were listed as Threatened under the ESA on March 19, 1998.
Columbia Basin DPS Bull Trout *(Salvelinus confluentu*s) were listed as Threatened June 10, 1998 (63 FR 31647),

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. Critical and Viable population thresholds have not been established by the Lower Columbia River/Willamette River Technical Review Team (TRT).

Lower Columbia River Steelhead *(Oncorhynchus mykis*s), were listed as threatened under the ESA on March 19, 1998. In Washington, the LCR steelhead ESU includes winter and summer steelhead in tributaries to the Columbia River between the Cowlitz River and Wind River.

Status of summer and winter runs: Steelhead located in tributaries from the Cowlitz River to the Wind River, inclusive, are considered part of the Lower Columbia ESU and these fish are listed as threatened under the Endangered Species Act (ESA). WDFW also considers most of these populations as depressed. However, Kalama winter steelhead are considered healthy. WDFW is currently monitoring wild steelhead populations and if the need arises WDFW, with concurrence from NMFS, will move forward with hatchery recovery actions including supplementation to recover listed fish. WDFW is evaluating the use of locally adapted broodstocks in the Kalama and other basins. If this program is successful at minimizing ecological and genetic risks and providing an enhanced sport fishery, WDFW will consider expanding this program to others rivers in the ESU including the Lewis, Washougal, Wind, and

White Salmon. For future out-plants to the Klickitat River, the Yakima/Klickitat Fisheries Project (YKFP) Transition Plan (Oshie and Ferguson, 1998) calls for phasing out Skamania Hatchery stock and shifting to supplementation of naturally spawning Klickitat stock.

The existence of naturally spawning winter steelhead was confirmed in the early 1980s, and winter steelhead are presumed to be indigenous. Howell et al. (1985) recognized both summer and winter races of steelhead in the Klickitat subbasin, with an adult winter steelhead migration period of January through May and a spawning period of March through June. To protect the winter run, current regulations prohibit sport fishing for steelhead in the Klickitat River from December through May and the treaty fishery is closed from January through March. Both seasons have been longer in previous years. In the Preliminary Information Report (July 8, 1988), March and April steelhead catches were assumed to be winter steelhead and ranged from two fish to 105 fish during the years 1977 through 1986. Hatchery-reared winter steelhead have never been released in the Klickitat Basin.

The years 1996-2000 comprise the most comprehensive set of steelhead spawner survey data. Redd counts over these years indicate an average escapement of 260 fish. This figure is undoubtedly an underestimate due to the inherent difficulty in conducting accurate counts during spring flow conditions. Mainstem spawning distribution is concentrated between RM 5.2 and RM 50.0, with occasional spawning above Castile Falls (RM 64). Tributary spawning occurs in Swale, Wheeler, Summit, and White creeks and the upper Little Klickitat River.

Table 2. Wild summer steelhead abundance estimates in the LCMA (FMEP 2003).

Brood Year	Pop Est. Trap	Snorkel Surveys			Index/Redds
	Kalama	**EF Lewis**	**Washougal**	**Wind**	**Wind**
1990	745		156	116	228
1991	704		31	123	294
1992	1,075		77	129	287
1993	2,283		71	101	
1994	1,041		49	104	
1995	1,302		70	136	84
1996	614	85	44	96	
1997	598	93	57	106	106
1998	205	61	112	44	
1999	220	60	115	43	96
2000	140	99	118	26	
2001	329	117	145		
2002	Na	Na	Na	Na	Na
2003	Na	Na	Na	Na	Na

Table 3. Wild winter steelhead abundance estimates in the LCMA.

Brood Year	Index Redd Surveys					Pop. Est. Trap Counts		Index Trap/redd
	Coweeman	SF Toutle	Green	EF Lewis	Washougal	NF Toutle	Kalama	Cedar Creek
1990	522	752	86	102		36	419	
1991		904	108	72	114	108	1,128	
1992		1,290	44	88	142	322	2,322	
1993	438	1,242	84	90	118	165	992	
1994	362	632	128	78	158	90	853	
1995	252	396	174	53	206	175	1,212	
1996	44	150				251	853	70
1997	108	388		192	92	183	537	78
1998	314	374	118	250	195	149	438	38
1999	126	562	72	276	294	129	562	52
2000	290	490	124	207	939	238	941	
2001	284	334	192	79	216	185	1085	
2002	Na	Na	Na	Na	Na	Na	Na	Na
2003	Na	Na	Na	Na	Na	Na	Na	Na

Columbia Basin DPS Bull Trout *(Salvelinus confluentus*) June 10, 1998 (63 FR 31647), Threatened.

The Fish and Wildlife Service issued a final rule listing the Columbia River and Klamath River populations of bull trout *(Salvelinus confluentus*) as a threatened species under the Endangered Species Act on June 10, 1998 (63 FR 31647). The Columbia River Distinct Population Segment is threatened by habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, and past fisheries management practices such as the introduction of nonnative species. The Lower Columbia Recovery Unit Team identified two core areas (Lewis and Klickitat rivers) within the recovery unit. The Klickitat Core Area includes all tributaries downstream to the confluence with the Columbia River. Recent evidence indicates both resident and adfluvial bull trout may be present in the basin. In 1998, CRITFC tribal pikeminnow gillnetters reported capturing two bull trout at the river's mouth. In May 2000, an additional bull trout recovery and release was reported at the Pikeminnow Sport-reward Registration Station at the river's mouth. Photographic evidence of fish angled in the mid-1980s are of a size associated with adfluvial populations. Additional survey work will be conducted in the upper drainage to determine the distribution and abundance of bull trout in the subbasin. In the 1995 Amendment to the 1994 Columbia River Basin Fish and Wildlife Program (10.5A.6), the Northwest Power Planning Council recognized the importance of studying bull trout in the Klickitat system, with particular attention to determining presence and abundance of juveniles and adults, comparing genetic makeup with other regional stocks, determining available habitat and limiting factors and developing a management plan. The YN, in conjunction with the WDFW, will conduct a cooperative study investigating the Klickitat River bull trout population(s). Field studies will determine stock(s) status and life history patterns present, through presence/absence investigations, population estimates, habitat analysis and genetic DNA analysis. The abundance and distribution of the stock is poorly known. There are insufficient data to make an assessment. However, it appears that there are very few bull trout in the lower- to mid-Klickitat drainage. Bull trout appear to be more abundant in the upper drainage where habitat conditions are more favorable. Four bull trout up to 10 inches in length were observed during snorkel surveys in the upper mainstem (RM 64, above the West Fork) and 23 bull trout (three to seven inches in length) were observed during electrofishing surveys in Trappers Creek. Portions of the West Fork upstream of Fish Lake Stream contain an isolated naturally reproducing population of bull trout. We do not know the impacts of hatchery salmon and steelhead in the main Klickitat River on bull trout/Dolly Varden. Generally, in drainages colonized by anadromous salmon and steelhead, char successfully co-exist by occupying a different ecological niche. However, negative interactions (predation) can occur when hatchery programs are released near char spawning and rearing areas.

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.

Describe hatchery activities: The following activities listed below are identified as general hatchery actions that are identified in the ESA Section 7 Consultation "Biological Opinion on Artificial Propagation in the Columbia River Basin" (March 29, 1999).

Broodstock Program:

Broodstock Collection: Not applicable for this direct plant. No direct take is associated with this program.

Genetic introgression: To reduce the number of hatchery fish that could interbreed with listed steelhead, WDFW uses a wild steelhead management strategy removing hatchery marked steelhead through selective sport harvest and tribal harvest on the Klickitat. When hatchery steelhead do spawn, their reproductive success in the wild is "very" low and few offspring are produced (Chilcote et al. 1986 and Leider et al. 1990). Indirect take from genetic introgression is unknown.

Rearing Program:

Operation of Hatchery Facilities: Not applicable as this is a direct plant.

Disease: Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of programs. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994) Chapter 5 have been instrumental in reducing disease outbreaks. Although pathogens may cause post release mortality in fish from hatcheries but there is little evidence that hatchery origin fish routinely infect natural populations of salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986; Stewart and Bjornn 1990; Foot et al. 2000). Indirect take from disease effects is unknown.

Release:

Hatchery Production/Density-Dependent Effects: Hatcheries can release numbers of fish that can exceed the density of the natural productivity in a limited area for a short period of time and can compete with listed fish. The current program release of 100,000 has been close to the 22 year average (WDFW Historical Database Files). Program is planted at a size, time and condition factor that indicates a strong smolt behavior. Fish emigrate at a time period similar to the Klickitat wild steelhead emigration which occurs from April to May, with this peak migration occurring in early May. Indirect take from density dependent effects is unknown.

Competition: Salmon and steelhead feed actively during their downstream migration (Becker 1973; Muir and Emmelt 1988; Sager and Glova 1988) and if they do not migrate they can compete with wild fish. Studies conducted in other areas indicate that this program is likely to pose a minimal risk of competition based on the following:

1) As discussed above, coho salmon and steelhead released from hatchery programs as smolts typically migrate rapidly downstream. The SIWG (1984) concluded that

"migrant fish will likely be present for too short a period to compete with resident salmonids." Studies have shown that coho moved downstream quickly, suggesting that coho spend very little time in the river after release (Fuss and Byrne 1995). Coho smolts released from the Marblemount Hatchery on the Skagit River migrated approximately 11.2 river miles day (Puget Sound data from Seiler et al. 1997; 2000). On station release in large systems may travel even more rapidly – migration rates of approximately 20 river miles per day were observed by steelhead smolts in the Cowlitz River (Harza 1998).

2) NMFS (2002) noted that "..where interspecific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates."
3) Flagg et al. (2000) concluded, "By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource. Thus, the modern enhancement strategy of releasing salmon and steelhead trout as smolts markedly reduces the potential for hatchery and wild fish to compete for resources in the freshwater rearing environment. Miller (1953), Hochachka (1961), and Reimers (1963), among others, have noted that this potential for competition is further reduced by the fact that many hatchery salmonids have developed different habitat and dietary behavior than wild salmonids." Flagg et al (2000) also stated "It is unclear whether or not hatchery and wild chinook salmon utilize similar or different resources in the estuarine environment."
4) Fresh (1997) noted that "Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. A major reason for the uncertainty in the available data is the complexity and dynamic nature of competition and predation; a small change in one variable (e.g., prey size) significantly changes outcomes of competition and predation. In addition, large data gaps exist in our understanding of these interactions. For instance, evaluating the impact of introduced fishes is impossible because we do not know which nonnative fishes occur in many salmon-producing watersheds. Most available information is circumstantial. While such information can identify where inter- or intra specific relationships may occur, it does not test mechanisms explaining why observed relations exist. Thus, competition and predation are usually one of several plausible hypotheses explaining observed results."

Predation: Steelhead released from this program may prey upon listed species of salmonids, but the magnitude of predation will depend upon the characteristic of the listed population, the habitat in which the population occurs and the characteristics of the hatchery program (e.g.. release time, location, number released and size at release). The site specific nature of predation and the limited number of empirical studies that have been conducted make it difficult to predict the predation effects of this specific hatchery release. WDFW is unaware of any studies that have empirically estimated the predation risks to listed fish by this program.

In the absence of site-specific empirical information, the identification of risk factors can be a helpful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented such as those on the Kalama River.

Predation Risk Factors:

Environmental Characteristics: These characteristics can influence the level of predation (see SIWG (1984) for a review) with risk greatest in small systems during periods of low flow and high clarity. The Klickitat River is a large stream and fish are planted in April-May during peak run-off flows. From March to June, runoff conditions increase the flow to an average of more than 2300 cfs. Glacial turbidity and suspended sediment occurs during the late summer and early fall. Release of this hatchery program is consistent in a timeframe with adequate flows to help emigration and before lower water conditions result in greater risk.

Dates of Releases: Steelhead can be released starting April 15, but staff has been implementing release dates after May 1st when operational and environmental conditions permit. Hatchery steelhead releases timed after these dates are consistent with providing a high level of protection to listed salmon from yearling hatchery programs.

Relative Body Size: Studies and opinions on size of predator/prey relationships vary greatly and although there is evidence that salmonids can prey upon fish up to 50% of their body length, most prey consumed is probably much smaller. Keeley and Grant (2001) suggest that the mean prey size for 100-200 mm fl salmonids is between 13-15% of predator body size. Salmonid predators were thought to be able to prey on fish up to approximately 1/3 of their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length in aquarium environments (Pearsons et al. 1998). Artic char are well known as piscivorous predators, but recent studies suggest the maximum prey size is approximately 47% of their length (Finstad et al. 2002). The “33% of body length” criterion for evaluating the potential risk of predation in the natural environment has been used by NOAA Fisheries and the USFWS in a number of biological assessments and opinions (c.f., USFWS 1994; NMFS 2002). Although predation on larger Chinook juveniles may occur under some conditions, WDFW believes that a careful review of the Pearson and Fritts (1999) study supports the continued use of the “33% of body length criterion” for listed species until further data for this system can be collected.

Release Location and Release Type: The likelihood of predation may also be affected by the location and type of release. Other factors being equal, the risk of predation may increase with the length of time that fish co-mingle. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release and the speed at which fish released from the program migrate. Steelhead migration rates of approximately 20 river miles per day have been observed in the Cowlitz River (Harza 1998). This study indicated that smolt releases from acclimation sites migrate faster than those made from one system to another. Although this is not the case for this direct plant, the larger size of a receiving system also was a determining factor in the study.

We have provided a summary of empirical information an theoretical analysis of competition and predation interactions that may be relevant to the Klickitat summer steelhead program.

Potential Klickitat summer steelhead predation and competition effects on listed salmonids: Proposed annual production goal is 100,000 actively migrating summer steelhead smolts. Releases can begin April 15 of the year at 5.0 FPP (208 mm fl) although WDFW has been implementing a start date no earlier than May 1st. Plants are spread out and made at RKm 16.1, 29.0, 40.3, and 45.1 on the Klickitat River. Summer run spawning window is from mid-February to mid-May while winter –run spawning occurs early March and lasts to mid-May (Klickitat Subbasin Anadromous Fishery Master Plan April 2004).

Depending on available temperature units, steelhead eggs will hatch in 4-7 weeks with fry emergence approximately 2-3 weeks after hatching (LCSI Draft 1998). Generally, in drainages colonized by anadromous salmon and steelhead, char successfully co-exist by occupying a different ecological niche although impact to bull trout is unknown.

Indirect take from competition is unknown.

Relative Body Size: Steelhead releases average 5.0 fpp (208 mm fl). Below are some data available for chinook fry and fingerling lengths from area Lower Columbia streams. The current release poses a risk to fish less than 69 mm although as mentioned previously, the magnitude of predation will depend upon the characteristic of the listed population of salmonids and the habitat in which the population occurs. Below are data available for some Columbia River Chinook:

- Lengths from the Lewis River system during the month of June indicate fish 48-55 mm fl (Columbia River Progress Report 2003-16).
- Average fork length by week from 26 sampling sites on the Kalama River by week indicate fish 44 mm fl on April 25, 46 mm fl on May 3, 56 mm fl on May 11, 62 mm fl by May 16, and ranges of 70 – 80 mm fl for the month of June and 77—89 mm fl for the month July (Pettit WDFW 1990).
- Fork lengths from Cedar Creek (tributary to the N.F. Lewis River) indicate that average Chinook lengths reach approximately 50 mm fl between the weeks of April 12 and April 19, 2004, with fish 55-60 mm fl by April 26 and May 3, 2004 and fish approaching 70 mm fl by mid-May (Rawding 2004).

Listed steelhead including emerging fry and migrating yearlings are present in the system. Depending on available temperature units, eggs will hatch in 4-7 weeks with fry emergence approximately 2-3 weeks after hatching (Table 3). Based on the migration and dispersal of the hatchery program, it is likely that a significant portion of this occurs before peak emergence of listed winter steelhead.

Table 3. Steelhead Spawn and Emergence Windows.

Race	Spawn Time	Peak Spawn Window	Incubation to Hatch	Swim-up Window	Swim-up @ 50% Date	Source
Winter	March – May	April 15 - 25th	May 13 – June 15	May 27- July 7	June 17	LCSI Draft 1998
Summer	February – April	March 20-30th.	April 14 – May 18	April 28 – June 2	May 15	Kalama Research Report

Wild steelhead smolts migrate from freshwater to saltwater from March through June (Loch et al. 1986). Wild steelhead smolts such as those on the Lewis River system averaged 135-154 mm fl in 1997 and 1998 respectively (Hawkins 2002) and would likely not be prey items. Potential competition would be minimized due to the migratory state of hatchery and wild stocks at this time with Bjornn (1990). He conclude that hatchery fish kept in the hatchery for extended periods before release as smolts (e.g. yearling salmonids) also may have different food and habitat preferences than wild fish, and that hatchery fish will be unlikely to out-compete wild fish and are at a competitive disadvantage in free flowing systems.
Indirect take due to competition and predation is unknown.

Residualism: To maximize smolting characteristics and minimize residual steelhead, WDFW adheres to a combination of acclimation, volitional release strategies, active pond management, size, and release guidelines (WDFW Steelhead rearing guidelines July 31, 2001). Condition factors of 0.90-0.99 (K factor) and co-efficient of variation on fork lengths (CVs) of less than 10% are steelhead the release guidelines. Recent research (Rhine et al. 1997, Bigelow 1997) indicates steelhead smaller than 180 mm are more prone to residualize, while smolting and survival are optimized for fish greater than 190 mm fl (WDFW Steelhead rearing guidelines July 31, 2001). As a case in point, data from steelhead release programs on the Toutle River system are representative of the Lower Columbia steelhead programs at release that illustrates that few fish are <180 mm fl and greater than > 250 mm fl on release. Below are presented length frequency samples of 100 smolts from 20,000 summer steelhead released directly from the N.F.Toutle Hatchery and 20,000 summer steelhead released from the Cowlitz Game and Anglers Acclimation Pond located on the S.F. Toutle River. In both cases, few fish are outside these general guidelines for optimum steelhead size at release. Indirect take from residualism is unknown.

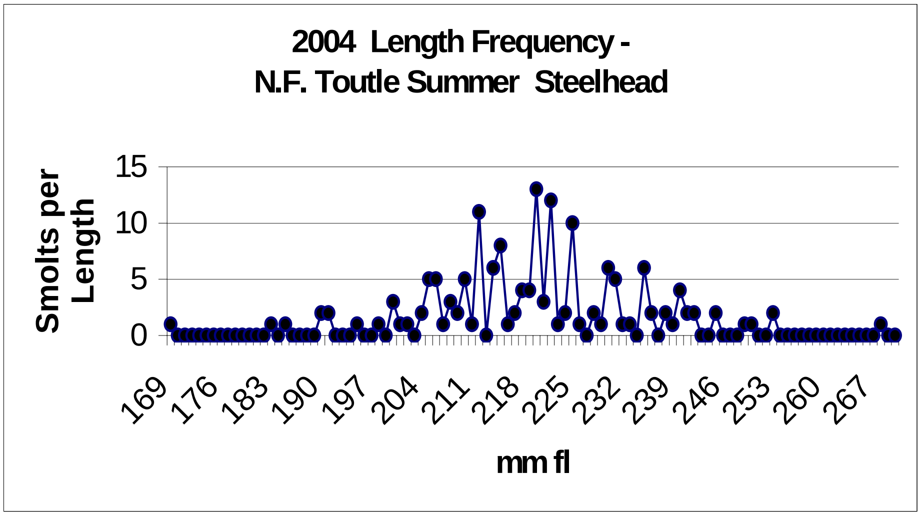

Figure 2. N.F. Toutle Summer Steelhead Plants (Hatchery Site Plants)

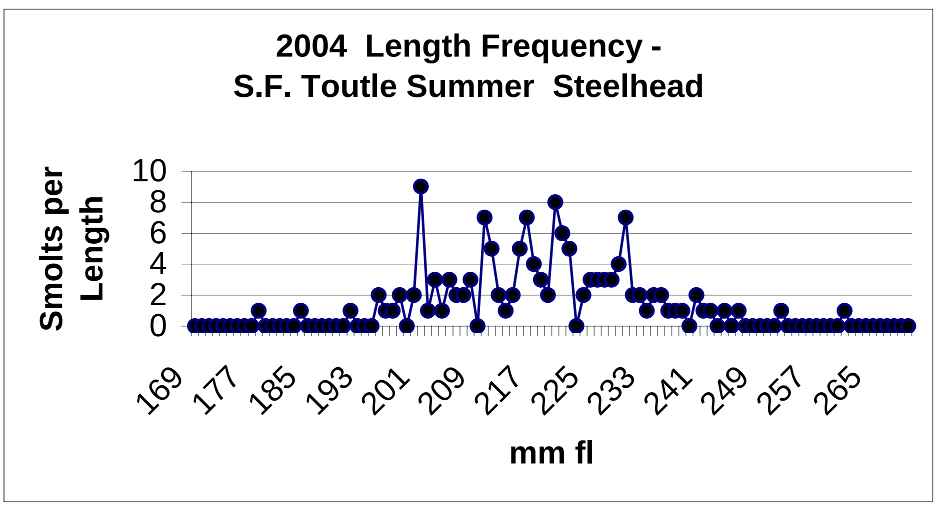

Figure 3. S.F. Toutle Summer Steelhead Plants (Hatchery Site Plants)

Indirect take from residualism is unknown.

Migration Corridor/Ocean: It is unknown to what extent listed fish are available both behaviorally or spatially on the migration corridor. Once in the main stem, Witty et al. (1995) has concluded that predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor and also stated there are no studies demonstrating that numbers of Columbia system smolts emigrating to the ocean can be associated with a change in the survival rates of juveniles in the ocean in part because of the dynamics of fish rearing conditions in the ocean. Indirect takes on migration corridor and the ocean is unknown.

Associated monitoring and evaluation and research programs: The WDFW received funding to install and operate a fish trap on the number 5 fishway at Lyle Falls, located at RM 2.2 on the Klickitat River. The fish trap was installed in the spring of 2003 and will be operated for two fiscal years, ending in 2005. This trap will provide WDFW with much needed data on escapement of salmon and steelhead into the Klickitat River. These data will provide the beginning of a database WDFW will use for fisheries management. The Yakama Nation (YN) conducts annual spawning ground surveys in index streams in the Klickitat River basin and operates two smolt traps to determine productivity. However, the spawning ground surveys cover less than 50 percent of the available spawning habitat in the basin and the efficiency of the smolt traps is not optimal (B. Sharp YN, pers. comm.). The YN is expanding the spawning ground surveys to cover more of the basin and relocating the smolt traps to more productive trapping locations. Data are not available to accurately estimate annual escapement or basin productivity. Scientific protocols are followed to limit impact on these activities. Additional concerns would be communicated to NOAA staff for adaptive management. Indirect take from these activities is unknown.

Spring chinook fisheries are open some years in Drano Lake and in the White Salmon, Klickitat, and Yakima Rivers. Both summer and winter steelhead occur in the Klickitat River. The status of these stocks is not known. The river presents many problems when it comes to estimating abundance for steelhead, such as seasonal high flows, turbid water, and access limitations. These conditions require extra effort to gather data needed to estimate steelhead abundance in the Klickitat River. Annually, WDFW develops and presents proposals to potential funding groups for monitoring and surveying activities. The WDFW has submitted proposals to groups such as BPA, Yakima Klickitat Fisheries Project, and NMFS. The WDFW will continue to seek funding for projects in the Klickitat River that will help to estimate steelhead abundance.

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).

In other HGMPs provided to NOAA (Puget Sound, Upper Columbia), indirect takes from hatchery releases such as predation and competition is highly uncertain and dependant on a multitude of factors (i.e. data for population parameters - abundance, productivity and intra species competition) and although HGMPs discuss our current understanding of these effects, it is not feasible to determine indirect take (genetic introgression, density effects, disease, competition, predation) due to these activities. There will be no direct take tables included for this program.

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.

Any additionally mortality from this operation on a yearly basis would be communicated to Fish program staff for additional guidance. For other listed species, if significant numbers of wild salmonids are observed impacted by this operation, then staff would inform WDFW District Biologist along with the Complex Manager would determine an appropriate plan and consult with NOAA for adaptive management review and protocol.

Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.
No data available.

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.

For ESU-wide hatchery plans, the plant of summer steelhead into the Klickitat River is consistent with:

- 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin
- 1999 Review of Artificial Production of Anadromous and Resident Fish in the Columbia River Basin
- Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994)
- The *U.S. v. Oregon* Columbia River Fish Management Plan
- NWPPC Fish and Wildlife Program
- Yakima/Klickitat Fisheries Project (YKFP or Project)
- Klickitat Subbasin Anadromous Fishery Master Plan

For statewide hatchery plan and policies, hatchery programs in the Columbia system adhere to a number of guidelines, policies and permit requirements in order to operate. These constraints are designed to limit adverse effects on cultured fish, wild fish and the environment that might result from hatchery practices. Following is a list of guidelines, policies and permit requirements that govern WDFW Columbia hatchery operations for the production of spring chinook for the Klickitat River:

Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington. These guidelines define practices that promote maintenance of genetic variability in propagated salmon.. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).

Spawning Guidelines for Washington Department of Fisheries Hatcheries. Assembled to complement the above genetics manual, these guidelines define spawning criteria to be use to maintain genetic variability within the hatchery populations.

Stock Transfer Guidelines. This document provides guidance in determining allowable stocks for release for each hatchery. It is designed to foster development of locally adapted broodstock and to minimize changes in stock characteristics brought on by transfer of non-local salmonids (WDF 1991).

Fish Health Policy in the Columbia Basin. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Fish Policy Chapter 5, IHOT 1995).

National Pollutant Discharge Elimination System Permit Requirements This permit sets forth allowable discharge criteria for hatchery effluent and defines acceptable practices for hatchery operations to ensure that the quality of receiving waters and ecosystems associated with those waters are not impaired.

3.2 List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

The program described in this HGMP is consistent with the following agreements and plans:

- The Columbia River Fish Management Plan
- U.S. vs. Oregon court decision
- Production Advisory Committee (PAC)
- Technical Advisory Committee (TAC)
- Integrated Hatchery Operations Team (IHOT) Operation Plan 1995 Volume III.
- Pacific Northwest Fish Health Protection Committee (PNFHPC)
- In-River Agreements: State, Federal, and Tribal representatives
- Northwest Power Planning Council Sub Basin Plans
- Washington Department of Fish and Wildlife Wild Salmonid Policy
- Lower Columbia Steelhead Conservation Initiative

Constraints on this facility relative to the IHOT Operation Plan are described in the Hatchery Evaluation Report Skamania Hatchery- Summer Steelhead 1997. The Clark Public Utility and the Department of Fish and Wildlife have a partnership (MOA) at the Vancouver Hatchery which provides rearing and incubation for the Skamania Summer Steelhead program. The Vancouver Hatchery provides pathogen free water, which provides IHN virus protection for Skamania Summer Steelhead during spring time rearing activities.

3.3 Relationship to harvest objectives.

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.

The purpose of hatchery programs in the MCMA is to provide harvest opportunity. All hatchery steelhead released for augmentation are adipose fin-clipped. Presence of an adipose fin allows anglers to easily identify wild fish and limit handling

The Klickitat summer steelhead harvest is important to the subsistence fishing needs of Yakama tribal members. The *U.S. v. Oregon* management plan stipulates that steelhead harvest shares be based on the aggregate of mainstem and tributary catches by tribal and recreational fisheries and, further, that neither the treaty share nor the non-treaty share shall exceed 50 percent of the aggregate harvestable steelhead. Within this framework, each season's regulations for the Klickitat River are developed through con-sultation between the Washington Department of Fish and Wildlife and the Yakama Indian Nation. Federal court decisions (U.S. vs. Oregon 1969 and U.S. vs. Washington 1974) ruled that Indian tribes who signed treaties with the federal government in the 1850s have treaty fishing rights to harvest a share (50 percent) of surplus fish resources. These tribes may fish in their usual and accustomed fishing grounds in the Columbia River basin and other Washington waters. These court decisions mandated cooperative fisheries management in a government-to-government relationship between Washington State and the treaty Indian tribes. These decisions also mandate state hatchery facilities to produce fish to ensure harvest opportunities for treaty tribes.

Member tribes of the Columbia River Inter-Tribal Fish Commission may hold fisheries in Drano Lake and White Salmon, Klickitat, Walla Walla and Yakima river watersheds and the mainstem Columbia River. The WDFW does not regulate these fisheries. Each tribe retained its authority to regulate its fisheries and issues fishery regulations through its respective governing bodies.

Tribal staff are represented on the CRFMP Technical Advisory Committee and participate in monitoring activities and data sharing with other parties. The tribes have policy representation in the U.S. vs. Oregon harvest management processes and generally coordinate fisheries with the Columbia River Compact (the Compact).

Selective fisheries were initiated for steelhead in 1986 in the Lower Columbia River tributaries. This regulation requires the release of all wild steelhead. The estimated mortality for wild winter steelhead for these fisheries in lower Columbia River tributaries ranges from 4% to less than 7% per basin depending on the fishing regulations. Harvest rates have been as high as 70% for hatchery steelhead in the Cowlitz River. (See also Section 1.12, above).

Return Year	Sport Harvest	Tribal Harvest (Includes an unknown number of wild fish)
1989/90	767	Na
1990/91	992	Na
1991/92	764	Na
1992/93	1,162	Na
1993/94	1,185	Na
1994/95	807	595
1995/96	832	482
1996/97	585	272
1997/98	1,011	500
1998/99	545	259
1999/00	572	59
2000/01	1,310	172
2001/02	3,479	712
2002/03	3,048	1,014

3.4 Relationship to habitat protection and recovery strategies.

The program described in this HGMP is consistent with the following habitat and protection strategies:

Yakama Nation Fisheries Program (YNFP):
The Lower Klickitat Riparian and In-Channel Habitat Enhancement Project is a BPA-funded watershed restoration project implemented by the Yakama Nation Fisheries Program (YNFP). The YNFP is working in coordination with WDFW, Natural Resources Conservation Service (NRCS), and the Central Klickitat Conservation District. The project was proposed under the Northwest Power Planning Council's Fish and Wildlife Program and funded by BPA in 1997. Initial project restoration projects were located within the Swale Creek and Little Klickitat River watersheds. Included in the project scope of work are in-stream structural modifications, re-vegetation of the riparian corridor, construction of sediment retention ponds to provide late-season flow to the creek and exclusion fencing to prevent channel degradation from livestock. A monitoring program has been initiated to document project success and guide future restoration activities. The second phase of the project will use EDT modeling output to guide and prioritization restoration activities.

Subbasin Planning and Salmon Recovery:
The current Klickitat program HGMP processes are designed to deal with existing hatchery programs and potential reforms to those programs. A regional sub-basin planning process (Draft Klickitat Sub-Basin Summary May 17, 2002) is a broad-scale initiative that will provide building blocks of recovery plans for listed fish and may well use HGMP alternative ideas on

how to utilize hatchery programs to achieve objectives and harvest goals.

Habitat Treatment and Protection:
WDFW and others are conducting, or have conducted, habitat inventories within the Klickitat subbasin. Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. It creates a model to predict fish population outcomes based on habitat modifications. WDFW is also conducting a Salmon Steelhead Habitat Inventory Assessment Program (SSHIAP), which documents barriers to fish passage. WDFW's habitat program issues hydraulic permits for construction or modifications to streams and wetlands. This provides habitat protection to riparian areas and actual watercourses within the watershed.

Limiting Factors Analysis:
A WRIA 30 (Klickitat Basin) habitat limiting factors report (LFA) has been completed by the Washington State Conservation Commission. This limiting habitat factors analysis was conducted pursuant to RCW 75.46 (Salmon Recovery). The purpose of this analysis was "to identify the limiting factors for salmonids" where limiting factors are defined as "conditions that limit the ability of habitat to fully sustain populations of salmon." It was intended that a locally based habitat project selection committee use the findings of this analysis to prioritize appropriate projects for funding under the state salmon recovery program. This analysis may also be used by local organizations and individuals interested in habitat restoration to identify such projects (Washington State Conservation Commission 2000).

3.5 Ecological interactions.

Below are discussions on both negative and positive impacts relative to the Klickitat River l summer steelhead outplant program and are taken from the Puget Sound listed and non-listed HGMP template (WDFW and NOAA 2003).

(1) Salmonid and non-salmonid fishes or species that could negatively impact the program: Klickitat summer steelhead smolts can be preyed upon release thru the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays in the Columbia mainstem sloughs can predate on steelhead smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that can take a heavy toll on migrating smolts (river otters), and returning adults include: harbor seals, sea lions and Orcas.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program: Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted thru a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult. WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon. See also Section 2.2.3 Predation and Competition.

3) Salmonid and non-salmonid fishes or other species that could positively impact the program. Multiple programs including fall and spring chinook, and coho programs are released from the Klickitat basin and limited natural production of chinook, coho, chum and steelhead occurs in this system along with non-salmonid fishes (sculpins, lampreys and sucker etc.). These species may serve as prey items during the emigration through the basin. While not always desired from a production standpoint, these hatchery fish provide an additional food source to natural predators that might otherwise consume listed fish and may overwhelm established predators providing a beneficial, protective effect to co-occurring wild fish

4) Salmonid and non-salmonid fishes or species that could be positively impacted by the program. Klickitat summer steelhead smolts can be preyed upon through the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays in the Columbia mainstem sloughs can predate on steelhead smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that benefit from migrating smolts and returning adults include: harbor seals, sea lions, river otters, and Orcas.

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.

For water source information at Skamania Hatchery, see Skamania Summer Steelhead HGMP. The Klickitat River is a large stream and fish are planted in April-May during peak run-off flows. Glacial turbidity and suspended sediment occur during the late summer and early fall. USGS flows are represented in the table below.

Mean of daily mean values for this day for 77 years of record[1], in ft^3/s											
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1588	2037	2386	2439	2356	2363	1429	931	770	735	836	1222

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.

Not applicable to this HGMP. For phase of rearing up to the transfer of fish see Skamania Summer Steelhead HGMP.

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

Not applicable to this HGMP. For broodstock collection see Skamania Summer Steelhead HGMP.

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

The Skamania Hatchery has two fish transport trucks. One 1979 Chevrolet 1,500 gallon tanker truck and one 1991 International 2,000 gallon tanker truck. The International has the capacity for hauling and off-loading brood fish. We have plans to develop an overhead crane loading system using a water-to-water container for loading fish for re-cycle to the fishery downstream.

5.3 Broodstock holding and spawning facilities.

Not applicable to this HGMP. For broodstock holding and spawning see Skamania Summer Steelhead HGMP.

5.4 Incubation facilities.

Not applicable to this HGMP. For incubation see Skamania Summer Steelhead HGMP.

5.5 Rearing facilities.

This is a direct plant. Not applicable to this HGMP. For rearing see Skamania Summer Steelhead HGMP.

5.6 Acclimation/release facilities.

This is a direct plant. Not applicable to this HGMP. For acclimation and release see Skamania Summer Steelhead HGMP.

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

Operational and fish health problems at Skamania can lead to significant fish mortality. See Skamania Summer Steelhead HGMP.

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.

This is a direct plant. Not applicable to this HGMP. For acclimation see Skamania Summer Steelhead HGMP.

Section 6. Broodstock Origin and Identity

6.1 Source.

The Klickitat River smolts are Skamania Hatchery Summer Steelhead stock, which was derived from wild fish taken from the Washougal and Klickitat rivers. For decades the Skamania Hatchery Summer Steelhead broodstock has been obtained directly from adults returning to the hatchery. See Skamania Summer Steelhead HGMP.

6.2.1 History.

The first fish captured at the Skamania Hatchery for broodstock occurred in 1956. The first returns of wild fish reared at the hatchery returned in 1959. Lavier (1973) described the Washougal River as originally being a summer steelhead stream. Cowlitz and Skamania Hatchery stocks were introduced into the system in the late 1950s and are assumed to have interbred with the wild stock (Salmon and Steelhead Production Plan Washougal River Subbasin, 1990). Wild summer steelhead in the mainstem Washougal River and tributaries are native and a distinct stock based on the geographical isolation of the spawning population. Similar to other wild summer steelhead stocks in the lower Columbia River area, run timing is generally from May through November and spawn-timing is generally from early March to early June. The Skamania Hatchery has been stocking hatchery steelhead into the river system since the late 1950's. Stock status has changed in recent years. Originally, the status of the stock was determined as "unknown" based on the 1992 SASSI Inventory. Limited spawner surveys and snorkel surveys of summering adults indicated low numbers of adult steelhead but not enough data was available at the time to assess the status of the stock. In a more recent study, the steelhead stock was determined to be "depressed" due to chronically low escapement measures taken between 1952 and 1997. See Skamania Summer Steelhead HGMP.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Washougal River Summer Steelhead	N	1956	U
Klickitat River Summer Steelhead	N	U	U
Skamania Hatchery Summer Steelhead	H	1959	Present

6.2.2 Annual size.

Broodstock needs have been consistent at approximately 600 to 800 adult fish returning to the hatchery. The average hatchery return over the past 9 years has been 1653 fish with the highest year in 1992 (5173 fish) and the lowest year being 1999 with an estimated 600 fish. The sex ratio for Skamania Summer Steelhead is typically 45% males and 55% females. See Skamania Summer Steelhead HGMP.

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

Initial use of natural fish is unknown. Currently, natural fish are not integrated within the broodstock program.

6.2.4 Genetic or ecological differences.

Skamania Summer Steelhead pool with wild summer steelhead from the Lower Columbia River (Phelps et. al. 1994, Leider et al. 1996 and Busby et al. 1997). The difference in spawn timing (3 months earlier for Skamania hatchery fish), poor reproductive success for these fish in the wild (Hulett et al. 1998) and spatial separation at spawning have helped to maintain genetic differences between hatchery and wild fish. Fish are released as age-1+ smolts whereas wild steelhead are predominantly age-2+ smolts. Outmigration timing for both life history types is similar but is slightly earlier for hatchery component (Fuss et. al. 1999).

6.2.5 Reasons for choosing.

For decades the Skamania Hatchery Summer Steelhead broodstock has been obtained directly from adults returning to the hatchery. There has been a long history of adaptation of the stock to Skamania facility contributing to the success of the summer steelhead program. Skamania stock has been the source of nearly all the hatchery summer steelhead smolts that WDFW releases in the Lower Columbia River region.

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.

Listed fish are not used in broodstock selection and can be identified by adipose fin presence and are handled with care and released in stream reaches as prescribed by Region 5 biologists.

Section 7. Broodstock Collection

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

This is a direct plant. Not applicable to this HGMP. For broodstock collection see Skamania Summer Steelhead HGMP.

7.2 Collection or sampling design

This is a direct plant. Not applicable to this HGMP. For broodstock collection see Skamania Summer Steelhead HGMP.

7.3 Identity.

This is a direct plant. Not applicable to this HGMP. For broodstock collection see Skamania Summer Steelhead HGMP.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults):
Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available. Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

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

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

7.6 Fish transportation and holding methods.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

7.7 Describe fish health maintenance and sanitation procedures applied.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

7.8 Disposition of carcasses.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

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.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

Section 8. Mating

8.1 Selection method.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

8.2 Males.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

8.3 Fertilization.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

8.4 Cryopreserved gametes.

Cryopreserved gametes are not used.

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.

Listed fish are not used in the mating scheme.

Section 9. Incubation and Rearing.

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

Data below pertains to past years at the Skamania Program. Klickitat plants are a portion of this.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1995	1870326	87.6	98.6	90	96.6	90	93.6
1996	1928449	93.1	96.0	90	99.0	90	94.0
1997	1034175	92.3	94.5	90	93.5	90	95.8
1998	765494	86.9	97.4	90	95.7	90	96.3
1999	655582	83.7	98.0	90	94.0	90	98.3
2000	673409	90.0	97.0	90	99.0	90	94.9
2001	537117	90.5	98.0	90	98.6	90	84.0

9.1.2 Cause for, and disposition of surplus egg takes.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

9.1.3 Loading densities applied during incubation.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

9.1.4 Incubation conditions.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

9.1.5 Ponding.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

9.1.6 Fish health maintenance and monitoring.

Staff conducts daily inspection, visual monitoring and sampling from eye, fry fingerling and sub-yearling stages. As soon as potential problems are seen, these concerns are immediately communicated to the WDFW fish health specialist. In addition fish health specialists conduct inspections monthly. Potential problems are managed promptly to limit mortality and reduce possible disease transmission. Formalin (37% formaldehyde) is dispensed into water for control of ecto-parasites on juvenile fish and for fungus control on eggs. Egg mortality ranges from 6 to 16 % and all eggs are processed through an automated egg picking machine and to some degree by hand.

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 (1990-2001), or for years dependable data are available.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Egg Survival Perfor-mance Std.	Fry-fingerling Survival (%)	Rearing Survival Perfor-mance Std.	Fingerling-Smolt Survival (%)
1995	1870326	87.6	98.6	90	96.6	90	93.6
1996	1928449	93.1	96.0	90	99.0	90	94.0
1997	1034175	92.3	94.5	90	93.5	90	95.8
1998	765494	86.9	97.4	90	95.7	90	96.3
1999	655582	83.7	98.0	90	94.0	90	98.3
2000	673409	90.0	97.0	90	99.0	90	94.9
2001	537117	90.5	98.0	90	98.6	90	84.0

9.2.2 Density and loading criteria (goals and actual levels).

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

9.2.3 Fish rearing conditions.

Not applicable to this HGMP. See Skamania Summer Steelhead HGMP.

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.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate	Hepatosomatic Index	Body Moisture Content
April	36	1000	nya	0.54	nya	nya
May	46	400	nya	0.60	nya	nya
June	64	175	nya	0.56	nya	nya
July	80	90	nya	0.48	nya	nya
August	101	45	nya	0.50	nya	nya
September	139	17	nya	0.63	nya	nya
October	153	13	nya	0.23	nya	nya
November	167	10	nya	0.23	nya	nya
December	173	9.0	nya	0.10	nya	nya
January	180	8.0	nya	0.11	nya	nya
February	188	7.0	nya	0.12	nya	nya
March	198	6.0	nya	0.14	nya	nya

9.2.5 Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

See section 9.2.4 above.

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*). (At Skamania only).

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
March-July	BioDiet	8	3.0-4.0	0.1	1.2
August-September	Moore Clark Nutra	6	2.0-2.5	nya	0.80
October-December	Moore Clark Nutra	Demand	1.0-1.5	nya	1.0
January-April	Moore Clark Nutra	Demand	0.5-1.0	0.06	1.1

9.2.7 Fish health monitoring, disease treatment, and sanitation procedures.

Monitoring	A fish health specialist inspects fish monthly at Skamania and Vancouver hatcheries and checks both healthy and if present symptomatic fish. Based on pathological or visual signs by the crew, age of fish and the history of the facility, the pathologist determines the appropriate tests. External signs such as lesions, discolorations, and fungal growths will lead to internal examinations of skin, gills and organs. Kidney and spleen are checked for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other pathogens. Additional tests for virus or parasites are done if warranted.
Disease Treatment	Bacterial cold water disease (Flavobacteriosis) can occur mid-summer with Florfenicol used. IHN can occur from mid-summer to fall. Loss o fish to IHN in 2002 was 6% of the summer steelhead population. As needed, appropriate therapeutic treatment will be prescribed to control and prevent further outbreaks. Mortality is collected and disposed of at a landfill. Fish health and or treatment reports are kept on file.
Sanitation	All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy). All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks are disinfected between the hauling of adult and juvenile fish. Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

9.2.8 Smolt development indices (e.g. gill ATPase activity), if applicable.

Besides time, size and past history, aggressive screen and intake crowding, swarming against sloped pond sides, a silvery physical appearance and loose scales during feeding events are signs of smolt development. From past history, hatchery specialists will reduce feed regimes in early spring as fish show signs of smolting. Also at this time feed conversions fall and fish appear leaner with condition factors falling well below 1.0 (K) to .90 (K).

9.2.9 Indicate the use of "natural" rearing methods as applied in the program.

None.

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.

Listed fish are not under propagation.

Section 10. Release

10.1 Proposed fish release levels.

Proposed release levels are 100,000 smolts. This has been a consistent number as the average plant for the last 22 years is 102,149 (WDFW Historical Database).

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

Plants are spread out and made at RKm 16.1, 29.0, 40.3, and 45.1 on the Klickitat River.

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

	Yearling Release		
Release Year	No.	Date (MM/DD)	Avg/Size (fpp)
1991	58655	April-May	5.3
1992	66180	April-May	6.5
1993	71586	April-May	6.1
1994	80674	April-May	6.0
1995	15938	April-May	5.7
1996	76926	April-May	5.9
1997	44530	April-May	5.9
1998	124866	April-May	5.7
1999	123709	April-May	5.5
2000	118454	April-May	5.5
2001	101844	April-May	5.4
2002	99941	April-May	5.1
2003	103800	May 1 – May 8	4.7
2004	77480	April 28 – April 30	5.2

10.4 Actual dates of release and description of release protocols.

Fish are pumped to waiting trucks and are transported to Klickitat River releases sites. Hauling can take multiple days. In 2003, five different haul days were made from May 1st to May 8 to complete the plantings. In 2004, 4 hauls were made from April 28 – April 30.

10.5 Fish transportation procedures, if applicable.

A 1900 gallon tanker truck is equipped with oxygen supply is used with 5000 ppm salt. Transit time one way can take 90 minutes.

10.6 Acclimation procedures (*methods applied and length of time*).

This is a direct plant without acclimation. Water temperatures between the tanker truck water and the receiving water is monitored.

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

Program is mass marked (adipose fin-clipped).

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

As additional eggs need to be taken at Skamania for potential IHN culling, on year without problems, overages can occur. The current level of plant is a maximum amount (plus/minus 5%) for this program. Excess fish could be taken to a lake for additional harvest.

10.9 Fish health certification procedures applied pre-release.

Prior to plants or releases, the population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen free water and little or no history of disease. Prior to this examine, whenever abnormal behavior or mortality is observed, staff also conducts the Area Fish Health Specialist. The fish specialist examines affected fish, and recommends the appropriate treatment. Reporting and control of selected fish pathogens are done in accordance with the Co-managers Fish Disease Control Policy and IHOT guidelines.

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

Not applicable to this HGMP.

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.

- Steelhead Rearing Guidelines target release sizes and condition factors that result in actively migrating smolts that vacate the system and limit freshwater interactions with listed species (WDFW - July 31, 2001).
- Broodstock collection at Skamania separates timing of earlier hatchery fish from later wild spawners to minimize overlap of spawning potential.
- A later release date is currently being implemented (as close to May 1st or on) to allow listed fish to grow to a size (early May) that will help reduce predation opportunities, and be in advance of winter and summer steelhead fry emergence in Columbia River tributaries.
- Release is from a location downstream of much of the habitat of listed Chinook and steelhead.
- All program fish are mass marked for easy identification. Returning hatchery fish are under heavy selective harvest and are identified by adipose fin-clip.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to assess, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.
- This date also is in advance of most of winter steelhead fry emergence and in advance of the peak emergence of summer steelhead fry in Columbia River tributaries.

Section 11. Monitoring and Evaluation of Performance Indicators

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

Continue to calculate annual fisheries contribution rates based on coded-wire-tag recoveries in regional commercial and sport fisheries. Continue use of mass marked (ad clip) and coded-wire-tagged groups as effective management and research tools. Ongoing research by the Kalama Research Station may provide applicable methods for management of this steelhead program. Also see HGMP Section 1.10. Also see future monitoring proposed in the Klickitat Subbasin Anadromous Fishery Master Plan (April 2004).

11.1.2 Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

With the loss of Mitchell Act funding, staffing and logistical support may be lost to continue the monitoring and evaluation of this and other programs on the Columbia River. Current Fish program staff is available to complete monitoring and evaluation baseline Lower Columbia system needs while research is on-going for coho interaction in the Lewis River.

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.

Monitoring, evaluation and research follow scientific protocols with adaptive management process, if needed. WDFW will take risk aversion measures to eliminate or reduce ecological effects, injury, or mortality as a result of monitoring activities. Most trap mortalities are the result of equipment failure or extreme environmental conditions that flood traps. WDFW will take precautions to make sure the equipment is properly functioning during the season. If environmental conditions are forecast that will cause high mortality, then traps will be removed or opened up to allow unobstructed passage without mortality. Any take associated with monitoring activities is unknown but all follow scientific protocols designed to minimize impact.

Section 12. Research

12.1 Objective or purpose.

No research is directly associated with the program.

12.2 Cooperating and funding agencies.

12.3 Principle investigator or project supervisor and staff.

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

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

12.6 Dates or time periods in which research activity occurs.

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

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

12.9 Level of take of listed fish: number of range or fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached “take table” (Table 1).

12.10 Alternative methods to achieve project objects.

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

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.

Section 13. Attachments and Citations

13.1 Attachments and Citations

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Section 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

14.1 Certification Language and Signature of Responsible Party

“I hereby certify that the information provided 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:_____________