HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Upper Columbia River Spring-run Chinook Salmon White River Supplementation Program
Species or Hatchery Stock:	Spring Chinook Salmon *Oncorhvnchus tshawvscha*
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Wenatchee Watershed Upper Columbia Region
Date Submitted:	
Date Last Updated:	September, 2005

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Upper Columbia River Spring-run Chinook Salmon White River Supplementation Program – WDFW and PUD #2 of Grant County

1.2) Species and population (or stock) under propagation, and ESA status.
State common and scientific names.

White River (Wenatchee River Basin, Washington) spring Chinook salmon
Oncorhynchus tshawytscha, endangered

1.3) Responsible organization and individuals
Indicate lead contact and on-site operations staff lead.

Agency or Tribe: Public Utility District #2 of Grant County
Name (and title): Chris Carlson – Senior Biologist
Address: P.O. Box 878, Ephrata, WA. 98823
Telephone: (509) 754-5293
Fax: (509) 754-5012
Email: ccarlso@gcpud.org

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

Agency or Tribe: Washington Department of Fish and Wildlife
Name (and title): Andrew Murdoch – Fish and Wildlife Biologist 4
Address: 3515 Chelan Hwy., Wenatchee, WA. 98801
Telephone: (509) 664-3148
Fax: (509) 662-6606
Email: murdoarm@dfw.wa.gov

AquaSeed Inc.: Greg Hudson - 10420 173rd Ave. SW., Rochester, Thurston Co., WA. 98579-9644. Contact number: (360) 273-9491
Captive broodstock rearing and spawning operations; contractor to PUD #2 of Grant Co.

Yakama Indian Nation: Tom Scribner - Co-manager and Priest Rapids Coordinating Committee member

Federated Tribes of the Colville Indian Reservation: Jerry Marco - Co-manager and Priest Rapids Coordinating Committee member

Confederated Tribes and Bands of the Umatilla Indian Reservation: Co-manager and Priest Rapids Coordinating Committee member

U.S. Fish and Wildlife Service: David Carie – Administration of the Endangered Species Act and member of the Priest Rapids Coordinating Committee.

National Marine Fisheries Service: Kristine Petersen - Administration of the Endangered Species Act and member of the Priest Rapids Coordinating Committee

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

Funding: PUD #2 of Grant County
AquaSeed Staffing level: Fish Culturists (3), Fish Hatchery Manager (1),
Operational costs – AquaSeed Inc.: $1,070,000 annually (2004 operating year).
Monitoring and Evaluation/Coordination/Planning – WDFW: Current = $191,000; proposed (August 2004) = $456,000.
Program Development and Administration – PUD #2 of Grant County: $85,000 (2004 operating year).

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

Include name of stream, river kilometer location, basin name, and state. Also include watershed code (e.g. WRIA number), regional mark processing center code, or other sufficient information for GIS entry. See "Instruction E" for guidance in responding.

<u>Juvenile-based Captive Brood:</u>

Broodstock Rearing Facilities
AquaSeed Corporation Facilities: 10420 173rd Ave. SW., Rochester, Thurston Co., WA. 98579-9644. Water source is ground water supplied by six wells drawing water from the Puget Sound Aquifer System.
Receiving water: 001 and 002 Black River
Water Body ID No: WA-23-1015
Lat 46 degrees 50'
Long 123 degrees 06'

Additional locations are being investigated for development.

Juvenile Rearing Facilities
Facilities for the juvenile rearing phase of the captive broodstock program have not been constructed at this time. PUD #2 of Grant Co. (the District) has provided temporary acclimation facilities at Tall Timbers Ranch on the White R. (WRIA #45) during 2004 and 2005. Construction sites for permanent facilities are currently being investigated, including the Tall Timbers site.

<u>Adult-based Supplementation:</u>

Facilities for the adult-based supplementation program will be designed and constructed consistent with the Biological Opinion (May 2005). It is expected that central hatchery facilities and acclimation/release facilities will be located on the White R. The District is currently investigating several candidate sites on the White R..

1.6) Type of program.

Define as either: Integrated Recovery; Integrated Harvest; Isolated Recovery; or Isolated Harvest (see Attachment 1 - Definitions" section for guidance).

Integrated Recovery Program

1.7) Purpose (Goal) of program.

Define as either: Augmentation, Mitigation, Restoration, Preservation/Conservation, or Research (for Columbia Basin programs, use NPPC document 99-15 for guidance in providing these definitions of "Purpose"). Provide a one sentence statement of the goal of the program, consistent with the term selected and the response to Section 1.6. Example: "The goal of this program is the restoration of spring chinook salmon in the White River using the indigenous stock".

Conservation/Preservation: The goal of this program is to prevent the extinction of, conserve, and ultimately restore the naturally spawning White River spring Chinook salmon spawning aggregation (Wenatchee R, system).

Mitigation: The conservation/preservation program has been incorporated into the mitigation responsibilities of Public Utility District No. 2 of Grant County through their Biological Opinion (dated May 3, 2004). Following the successful restoration to self-sustaining natural production of White River stock (eight to twelve years estimated), Grant Co. will continue mitigation production of this stock at a level consistent with continuing impacts associated with operation of their Priest Rapids hydro complex.

1.8) Justification for the program.

Indicate how the hatchery program will enhance or benefit the survival of the listed natural population (integrated or isolated recovery programs), or how the program will be operated to provide fish for harvest while minimizing adverse effects on listed fish (integrated or isolated harvest programs).

The White River spring Chinook spawning aggregation is severely depressed and persistently experiences escapement levels below critical population thresholds. The White River spawning aggregation is within the Upper Columbia River Spring-run Chinook Salmon ESU which is listed as Endangered (FR Vol. 64, No. 56, March 24, 1999). This ESU includes all naturally spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. The White R. aggregation is the most genetically unique among those spawning in tributaries within the ESU (Utter et al. 1995). Hatchery propagation of the White River, Nason Creek, Chiwawa River, Twisp River, Methow River, and Chewuch River stocks is included in the ESU.

The proposed recovery program will incorporate captive brood technology to rear progeny of native spring Chinook spawners from the White River. Eggs or fry from naturally spawning spring Chinook will be collected from redds and reared in captivity. The subsequent adults will be spawned and the resulting progeny will be released from acclimation ponds into the native stream at the smolt stage after approximately 18 months of rearing. The survival efficiency gained between the egg/fry life history stage and the adult stage while reared in captivity is expected to increase the quantity of spawners produced when compared to that realized in natural production (i.e. about 30% vs about 0.3%, respectively). When eggs are collected from captive brood adults, the F_2 progeny are expected to enjoy additional survival advantage during the juvenile life history phase (about 65%) before being released as smolts for natural migration to the ocean and return. The amplification gained through survival efficiencies while in the hatchery environment will result in a greater quantity of spring Chinook salmon returning to the White River for natural spawning. The projected duration of the captive broodstock rearing phase is expected to extend from 2002 through 2016. Broodstock will be collected from 2002 through 2009. Rearing and spawning will continue through 2014 and the final release of smolts will occur in 2016. The proposed activity is expected to reduce risk of extinction, increase survival, maintain genetic distinction, and improve the overall numerical abundance of the White River spawning aggregation.

The program will ultimately transition from a captive brood-based program to an adult-based supplementation program as the naturally spawning target population becomes more robust and the risk of extinction is lessened or the program is determined to fail to meet performance standards as determined by the Priest Rapids Coordination Committee (BiOp requirement). The schedule for transition into adult-based supplementation is predicted to be up to twelve years but may differ depending on the success of the captive broodstock program, the rate of recovery, and the availability of adult-based supplementation facilities.

1.9) List of program "Performance Standards".

"Performance Standards" are designed to achieve the program goal/purpose, and are generally measurable, realistic, and time specific. The NPPC "Artificial Production Review" document attached with the instructions for completing the HGMP presents a list of draft "Performance Standards" as examples of standards that could be applied for a hatchery program. If an ESU-wide hatchery plan including your hatchery program is available, use the performance standard list already compiled.

See Section 1.10

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

"Performance Indicators" determine the degree that program standards have been achieved, and indicate the specific parameters to be monitored and evaluated. Adequate monitoring and evaluation must exist to detect and evaluate the success of the hatchery program and any risks to or impairment of recovery of affected, listed fish populations.

The NPPC "Artificial Production Review" document referenced above presents a list of draft "Performance Indicators" that, when linked with the appropriate performance standard, stand as examples of indicators that could be applied for the hatchery program. If an ESU-wide hatchery plan is available, use the performance indicator list already compiled. Essential 'Performance Indicators" that should be included are monitoring and evaluation of overall fishery contribution and survival rates, stray rates, and divergence of hatchery fish morphological and behavioral characteristics from natural populations.

The list of "Performance Indicators" should be separated into two categories: "benefits" that the hatchery program will provide to the listed species, or in meeting harvest objectives while protecting listed species; and "risks" to listed fish that may be posed by the hatchery program, including indicators that respond to uncertainties regarding program effects associated with a lack of data.

1.10.1) "Performance Indicators" addressing benefits. (e.g. "*Evaluate smolt-to-adult return rates for program fish to harvest, hatchery broodstock, and natural spawning.*").

Benefits **Performance Standards**	**Performance Indicators**	**Monitoring and Evaluation**
1. Prevent extinction of the White River spawning aggregation using captive broodstock technology to rapidly increase numerical abundance and improve population viability within the ESU. (See Attachment X)	Produce a maximum adult contribution up to approximately 450 adult spring Chinook based on a release of 150,000 smolts and smolt-to-adult survival rate of 0.3%.	Evaluate smolt-to-adult survival rates through recovery and analysis of coded-wire or PIT tagging data, enumeration at adult collection or passage facilities, and spawning ground surveys under M & E objectives #7 and #9.
2. Conserve and enhance spatial diversity within the ESU by culturing known White R.-origin broodstock.	Implement broodstock collection strategies that assure brood populations are representative of the White R. spawning aggregation and are large enough to maintain genetic variation while addressing Ryman-Laikre effects. a. for captive broodstock, collect 100 or fewer eggs/fry from up to 50 redds to provide a	a. For captive broodstock, annually collect eggs and/or fry from redds from known White R. adults. Observe active spawners to eliminate hatchery-origin strays from collection. Triangulate redd locations and monitor temperature to determine accumulation of approximately 450 temperature units. Collect eggs or fry by redd pumping and transfer eggs

	maximum of 1700 eggs/fry. b. for adult –based supplementation, collect approximately 135adults proportional to run timing and strength and in appropriate proportions to manage Ryman-Laikre effects.	to receiving facility Monitor and record number collected, mortality, temperature units, dates, and family number. b. For future adult-based supplementation, produce annual brood collection protocol for approval by PRCC.
3. Conserve the genetic characteristics and integrity of the White River spawning aggregation.	Phenotypic traits of the progeny of hatchery fish when spawning in the wild, including age composition, body size, sex ratio, juvenile migration timing, adult run timing, and spawn timing are similar to wild fish.	Wild- and hatchery-origin adult fish are biosampled in order to collect length, age, sex, DNA, and tagging information. Juvenile fish are sampled at smolt traps to determine migration strength, timing, and composition.
4. Achieve mitigative artificial propagation levels as stipulated in the Biological Opinion for the Priest Rapids Complex	Release up to 150,000 White R. spring Chinook smolts from acclimation-release site(s) located on the White R. Initial releases will be from captive broodstock production. Program will transition into an adult-based supplementation program following rebuilding of White R. spawning aggregation.	PRCC receives an annual report from Grant Co. and the operating agencies detailing production in relation to requirements of the Biological Opinion for the Priest Rapids Complex.
5. Conduct White R. captive brood rearing and rearing of their F_2 progeny in accordance with stipulated propagation criteria.	Maintain the fish culture environment within the following biological criteria <u>a. Captive broodstock</u> Temperature ≤ 55^{o}F; reduce to ≤ 52^{o}F within two weeks of spawning. O_2 > 7ppm at outfall, > 90% saturation at intake. Nitrogen < 103% saturation. Density Index	Follow Monitoring and Evaluation Objective #6 requiring routine monitoring of all specified biological criteria; record observations as prescribed by fish health specialist and monitoring plan.

	$0.1lbs/ft^3$/inch of length, not to exceed $0.5lb/ft^3$ at 10g. Loading Index 1.8lbs/gmp/inch of length <u>b. F_2 progeny</u> Temperature ≤ 55^oF. O_2 > 7ppm at outfall, > 90 saturation at intake. Nitrogen < 103% saturation. Density Index $0.06Lb/ft^3$/inch of length for lots with BKD optical density (od) ≥ 0.12; 0.125 Lb/ft^3/inch of length for lots with BKD od < 0.12 Loading Index Minimum loading indices to control BKD are 06lb/gpm/inch of length for lots with BKD od ≥ 0.12; 0.75lb/gpm/inch of length for lots with BKD od < 0.12. Design flow is 1.5 water exchanges per hour.	
6. Conduct White R. adult-based supplementation rearing in accordance with stipulated propagation criteria.	Maintain the fish culture environment within the following biological criteria <u>a. Adult holding</u> Temperature ≤ 55^oF; reduce to ≤ 52^oF within two weeks of spawning. O_2 > 7ppm at outfall, > 90% saturation at intake. Nitrogen < 103% saturation. Density; $10ft^3$ per adult. Loading; 2gpm/adult, increase 5% per each degree F above 50^0F. <u>b. Juvenile Rearing</u> Temperature ≤ 55^oF.	Follow Monitoring and Evaluation Objective and #8 requiring routine monitoring of all specified biological criteria; record observations as prescribed by fish health specialist and monitoring plan.

	O_2 > 7ppm at outfall, > 90 saturation at intake. Nitrogen < 103% saturation. Density Index 0.06Lb/ft^3/inch of length for lots with BKD od ≥ 0.12; 0.125 Lb/ft^3/inch of length for lots with BKD od < 0.12 Loading Index Minimum flow indices to control BKD are06lb/gpm/inch of length for lots with BKD od ≥ 0.12; 0.75lb/gpm/inch of length for lots with BKD od < 0.12. Design flow is 1.5 water exchanges per hour.	
7. Achieve life stage survival targets for captive broodstock and F_2 progeny.	Achieve life stage survival rates as follows: Captive fry-to-adult = 30% F_2 egg-to-smolt = 65% F_2 smolt-to-adult = 0.3%	Monitoring and evaluation objective #7 provides data collection and analysis to assess performance criteria.
8. Achieve life stage survival targets for adult-based supplementation	Achieve life stage survival rates as follows: Adult holding = 90% Fertilization to ponding = 90% Rearing to yearling = 85% Transfer to release = 90%	Monitoring and evaluation Objective #9 provides data collection and analysis to assess performance criteria.
9. Maximize survival at all life stages throughout captive broodstock rearing and adult-based supplementation using disease control and prevention.	Fish health to be managed in a manner consistent with WDFW Fish Health Manual (1996), Co-Managers Salmonid Fish Disease Control Policy (1997), Pacific Northwest Fish Health Protection Committee (1989).	Fish health specialist will visit rearing sites every two weeks to assess fish health and detect potential fish health problems. As necessary the fish health specialist will recommend remedial or preventative measures to treat or prevent disease with administration of

		therapeutic or prophylactic treatments as deemed necessary.
10. Release healthy and functional smolts from the captive broodstock program and, at some future point, from the adult-based supplementation program.	Release up to 150,000 smolts at approximately 30g (15 fish/Lb)	A fish health specialist will perform a quality assessment within two weeks prior to smolt release including OSI or other physiological assessments as deemed valuable. Epizootics may trigger review and recommendations from the JFP. Biological sampling will be performed by Monitoring and Evaluation staff including length, weight, and condition factor. Tag retention will be evaluated as appropriate.
11. Design and implement projects to improve the quality of fish production at all project artificial production facilities.	Projects are identified, reviewed, and implemented that will increase survival of program fish while minimizing negative genetic or ecological impacts.	A robust monitoring program is incorporated into project operations (see attached).

1.10.2) "Performance Indicators" addressing risks.
(*e.g. "Evaluate predation effects on listed fish resulting from hatchery fish releases."*).

<u>**Risks**</u> **Performance Standards**	**Performance Indicators**	**Monitoring and Evaluation**
1. Artificial propagation activities comply with ESA responsibilities.	Project conducts Section 10 consultation and completes an HGMP. Complies with Section 10 permit when issued including all RPAs.	Required data are generated through the M & E plan and provided to NOAA Fisheries as required.
2. Artificial propagation activities comply	All facilities will meet National Pollution Discharge Elimination	Environmental monitoring of total suspended solids, settleable solids, in-hatchery water

<u>Risks</u> **Performance Standards**	**Performance Indicators**	**Monitoring and Evaluation**
with water quality standards.	System (NPDES) requirements. AquaSeed current NPDES permit #WA0040819. Adult-based supplementation facilities will be established as future sites are developed.	temperatures, in-hatchery dissolved oxygen, nitrogen, ammonia, and pH will be conducted and reported as per permit conditions.
3. Water intake systems minimize impacts to listed wild salmonids and their habitats.	Water withdrawal – permits will be obtained to establish water rights for each hatchery facility. Current groundwater permits in hand for captive broodstock operation at AquaSeed <u>Intake screens</u> – designed and operated to assure approach velocities and operating conditions provide protection to wild salmonid species.	Intake system designed to deliver permitted flows. Operators monitor and report as required Hatcheries participating in the programs will maintain all screens associated with water intakes in surface water areas to prevent impingement, injury, or mortality to listed salmonids.
4. The risk of catastrophic fish loss due to hatchery facility or operation failure is minimized.	<u>Staffing</u> allows for rapid response for protection of fish from risk sources (water loss, power loss, etc.). <u>Backup generators</u> to provide an alternative source of power to supply water during power outages. <u>Protocols</u> in place to test standby generator and all alarm systems on a routine basis. <u>Multiple</u> rearing sites or footprints for captive broodstock rearing. <u>Alarm</u> systems installed and operating at each rearing	<u>Hatchery engineering design and construction</u> accommodate security measures. <u>Operational funding</u> accommodates security measures. <u>Training</u> in proper fish handling, rearing, and biological sampling for all staff. Staff are trained to respond to alarms and operate all emergency equipment on station. <u>Maintenance</u> is conducted as per manufacturer's requirements and according to hatchery maintenance schedules.

<u>Risks</u> Performance Standards	Performance Indicators	Monitoring and Evaluation
	vessel to detect loss of or reduced flow and reduced operating head in rearing vessels. <u>Densities</u> at minimum to reduce risk of loss to disease. <u>Sanitation</u> – all equipment is disinfected between uses on different lots of fish including nets, crowders, boots, raingear, etc.	
5. Minimize disease risk to wild fish.	All activities are conducted in accordance with the WDFW Fish Health Manual (WDFW 1996), The Co-Managers Salmonid Fish Disease Control Policy (1997), and the Pacific Northwest Fish Health Protection Committee (PNFHPC 1989).	Fish health specialist will visit rearing sites every two weeks to assess fish health and detect potential fish health problems. As necessary the fish health specialist will recommend remedial or preventative measures to treat or prevent disease with administration of therapeutic or prophylactic treatments as deemed necessary. All spring chinook will be handled, transported, and propagated in accordance with prevailing fish health disease prevention and control standards to minimize the risk of disease transfer to wild fish.
6. Negative genetic impacts associated with the artificial propagation program are minimized.	Genetic risk management approaches are in place to limit the potential for genetic impacts in four categories: *Loss of within-population genetic variation* a. captive brood 1. A representative sample of up to 100 eggs/fry will be collected from between	The Monitoring and Evaluation Plan (Objectives #1, 2, and 4) provide for assessment of the project genetic risk containment measures

Risks **Performance Standards**	**Performance Indicators**	**Monitoring and Evaluation**
	25 and 50 redds resulting in a total egg/fry collection of approximately 1700. 2. Family size will be equalized as much as possible to maintain the highest N_e possible. 3. Mating protocols will avoid full-sib or closely related matings and between-year-class matings will be prioritized over within-year-classes. 4. Factorial matings of 2X2 or greater will capture a high percentage of available genetic variation. b. adult-based supplementation 1. Brood collection will be systematic and designed to be representative with respect to run timing, run strength, and demographic traits. 2. Production will be scaled to avoid swamping of the natural spawning population with a high proportion of hatchery-origin escapement. 3. Survival within the hatchery will be maximized. *Loss of between-population genetic variation* a. captive brood 1. Eggs/fry will not be collected from redds for which parentage is unknown or for which non-local hatchery parents are involved (e.g. Chiwawa R.	

Risks Performance Standards	Performance Indicators	Monitoring and Evaluation
	origin fish). 2. Juvenile smolts will be imprinted on surface water from the natal stream to reduce or eliminate straying to other tributaries. b. adult-based supplementation 1. Only adults of known White R. origin will be collected at an adult weir in the White R. Marks will be used to determine stream of origin and prevent straying from other tributaries into the White R. 2. Juvenile smolts will be imprinted on surface water from the natal stream to reduce or eliminate straying to other tributaries. 3. All juveniles will carry a mark that can be interrogated at the adult stage without sacrificing the animal. *Domestication selection* a. captive brood 1. Captive broodstock approach will be limited to approximately two life cycles to reduce potential consequences of raising fish in an intense culture environment. 2. Natural production will continue to occur in the White R. with egg/fry collection representing only a small numerical portion of total egg deposition. 3. All fish rearing will occur at minimum pond	

<u>Risks</u> **Performance Standards**	**Performance Indicators**	**Monitoring and Evaluation**
	rearing densities to minimize the effects of domestication. b. adult-based supplementation 1. Upstream escapement of approximately 80 adults per year will be maintained as a minimum level for natural spawning. 2. Brood collection protocols will assure random collection without respect to hatchery or wild origin. 3. All fish rearing will occur at minimum pond rearing densities to minimize the effects of domestication.	
7. Minimum performance standards are met for at least half of the brood years under captive broodstock propagation.	At minimum, achieve life stage survival rates as follows: Captive fry-to-adult = 15%. F_2 egg-to-smolt = 40%. F_2 smolt-to-adult = .15%	Monitoring and evaluation objectives #7 and #9 provide data collection and analysis to assess performance criteria. PRCC to review annually and provide recommendations.
8. Broodstock collection and juvenile hatchery releases minimize ecological effects on listed wild fish.	<u>a. captive brood</u> 1. Hatchery spring chinook reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in streams after release (Coefficient of Variation (CV) for length ≤ 10%, condition factor 0.9 – 1.0). 2. Smolts acclimated and imprinted on surface water from the natal steam to enhance smoltification and reduce residence time in the	Fish culture and evaluation staff monitor behavior, coefficient of variation in length, and condition. Fish health specialists will certify all hatchery fish before release. Up to three downstream juvenile smolt traps will be used to monitor the outmigration of hatchery and wild fish. Outmigration may also be monitored through PIT tag detection systems at mainstem

Risks **Performance Standards**	**Performance Indicators**	**Monitoring and Evaluation**
	tributaries and mainstem migration corridors. b. adult-based supplementation 1. All spring Chinook encountered in hatchery broodstock collection operations will be held for a minimal duration in the traps; generally less than 24 hrs. 2. Spring Chinook trapped in excess of broodstock collection goals will be released upstream or returned to natal streams immediately. 3. Hatchery spring Chinook reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in streams after release (CV length ≤ 10%, condition factor 0.9 – 1.0). 4. Smolts acclimated and imprinted on surface water from the natal steam to enhance smoltification and reduce residence time in the tributaries and mainstem migration corridors.	passage facilities. Broodstock collection protocols will developed each season and reviewed by the PRCC.

1.10.3) Special decision criteria for captive broodstock program.

The captive broodstock approach is broadly recognized as an extreme measure and is generally employed only when populations are dangerously close to extinction and when inaction may lead to continued population decline (Flagg and Mahnken 1995, Hard et al 1992, NMFS 1999a, NMFS 1999b). Intensive fish culture programs of this type are monetarily costly, largely untested, and may pose some poorly understood risks to the resource. Consequently, it is important that mechanisms be in place to assess performance of the project relative to expectations and to guide decisions concerning the future direction of the program. In particular, there is interest in a method by which the duration and appropriate end point for the captive broodstock phase of the White River spring Chinook recovery program can be recognized. The following decision framework provides a tool by which the efficacy of the captive broodstock program can be assessed by the Priest Rapids Coordinating Committee and NOAA Fisheries.

The decision packet consists of a binomial key leading to possible conclusions concerning the continuation or discontinuation of the captive broodstock phase of the recovery program. The captive broodstock program is presumed to be underway and exercise of the key is dependent on the following assumptions.

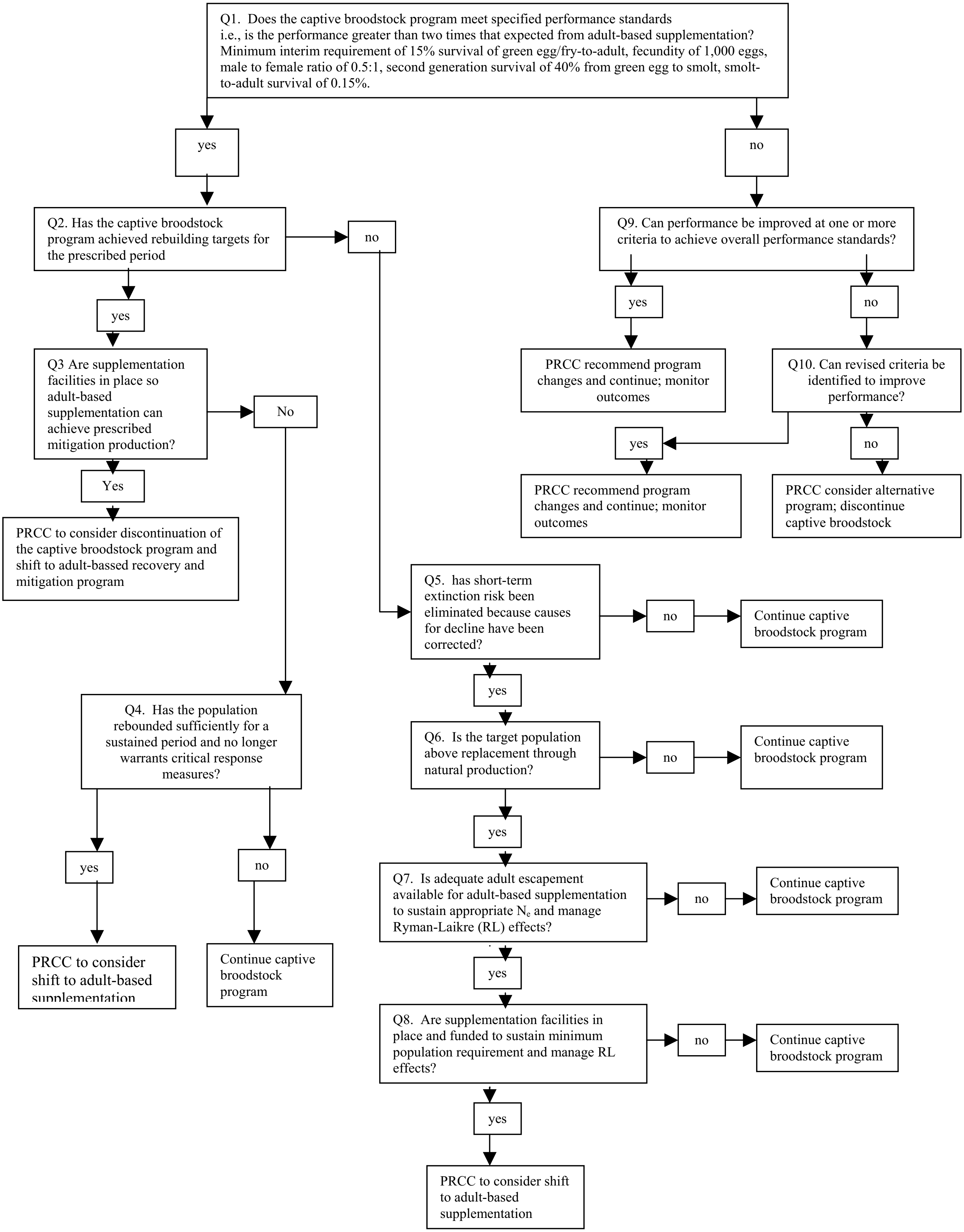
Assumptions:

a. Biological fish culture criteria have been developed, documented and implemented

b. Performance criteria have been developed and documented

c. Facility design criteria have been developed, documented, and implemented.

d. A robust monitoring and evaluation plan has been initiated and funded at levels agreed to be adequate to assess appropriate response variables.


Q1. Does the captive broodstock program meet specified performance standards i.e., is the performance greater than two times that expected from adult-based supplementation? Minimum interim requirement of 15% survival of green egg/fry-to-adult, fecundity of 1,000 eggs, male to female ratio of 0.5:1, second generation survival of 40% from green egg to smolt, smolt-to-adult survival of 0.15%.
yes
no
Q2. Has the captive broodstock program achieved rebuilding targets for the prescribed period
no
yes
Q3 Are supplementation facilities in place so adult-based supplementation can achieve prescribed mitigation production?
No
Yes
PRCC to consider discontinuation of the captive broodstock program and shift to adult-bassed recovery and mitigation program
Q4. Has the population rebounded sufficiently for a sustained period and no longer warrants critical response measures?
yes
no
PRCC to consider shift to adult-based supplementation
Continue captive broodstock program
Q9. Can performance be improved at one or more criteria to achieve overall performance standards?
yes
no
PRCC recommend program changes and continue; monitor outcomes
Q10. Can revised criteria be identified to improve performance?
yes
no
PRCC recommend program changes and continue; monitor outcomes
PRCC consider alternative program; discontinue captive broodstock
Q5. has short-term extinction risk been eliminated because causes for decline have been corrected?
no
Continue captive broodstock program
yes
Q6. Is the target population above replacement through natural production?
no
Continue captive broodstock program
yes
Q7. Is adequate adult escapement available for adult-based supplementation to sustain appropriate N_e and manage Ryman-Laikre (RL) effects?
no
Continue captive broodstock program
yes
Q8. Are supplementation facilities in place and funded to sustain minimum population requirement and manage RL effects?
no
Continue captive broodstock program
yes
PRCC to consider shift to adult-based supplementation

1.11) Expected size of program.

In responding to the two elements below, take into account the potential for increased fish production that may result from increased fish survival rates effected by improvements in hatchery rearing methods, or in the productivity of fish habitat.

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

Captive Brood Phase: No adults will be collected. Up to 1,700 eggs/fry will be collected from the White River spawning aggregation for captive brood rearing (updated from 1000 as described in BAMP 1998). The number of eggs/fry collected for the White R. rebuilding program might be reduced depending on the overall distribution of artificial propagation among Wenatchee River tributaries as agreed by the Joint Fishery Parties (JFP) in May, 2005 (reference to be added if available).

Adult-based Supplementation Phase: Approximately 100 to 200 adults will be collected when the project has transitioned into adult-based supplementation. The range represents a redistribution of artificial propagation emphasis among the Wenatchee R. tributaries with a reduction of from up to 240,000 annual White River fish release to 150,000 annual release concurrent with artificial propagation and release of 250,000 Nason Cr.-origin smolts into Nason Cr. as agreed by the JFP in May, 2005 (reference to be added if available).

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location. (*Use standardized life stage definitions by species presented in* Attachment 2).

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling	White River, Wenatchee R. Basin	90,000 (years 2007 – 09)
Yearling	White River, Wenatchee R. Basin	150,000

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

Provide estimated smolt-to-adult survival rate, total adult production number, and escapement number (to the hatchery and natural areas) data available for the most recent twelve years (roughly three fish generations), or for the number of years of available and dependable information. Indicate program goals for these parameters.

Juvenile-based Captive Brood:

The survival rate for White R. captive broodstock held from eyed egg to mature spawner has ranged from 4% to 31.7% and averaged 20.2% for three brood years for which complete data are available. An average survival rate of 34%was attained for three stocks held for captive brood (Murdoch and Hopley 2005). The survival goal for eyed egg-to-mature adult is 30% for captive broodstock.

A small number of second generation (F_2) smolts were released in 2004 and 2005 from 2002 and 2003 captive broodstock spawning activities. Adults have not returned from these releases but the expected smolt-to-adult survival rate is 0.3%.

Adult-based Supplementation:

The program has not transitioned to adult-based supplementation.

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

First eggs/fry collected for captive brood program in 2002.

1.14) Expected duration of program.

Juvenile-based Captive Brood:

Eyed egg collections through 2009; smolt releases through 2016.

Adult-based Supplementation:

Indefinitely pending duration of PUD #2 of Grant County mitigation responsibility.

1.15) Watersheds targeted by program.
Include WRIA or similar stream identification number for desired watershed of return.

White River (Wenatchee River system, Washington) – WRIA #45

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

The co-managers (NMFS, WDFW, USFWS, Yakama Indian Nation, Colville Confederated Tribes, Confederated Umatilla Tribes, and Chelan, Douglas, and Grant Public Utility Districts) concluded in the "Biological Assessment and Management Plan:

Mid-Columbia River Hatchery Program" (BAMP 1998) that many populations are at high risk for extinction, and artificial propagation is essential for recovery. For the White River population, other alternatives were not adequate to meet the immediate risk of extinction. One of several significant mortality factors facing this stock is passage mortality experienced while passing through mainstem hydropower facilities during their downstream smolt migration. Passage improvements to hydropower facilities have been underway for decades. However, even when passage protection is maximized there will still be a level of mortality that is expected to require continued artificial propagation.

SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS. (USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

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

A Section 10 direct take permit (1196) was issued for Upper-Columbia River Spring-run Chinook supplementation recovery operations in August, 2002. The White River captive broodstock and adult-based supplementation program was excluded from this permit. Operation of the White R.i captive broodstock program is covered under consultation with NOAA Fisheries. The following is a chronological list of permit activities relative to this project.

December, 1998 – WDFW submits Section 10 direct take application for all Upper Columbia River Spring-run Chinook Salmon artificial propagation activities including captive broodstock programs for The White R., Nason Cr.and the Twisp R.

August, 2002 – Environmental Assessment and FONSI issued for Permit #1196; captive broodstock programs are not assessed.

August, 2002 – Section 10 Direct Take permit issued for WDFW Upper Columbia River Spring-run Chinook Salmon supplementation recovery programs; captive broodstock programs are excluded based on uncertainty of continued funding and lack of a formal strategic plan.

October, 20002 – WDFW submits strategic plan and funding basis and requests Section 10 permit for captive broodstock programs.

2.2) Provide descriptions, status, and projected take actions and levels for NMFS ESA-listed natural populations in the target area.

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

Include information describing: adult age class structure, sex ratio, size range, migrational timing, spawning range, and spawn timing; and juvenile life history strategy, including smolt emigration timing. Emphasize spatial and temporal distribution relative to hatchery fish release locations and weir sites

Upper Columbia River Spring-run Chinook Salmon

Adult spring Chinook salmon (Onchorhynchus tshawytscha)enter the Columbia River from March through mid-May (Myers et al. 1998). Peak abundance of the run in the lower Columbia River occurs in April and May (Chapman et al. 1995). Upper Columbia-origin spring chinook exhibit peak migration at Rock Island Dam in mid-May. The fish spawn in the Wenatchee and Methow rivers from late July through September, peaking about mid-August. The majority of adult spring Chinook salmon mature at four years of age (58%). A significant proportion of age-5 spring Chinook may also be present

(~40%). Adults will average 66 cm for females and 67 cm for males based on recent year spawner size data (Chapman et al. 1995). Fecundity for female chinook may range between 2,600 and 8,100, based on data for the Chiwawa and Methow river populations.

Juvenile wild Upper Columbia R. ESU spring Chinook are present at various life stages year-round in the Wenatchee and Methow rivers and tributaries, and may rear and over-winter in the mainstem upper Columbia River. Eggs incubate from late July through late fall or early winter, when the eggs generally hatch (Chapman et al. 1995). Alevins remain in the gravel 4-6 weeks or more, emerging as fry in late winter or early spring. Spring Chinook fry disperse extensively downstream after emergence, although some fry assume residence in the natal stream near the spawning site. A second downstream movement occurs during late fall when the chinook emmigrate to suitable over-wintering habitat, usually from the tributaries to the river mainstem. A third and final downstream movement takes place in the spring when the Chinook migrate as yearling smolts to the sea. The average 10%, 50%, and 90% passage of the seaward smolt migration measured at Rock Island Dam was April21, May 10, and June 3, respectively from 1985 – 94 (Chapman et al. 1995). Wild fry and sub-yearling spring Chinook may range in size from 30-40 mm in the spring, average 54 mm in June, and average 88 mm by October. Upper Columbia River spring Chinook migrating seaward as yearling fish may average 87 to 127 mm.

The proposed program will focus on the White R. subpopulation within the Wenatchee R. basin. The White R. subpopulation has evolved in a unique environment and is gentically distinct from other Wenatchee Basin subpopulations (Marshall and Young 1994). Juveniles must pass through Lake Wenatchee on their way to the Columbia River, and returning adults pass through a second time to reach the spawning grounds. Spawning takes place between RM 8 and RM 13 from the second week in August through the fourth week in September (Murdoch and Hopley 2005). Little is known about the specific juvenile life history of the White R. subpopulation. Juvenile monitoring will be initiated during 2005 to characterize juvenile migration patterns, life history strategies, and productivity.

<u>Upper Columbia River Summer Steelhead</u>

Steelhead (<u>Oncorhynchus mykiss</u>) display the most complex life history traits of any Pacific salmonid (Busby et al. 1996). They can be anadromous or resident and the anadromous form can spend up to seven years in freshwater before smoltification and seaward migration. They can spend up to three years in saltwater before returning to spawn (Busby et at. 1996). Two major run types are identified: ocean-maturing and stream-maturing. The ocean-maturing run type (winter steelhead) usually enter freshwater coastal and lowland streams in November through April and spawn soon thereafter. The stream-maturing run type (summer steelhead) generally enter freshwater from May through October and are sexually immature, requiring several months to spawn (Busby et al. 1996). The stream-type runs typically spawn in inland steams.

The Upper Columbia River (UCR) Steelhead ESU occupies the Columbia R. upstream of the Yakima R. (excluded) to Chief Joseph Dam (62FR43937). NOAA has identifed three independent populations within the ESU: the Wenatchee, Entiat, and Methow populations (Interior Technical Recovery Team 2003).
Steelhead of the UCR ESU are classified as stream-maturing type, similar to other inland steelhead ESUs (Snake and Mid-Columbia rivers). Detailed descriptions of the UCR ESU are provided in Busby et al. (1996), WCSBRT (2003), and ITRT (2003).

Adult steelhead from the UCR ESU return to the Columbia R. from May through September and quickly migrate into the tributaries, usually beginning in mid-July and peaking in mid-September through October (Busby et al. 1996,WCSBRT 2003, NOAA Fisheries 2002). The predominant adult age class is 2-salt (51%) followed by 1-salt (47%). Two percent return as 3-salt (WDFW 2002). Some may stay in mainstem reservoirs and migrate into tributaries in April or May of the of the following year (WCSBRT 2003). Typically they spawn in late spring of the calender year after entering freshwater. In the Wenatchee R., summer steelhead arrive in mid-July and through April the follwing year. Spawning is from April through June (WDFW 2002, WDFW 1993). Eggs incubate late March through June and fry emerge late spring through August (WDFW 2002). Life stages are present year-round in the tributaries of the UCR ESU. Fry and smolts disperse downstream in late summer and fall. Outmigration occurs during April and May and is dominated by 3+ (46.6%) and 2+ (43.2%) age-class smolts (Peven 1990). There is only occasional limited presence of steelhead spawning in the White R. The sporadic spawning suggests that no established spawning populations exists in the tributary (Tonseth, personal communication).

- Identify the NMFS ESA-listed population(s) that will be directly affected by the program. *(Includes listed fish used in supplementation programs or other programs that involve integration of a listed natural population. Identify the natural population targeted for integration).*

The White River spring chinook spawning aggregation of the Upper Columbia River Spring-run Chinook Salmon ESU (Wenatchee River basin).

- Identify the NMFS ESA-listed population(s) that may be incidentally affected by the program.
(Includes ESA-listed fish in target hatchery fish release, adult return, and broodstock collection areas).

The Chiwawa R. spring chinook subpopulation of the Upper Columbia river Spring-run Chinook Salmon ESU (Wenatchee R. basin).
The Nason Cr. Spring chinook subpopulation of the Upper Columbia River Spring-run Chinook Salmon ESU (Wenatchee R. basin).
The Upper Columbia River steelhead spawning in the Wenatchee R.There are few steelhead in the White River.

2.2.2) <u>Status of NMFS ESA-listed salmonid population(s) affected by the program.</u>

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds (*see definitions in "Attachment 1")*.

<u>Upper Columbia River Spring-run Chinook Salmon</u>

Meyers et al. (1998) assessed the status of West coast Chinook salmon from Washington, Idaho, Oregon, and California in response to petitions (PRO-Salmon 1994, ONRC and R.K. Nawa 1995) to list Chinook salmon as threatened or endangered. Meyers et al. (1998) citing Nehlsen et al. 1991, WDF 1993, PRO-Salmon 1994, ONRC and R.K. Nawa (1995), andWilderness Society (1993) concluded that, overall, a high percentage of West coast salmon stocks were extinct or in danger of extinction. WDF (1993) reported that 40 of 108 Chinook stocks in Washington were critical or depressed and ONRC/R.K.Nawa (1995) reported that Columbia R. Chinook stocks above McNary Dam experienced the second highest level of extinctions (28%) of West coast stocks with another 44% declining.

Using a suite of biological and environmental information Meyers et al. (1998) defined the Upper Columbia River Spring-run Chinook Salmon ESU as those stream-type Chinook salmon spawning above Rock Island Dam; i.e. spawning in the Wenatchee R. basin, the Entiat R. and the Methow R. basin. An assessment of extinction risk for the UCR ESU determined that the 5-yr geometric mean natural run size for the entire ESU above Priest Rapids Dam was 4880 adults (1990-1994). There were no individual populations within the ESU with run sizes over 150 individuals.

In addition, assessments of long- and short-term abundance trends for stocks within the ESU showed that all were negative with eight of ten exhibiting declines of greater than –20% per year over the period of the data set. Within the Wenatchee R. basin, the short-term trend was –37.4% and the long-term trend was 11.5%. Record low escapements had occurred in the previous few years.

In the White R. tributary of the Wenatchee R. basin, the geometric mean escapement for the period 1990 through 1994 was 25. Short-term decline was estimated at –35.9% and the long term trend was –10.6%.

Meyers et al. (1998) concluded that the spring Chinook salmon of the Upper Columbia R. ESU were in danger of extinction. The abundance levels (1994-1996) were the lowest in 60 years. The review team was also especially concerned for the declining trends in abundance and the extremely small population size exposing the ESU to high genetic and demographic risk.

The NMFS listed the Upper Columbia River Spring-run Chinook Salmon ESU as endangered on March 24, 1999 (64FR14309). The listing described the ESU as including all naturally spawned populations of Chinook salmon in all river reaches accessible to chinook salmon in Columbia R. tributaries upstream of the Rock Island and downstream of Chief Joseph Dam in Washington, excluding the Okanogan R. Chinook. Chinook salmon and their progeny from the Chiwawa R., Methow R., Twisp R., Chewuch R., White R., and Nason Cr. hatchery programs were determined to be necessary for recovery and were included in the ESU.

The Interior Columbia Technical Review Team (ICTRT 2003) further delineated the ESU using genetic, dispersal, phenotypic, environmental, and demographic data. Three independent populations were identifed: the Wenatchee R. except Icicle Cr., the Enitat R. and the Methow R. The ITRT also noted that the White R. and Twisp R.spawning segments contributed a majority of the gentic variation between localities and show the greatest differentiation from other areas.

More recently, WCSBRT (2003) completed an updated status review of West coast Chinook salmon including use of Viable Salmon Population (VSP) criteria as described by McElhaney et al. (2000). The BRT concluded that all three populations within the UCR ESU were still in decline when 1996-2001 data were included. At the time of the first status review (Meyers et al. 1998), total run into the ESU was less than 5000 with most individual tributary segments at less than 100. Within the Wenatchee R. population, natural run size from1997-2001 was 274 compared to 27 during the first status review. This represents an escapement of only 13% of the interim recovery target of 3750 set by Ford et al. (2001). For the White R., recent (1997-2001) average redd count was 9 (range = 1 – 104) compared to the previous average of 25. The short-term population abundance trend is –6.6% compared to –35.9 presented during the previous status review.

Given the current abundance and population trends, the WCSBRT predicted a 100% probablility of decline over the next fifty years for populations within the UCR ESU. Therefore the WCSBRT determined the UCR ESU continued to be “in danger of extinction”.

Upper Columbia River Summer Steelhead

The steelhead Biological Review Team (BRT, Busby et al. 1996) assessed the status of West coast steelhead (O. mykiss) from Washington, Idaho, Oregon, and California. The BRT identified 15 ESUs including the Upper Columbia River Summer Steelhead ESU which includes all Columbia River tributaries above the Yakima R. All upper Columbia River steelhead are summer steelhead. Busby et al. 1996, siting Chapman 1994, reported pre-1960s fish counts at Rock Island Dam (1933 – 1959) averaged 2,600 – 3,700. The 1989 – 1993 natural escapement estimates were 800 for the Wenatchee R. and 450 for the Methow and Okanogan Rivers combined. Average total escapements for these stocks were 2,500 and 2,400, respectively. Tends in total (natural and hatchery combined) escapement between 1962 and 1993 showed a 2.6% increase. A 12% decline was reported for the Methow and Okanogan Rivers combined. Nehlsen et al (1991) identified six stock in this region that were either at risk or stocks of concern. WDFW (1993) identified three stocks and characterized all as depressed.

Spawning escapement within the ESU is strongly dominated by hatchery production with estimates of recent contributions averaging 65% in the Wenatchee R. and 81% in the Methow and Okanogan Rivers (Busby 1996). Adult replacement ratios were 0.3:1.0 in the Wenatchee and 0.25:1.0 in the Entiat (WDFW 1993) and were believed not to be self-sustaining without continued hatachery supplementation.

Busby et al. concluded that the Upper Columbia steelhead ESU was at danger of extinction. Even though total abundance of populations within the ESU were relatively stable or increasing, it was thought to be occurring only because of major hatchery supplementation programs. The major concern of the BRT was the clear failure of natural stocks to replace themselves. In addition, the BRT was strongly concerned about problems of genetic homogenization due to hatchery supplementation within the ESU. There was also concern for high harvest rates on steelhead smolts in rainbow trout fisheries and degradation of freshwater habitats with the region.

In August 1997, the NMFS listed the Upper Columbia River Steelhead ESU as endangered (62 FR 43937). Subsequently, using the Viable Salmonid Population guidelines described by McElhany (2000) an initial set of population definitions for the UCR steelhead ESU identified the Wenatachee R., the Entiat R., and the Methow R as separate populations within the ESU (Ford 2000).

More recently, the WCSBRT (2003) completed an updated status review of West coast steelhead, including the UCR steelhead ESU. The BRT found that returns of both hatchery and naturally produced steelhead in the upper Columbia R. have increased in recent years. The average combined return through Priest Rapids Dam was 12,900 steelhead between 1997 and 2001. The average for ther previous 5 years (1992-1996) was 7,800. The total returns, however, continue to be dominated by hatchery-origin fish. Although the percentage of natural-origin returns had increased to about 25% during the 1980s, the median percent of natural-origin fish between 1997-2001 was 17% (2,200 of 12,800), a slight improvement of the the period between 1992 and 1996 when the percentage of natural-origin fish in the run was less than 10% (1,040 of 7,800). The 5-yr geometric mean natural-origin escapement for the Wenatchee and Ential Rivers for 1997-2001 was 900, well below the interim recovery goal of 3,000 (Lohn 2002). While there is an increasing growth trend of approximately 3.4% per year, the natural-origin proportion in the Wenatchee/Ential has declined from 35% to 29%.

The WCSBRT (2003) concluded that the UCR steelhead ESU continues to be in danger of extinction based on evaluation of natural production. The most serious risk to the natural population is the poor growth rate and productivity within the ESU. Although there has been an increase in naturally-produced fish in recent years, mean abundance is still only a fraction of the interim recovery goal. The ratio of naturally produced adults to combined parents escapement is still low (about 43%, Murdoch et al. 1998) and detailed information on productivity is lacking.

- 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.

White River spring Chinook recruits per spawner, 1981 – 1999. Compiled from Tonseth, personal communication

Brood Year	Recruits per Spawner	Brood Year	Recruits per Spawner
1981	5.52	1991	0.25
1982	0.92	1992	0.32
1983	0.37	1993	0.25
1984	0.72	1994	1.24
1985	0.28	1995	1.59
1986	0.24	1996	1.50
1987	0.59	1997	4.47
1988	0.70	1998	5.15
1989	0.42	1999	0.26
1990	0.12		

- 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. *(Include estimates of juvenile habitat seeding relative to capacity or natural fish densities, if available).*

White River spring Chinook annual redd counts and estimated run size, 1990 – 2004 (compiled from Murdoch, unpublished data and NMFS 1999)

Year	Redd Count	Expansion Factor	Estimated Run Size
2004	20[a/]	3.00[b/]	61[c/]
2003	14[a/]	2.43[b/]	33[c/]
2002	33[a/]	2.05[b/]	68[c/]
2001	99[a/]	1.60[b/]	158[c/]
2000	8	2.70[d/]	21
1999	1	2.2	2
1998	5	2.2	11
1997	15	2.2	33
1996	12	2.2	26
1995	2	2.2	4
1994	3	2.2	7
1993	60	2.2	147
1992	35	2.2	77
1991	21	2.2	46
1990	22	2.2	48
	$\mu = 23$ range = 1 – 99		$\mu = 48$ range = 2 – 158

[a/] 66 White R. stock redds estimated when adjusted for stray rates
[b/] expansion based on sex ratio from broodstock collected for Chiwawa
[c/] 105 White R. stock adults when adjusted for stray rates
[d/] expansion based on sex ratios from Tumwater video

- **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.**

Hatchery-origin strays into target populations (Murdoch, personal communication)									
	Brood Year								
Water	1996	1997	1998	1999	2000	2001	2002	2003	2004
White River	0	0	0	0	0	0.33	0.21	0.05	0.05

2.2.3) <u>Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take</u> *(see "Attachment 1" for definition of "take")***.**

- 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.

(*e.g. "Broodstock collection directed at sockeye salmon has a "high" potential to take listed spring chinook salmon, through migrational delay, capture, handling, and upstream release, during trap operation at Tumwater Falls Dam between July 1 and October 15. Trapping and handling devices and methods may lead to injury to listed fish through descaling, delayed migration and spawning, or delayed mortality as a result of injury or increased susceptibility to predation*").

Broodstock Collection:

<u>Juvenile-based Captive Brood</u>. Collection of eggs/fry for captive broodstock will result in a direct take of listed spring Chinook from natural production. A sub-sample of approximately 1700 eggs/fry will be collected from up to 50 target redds using standard hydraulic sampling methods during the period from September through November. Sampling might result in disturbance of redds and increased mortality of remaining eggs/fry. Fewer individuals will remain in the natural habitat for natural rearing.

<u>Adult-based Supplementation</u>. The recovery program is expected to evolve away from a captive brood strategy and into an adult-based supplementation strategy at the completion of the interim rebuilding phase. The shift to an adult-based program could occur at an earlier time if the captive broodstock program does not achieve performance expectations or rebuilding is more rapid than scheduled. Collection of adults for hatchery propagation will result in removal of a portion of the natural spawning population. Operation of a weir for adult collection can result in delay of migration for some spawners or displacement of spawners below the weir. Some adult spawners that did not originate in the target tributaries (e.g. Chiwawa River) might be removed and transported to their natal tributaries for spawning.

Juvenile Rearing:

Juvenile-based Captive Brood. All spring Chinook life stages will be propagated (and therefore taken) through the proposed captive rearing program. Eyed eggs and alevins will be hydraulically sampled from redds in the rivers during the late summer for incubation in the hatcheries. Fry, fingerlings and smolts produced will be similar in size to supplementation program fish with fingerling size of 1.1 – 7.0 g achieved through the summer, ~15 g by fall, and ~32 g at yearling age. Smolted fish will be retained in the hatchery and reared an additional two-three years to maturity, leading to the take of listed fish ranging in size from 115 to 690 mm. Fish reaching maturity will be spawnedand the eggs produced transferred to the Upper Columbia hatcheries where the life stages described below for the adult-based supplementation program will repeated.

Adult-based Supplementation. Listed spring chinook will be propagated from green egg to smolt size through this portion of the program. All freshwater juvenile life stages, up to yearling smolt, will therefore be taken. Green eggs, eyed eggs and alevins will be incubated to produce swim-up fry averaging approximately 0.45 grams each. Fry will be reared to fingerling size (1.1 – 7.0 g) through the summer months, with sub-yearlings (~15 g) produced by the fall. Yearling smolts at an average size of ~32 g will be produced by late spring after approximately 200 days of rearing for liberation into natal streams.

- **Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish**.
-

Takes of eggs/fry from White River spring Chinook population for captive brood (Murdoch and Hopley 2005)						
1997	1998	1999	2000	2002	2003	2004
527	199	235	272	183	723	1529

- 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).
*Complete the appended "take table" (**Table 1**) for this purpose. Provide a range of potential take numbers to account for alternate or "worst case" scenarios.*

- 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.
(*e.g. "The number of days that steelhead are trapped at Priest Rapids Dam will be reduced if the total mortality of handled fish is projected in-season to exceed the 1988-99 maximum observed level of 100 fish."*)

Take levels for captive brood are not expected to exceed the levels described herein. Take levels will be reviewed in-season but prior to initiation of redd pumping. Because take levels are specified beforehand, there is little probability they will be exceeded.

As the program transitions into adult-based supplementation, take levels at adult trapping facilities will be projected before the trapping season begins. In-season adjustments to collection rates will be made as necessary if the planned trapping schedule will result in excess collection of adults.

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. *(e.g. "The hatchery program will be operated consistent with the ESU-wide plan, with the exception of age class at release. Fish will be released as yearlings rather than as sub-yearlings as specified in the ESU-wide plan, to maximize smolt-to-adult survival rates given extremely low run sizes the past four years.").*

At present there is no Upper Columbia River-wide recovery plan for the spring-run Chinook salmon ESU. A recovery plan will be developed by the TRT including recovery goals for each population within the ESU. However, a 50-year multi-species Habitat Conservation Plan (HCP) and relicensing agreement is in place which addresses several populations of the Upper Columbia River spring run chinook ESU. The HGMP presented herein addresses the remaining White River spring chinook aggregate and will be consistent with the current HCP. This HGMP also reflects requirements of the BiOp and the intent of the Joint Fishery Parties as detailed in the Biological Assessment and Management Plan (BAMP 1998).

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates. *Indicate whether this HGMP is consistent with these plans and commitments, and explain any discrepancies.*

The overarching direction for recovery of White River spring Chinook is contained in the Biological Opinion for ESA Section 7 Consultation on Interim Operations for the Priest Rapids Hydroelectric Project (FERC No. 2114). This HGMP is designed to be consistent with and implement the direction provided in the BiOp.

The program must also be consistent with NMFS policy for artificial propagation under the Endangered Species Act, fulfillment of federal treaty obligations to Native Americans, fulfillment of court approved actions developed under the auspices of United States v. Oregon, the discharge of fisheries mitigation responsibilities incurred as a result of water development authorizations, and achievement of U.S./Canada Pacific Salmon Treaty obligations. The proposed program implements the BAMP (1998) as developed and agreed upon by the co-managers.

3.3) Relationship to harvest objectives.
Explain whether artificial production and harvest management have been integrated to provide as many benefits and as few biological risks as possible to the listed species. Reference any harvest plan that describes measures applied to integrate the program with harvest management.

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. *Also provide estimated future harvest rates on fish propagated by the program, and on listed fish that may be taken while harvesting program fish.*

No directed harvest of these populations is intended during the rebuilding phase. The first release from the program occurred in 2004 when 2,589 smolts were released into the White River. A second release of 1,946 smolts occurred in 2005.

Once releases begin, incidental harvest could conceivably occur during fisheries targeted on hatchery-origin spring Chinook. These fisheries are planned and managed by the Columbia River Compact, consistent with court-ordered requirements of U.S. v Oregon and the Columbia River Fish Management Plan. NMFS is included in harvest planning and harvest strategies are designed to limit impacts to listed species.

3.4) Relationship to habitat protection and recovery strategies.
Describe the major factors affecting natural production (if known). Describe any habitat protection efforts, and expected natural production benefits over the short- and long-term. For Columbia Basin programs, use NPPC document 99-15, section II.C. as guidance in indicating program linkage with assumptions regarding habitat conditions.

WDFW is a cooperating agency involved in regional fish and wildlife planning and technical assistance effort through the Upper Columbia Salmon Recovery Board (UCSRB). The mission of the UCSRB is to restore viable and sustainable populations of salmon, steelhead, and other at-risk species through the collaborative, economically sensitive efforts, combined resources, and wise resource management of the Upper Columbia Region. Along with Chelan, Douglas, and Okanogan counties, the Yakama Nation, and Colville Confederated Tribe, local, state, and federal partners, agency staff will be working closely in partnership with existing planning efforts in the region including Wenatchee Watershed Planning, Entiat Watershed Planning, Lead Entities, Regional Fisheries Enhancement Group, and Salmon Recovery Planning.

Six fish and wildlife plans (also known as "subbasin plans") will be developed for the following "subbasins" (commonly known as watersheds): Wenatchee, Entiat, Lake Chelan, Methow, Okanogan, and the mainstem Columbia River from Rock Island dam to the Canadian border. Subbasin plans will be submitted to the Northwest Power Planning Council in May 2004. These subbasin plans will identify and provide the basis for prioritizing project proposals to be submitted to the Northwest Power Planning Council in future funding cycles and will be used, potentially, for salmon recovery planning in North Central Washington.

WDFW helps ensures that actions taken to protect and restore salmonid habitat in the region are based on sound scientific principles thru technical assistance of Regional staff. In addition to habitat, WDFW is involved with the Yakama Nation and Colville Confederated Tribes in helping develop recovery goals, and providing coordination and representation for all 4 H’s (Harvest, Hydro, Hatcheries and Habitat). At the watershed scale, technical tools such as Limiting Factors Analysis (LFA), Ecosystem Diagnosis and Treatment (EDT) and SSHIAP (Salmon and Steelhead Inventory and Assessment Program) will used to identify factors that currently impact salmon and the priority actions needed in the watershed.

3.5) Ecological interactions. [Please review Addendum A before completing this section. If it is necessary to complete Addendum A, then limit this section to NMFS jurisdictional species. Otherwise complete this section as is.]

Describe salmonid and non-salmonid fishes or other species that could (1) negatively impact program; (2) be negatively impacted by program; (3) positively impact program; and (4) be positively impacted by program. Give most attention to interactions between listed and "candidate" salmonids and program fish.

During the captive rearing phase, program fish would not be affected by or affect other species. Progeny of captive brood, and fish from adult-based supplementation will however, be released as yearling smolts at which time they may interact with White River natural rearing spring Chinook or other species. Program fish could be negatively impacted by competition for food or space with naturally rearing spring Chinook or with other species such as coho, bulltrout or rainbow trout competing for the same resources. Program fish could suffer predation if predators of sufficient size were present. Program fish could also negatively affect naturally rearing spring chinook and other species through increased competition for food or space. Naturally rearing spring Chinook or other species could experience increased indirect predation if the presence of large numbers of program smolts were to entice a large number of predators into the area. Program fish might also negatively impact the same or other species through increased transfer of disease from hatchery effluent or from commingling in the natural habitat. Positive impacts to program fish might include shielding from predation by large numbers of non-program fish such as coho salmon released concurrent with program releases. Alternatively, program fish might positively affect non-program fish by "swamping" predators when large numbers of program fish are present, thereby reducing the predation rate on non-program fish. Program fish might also benefit from nutrient enrichment resulting from the naturally spawned carcasses of spring chinook or coho salmon. Carcasses originating from the program will provide nutrients brought from the ocean for ecosystem enhancement of naturally rearing spring chinook and other non-target species.

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 integrated programs, identify any differences between hatchery water and source, and "natal" water used by the naturally spawning population. Also, describe any methods applied in the hatchery that affect water temperature regimes or quality. Include information on water withdrawal permits, National Pollutant Discharge Elimination System (NPDES) permits, and compliance with NMFS screening criteria.

Juvenile-based Captive Brood:

Captive broodstock is currently reared and spawned at AquaSeed Incorporated, a private aquaculture facility located at 10420 173rd Ave. S.W., Rochester, WA.

Water for captive broodstock rearing is drawn from the Puget Sound Aquifer System . Water is supplied to two adjacent but distinct rearing locations via pumped wells. Department of Ecology groundwater permits for the two sites total 6,000 gallons per minute. Site number 001, known as the ESA site, has four wells at 125' of depth supplying 1,875 gallons per minute for captive broodstock rearing. The remainder of the permitted 3,500 gallons per minute is currently used by the grower for commercial production. Site number 002, known as the Carlson site, has two wells at 125' of depth supplying approximately 1,300 gallons per minute with potential under the existing permit for up to 2,500 gallons per minute.

This rearing location is geographically remote from the White River. Although characteristics of the aquifer water supply clearly differ from the surface water of the natal stream, the groundwater supply contributes significantly to the viability of the captive broodstock program. The water source is pathogen-free and presents no risk from disease introduced via the water supply. Surface water supplies, including the natal stream, represent a constant reservoir for disease organisms. This characteristic is especially important for captive broodstock which will be held for as long as five years.

Water temperature from the groundwater aquifer is constant at approximately 50^0F. In contrast, temperature in the White R. fluctuates annually and exceeds 60^0F during summer months. While fluctuating ambient temperature regimes are often desirable for juvenile rearing, captive broodstock adults should not be reared in temperatures exceeding approximately 55^0F. Both survival and egg viability would be severely impacted. Past experience and trials conducted by the grower demonstrate that a water temperature regime within the 49^0F to 52^0F range contributes to excellent growth, higher fecundity, and higher egg viability of captive broodstock when compared to warmer or colder regimes. It is advantageous to reduce water temperature during egg incubation to delay emergence time to more closely match natural production and to limit growth during the first year of life to reduce early maturation of males. An incubation water chilling system will be operational prior to incubation of 2005 broodyear eggs/fry.

Water chemistry parameters shall be well within acceptable ranges for rearing spring chinook captive broodstock. Total gas, hardness, and pH are routinely monitored. Total gas levels approximate 107% saturation at the well head and are reduced to approximately 102% by passing through a packed column before delivery to rearing ponds and incubators. Hardness and pH are within accepted fish health criteria. Water chemistry is evaluated annually by a professional laboratory and all parameters are within accepted fish rearing criteria.

Rearing and acclimation of F_2 progeny from captive broodstock will be conducted in as yet undeveloped locations in the Wenatchee watershed. Several candidate sites within the White R. are being evaluated at the time of this writing. It is expected that two rearing facilities will be constructed. A central facility will provide egg incubation and early rearing. Juvenile pre-smolts will then be transferred to an acclimation/release facility for final rearing. Engineering design has not been completed but it is calculated that up to 11.6 cfs of surface water from the White R. will be required for final rearing at the proposed acclimation/release facility. Additional groundwater may be required to control icing, depending on the time of transfer to the acclimation facility. The central facility will require an estimated 8.5 to 11.6 cfs of water for incubation and rearing. The estimated amount differs depending upon the time of transfer to the acclimation facility. The water supply for the central facility will include some amount of groundwater. The specific amount will be determined during final engineering and design. Groundwater will be necessary for temperature management, especially during the summer months when surface water might exceed 60^0F. Chilled water will be required for incubation.

Spawning of the 2002 and 2003 broods of captive broodstock produced second generation progeny that were released in 2004 and 2005, respectively. Because dedicated rearing and acclimation/release sites had not yet been constructed, these groups were incubated and reared at AquaSeed Inc. Pre-smolts were transferred to temporary acclimation facilities at Tall Timers Ranch and released after a short rearing period. The acclimation tanks were supplied with surface water from the White R. Rearing of second generation F_2 progeny at AquaSeed Inc. may continue for a limited time as possible alternative existing rearing facilities are identified and construction of facilities in the White R. watershed progresses. Transitional rearing sites may be employed if practical and within water demand criteria as stipulated in Section 1.10.

Adult-based Supplementation:

The eventual transition into an adult-based supplementation program will require and make use of the same rearing facilities described above for rearing F2 progeny of captive broodstock. Facilities have not been designed or constructed at this time. Water delivery specifications will be provided to the engineering design team, based on the criteria provided in Section 1.10 above. Both surface water and groundwater will be required to achieve all phases of artificial production. Adult holding will require water in addition to the amounts identified above. Approximately 135 gpm (.3 cfs) of water at temperatures not to exceed 52^0F will be required for adult holding. Groundwater will be required to manage summer temperature, either exclusively or in combination with surface water.

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.
(e.g. "Hatchery intake screens conform with NMFS screening guidelines to minimize the risk of entrainment of juvenile listed fish.").

Juvenile-based Captive Brood:

The water supply for captive broodstock rearing is pumped from wells. There is no risk to listed species. Effluent water is chlorinated and managed as directed by NPDES permit #WA0040819.

Adult-based Supplementation:

Adult-based facilities have not been designed at this time. Hatchery intakes will conform to NMFS and WDFW requirements for screen approach velocities and operating criteria and to Department of Ecology water use permits identifying approved flow volumes. Effluent management will conform to NPDES permit requirements.

SECTION 5. FACILITIES

Provide descriptions of the hatchery facilities that are to be included in this plan (see "Guidelines for Providing Responses" Item E), including dimensions of trapping, holding incubation, and rearing facilities. Indicate the fish life stage held or reared in each. Also describe any instance where operation of the hatchery facilities, or new construction, results in destruction or adverse modification of critical habitat designated for listed salmonid species.

5.1) Broodstock collection facilities (or methods).

Juvenile-based Captive Brood:

White R. spring Chinook required to continue the captive brood program will be obtained through removal of a limited number of eyed eggs and pre-emergent fry from selected redds in the drainage using standard hydraulic sampling methods (Young and Marlowe 1995). White R. spring Chinook typically spawn between the second week in August and the fourth week in September. Redds will be identified during routine spawning surveys and their positions triangulated for subsequent sampling of eyed eggs and pre-emergent fry. Marked hatchery adults from other tributaries will be identified and redds on which they have spawned will be cataloged and precluded from collections to assure the genetic basis for the White River population. Redd sampling will occur between approximately September 9 and November 19.

Adult-based Supplementation:

The White R. recovery program is expected to transition away from a captive broodstock strategy and into an adult-based supplementation strategy at the completion of approximately two cycles of captive broodstock rearing. The rebuilding phase is estimated to extend approximately eight to twelve years from the start of the program (2002). The shift to an adult-based program could occur at an earlier time if the captive broodstock program does not achieve performance expectations or rebuilding of the White R. population proceeds more rapidly than projected. Unless technologies are developed to accurately identify and sort individual White R.-origin adults at downstream trapping locations, White R. broodstock will be trapped and collected within the White R. In the interim period, an adult trap/weir will be in operation to support baseline data collection and management of non-local spring Chinook entering the White R. from other sources. During the baseline data collection period and the subsequent adult broodstock collection period, the adult trapping and handling facilities must provide for intensive management of adult escapement including variable operating schedules, effective passage of adults upstream, interrogation of individual adults for marks or tags, and facilities for holding and transport.
A weir is not yet in place as of this writing (June, 2005). Site visits are being conducted by the parties with the expectation that an adult weir will be in place in time for the 2007 adult migration period. The weir is expected to consist of vertical picket sections directing migratory spring Chinook to a box or V trap. The weir will extend from bank to bank and may be from approximately 25m to 60m in length, depending on the final site selected. The following desirable attributes are being provided to guide engineering and design efforts.

a. Locate the weir within the target tributary.
b. Locate weir below all spawning habitat to support monitoring of run size, run timing, and representative broodstock collection.
c. The weir should be operational throughout the adult migratory period to assure thorough and accurate enumeration and representative adult collection.
d. The site should be easily accessible to trucks and equipment.
e. Adequate land should be available adjacent to the weir to support operations and potential adult holding facilities.
f. The site should have the potential for a seasonal intake structure if adults are to be held on site.
g. The facility must support interrogation of individual fish for mark identification and collection of biological data; preferably a dedicated bio-sampling area.
h. The facility must support enumeration of all adults and jacks.

Twenty four hour security must be available when the facility is trapping or holding fish Construction of the weir may cause some temporary disturbance to habitat used by listed spring chinook and steelhead. Construction methods and the duration of construction will be guided by the necessary permits. Operation of the weir may affect movement of spring chinook and steelhead. Operations will be guided by the necessary permits.

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

Juvenile-based Captive Brood:

Eggs and Fry - Eyed eggs are transported in small buckets or custom-designed cylindrical tubes resting on insulating material over ice within a cooler. Alevins and fry are transported in heavy duty freezer bags partially filled with water and inflated with oxygen. Bags are placed on a layer of insulation over ice within a cooler.

Juveniles - Pre-smolts are transferred from AquaSeed to the White R. acclimation facilities in tanks designed for juvenile fish transport. Density, loading, temperature, and dissolved oxygen criteria are defined prior to transport and monitored throughout the transfer.

Adult-based Supplementation:

Adults – Adults will be transported from trapping facilities in the White R. to adult holding facilities expected to be constructed within the watershed. Transport tanks will be designed for adult transfer and will operate within criteria provided by fish health and fish culture professionals.

*Eggs and fry –*Current plans for the adult-based supplementation phase do not call for transfer of eggs or fry. In the event eggs or fry are transported, protocols will follow those described above.

Juveniles – Fingerling or pre-smolt spring Chinook will be transported from the proposed White R. Hatchery to acclimation/release ponds on the White R. Fish will be transported in tanks designed for juvenile fish transport. Density, loading, temperature, and dissolved oxygen criteria will be defined prior to transport and monitored throughout the transfer.

5.3) Broodstock holding and spawning facilities.

Juvenile-based Captive Brood: Captive broodstock are presently held in circular tanks of varying size, ranging from 4 to 50 feet in diameter and 1.4 to 4 feet of operating depth depending on fish size, age, and population numbers. Tanks are supplied with pathogen-free groundwater at 50^0F. A covered biological processing area contains fixtures and equipment necessary for spawning including tables, scales, measuring devices, buckets, colanders, microscopes, glassware, water, and fish health sampling provisions.

Adult-based Supplementation: Adult holding facilities will be located at the proposed White R. Hatchery. Adults will be likely held in two formal raceways to be designed specifically for adult holding. Design criteria require approximately 8 – 10 cubic feet of volume per adult with a water flow of approximately two gallons per minute per adult. Surface and groundwater will be supplied to the holding ponds in a manner that will facilitate maintenance of adult holding temperature below 52^0F. Design will facilitate crowding and sorting of fish by gender, ripeness, etc. Spawning will occur in a dedicate bio-processing area adjacent to the adult holding facilities. The area will be supplied with water, concrete slab flooring with wash down drain, buckets, troughs, and laboratory supplies to support fish health sampling and fertilization.

5.4) Incubation facilities.

Up to ten half stacks (8 trays) of vertical incubators are used at the existing AquaSeed Inc. facility. Incubators are supplied with 5 gpm of water at 50^0F. Chilled water will be supplied beginning with the 2005 spawning season. Preliminary design calls for four full stacks (16 trays) of vertical incubators for the proposed White R. Hatchery. Chilled groundwater will be supplied at 5 – 6 gallons per minute per stack. Iso-buckets temporarily installed in shallow troughs may be used during early incubation while viral and disease screening is completed.

5.5) Rearing facilities.

Juvenile-based Captive Brood:

In the case of captive broodstock, the adult holding facilities described in Section 5.3 above are the rearing facilities

Second generation (F_2) progeny spawned from captive broodstock in 2002, 2003, and 2004 have been reared at AquaSeed Inc. for a period of about 16 months and subsequently transferred to acclimation facilities on the White R. Rearing was conducted in the same array of tanks described in section 5.3 above.

Adult-based Supplementation:

Preliminary design for the proposed White R. Hatchery describes an array of standard raceways measuring 10'in width and 100' in length with 3' of operating depth. Total volume per raceway will equal 3,000 ft^3. Design flow per each raceway will be approximately 560 gpm resulting in a turnover rate of about 1.5 exchanges of water volume per hour.

5.6) Acclimation/release facilities.

Juvenile-based Captive Brood:

Acclimation facilities adequate to contain 165,000 smolts are being required for release of second generation smolts produced from captive broodstock spawning. Planning for design and construction is advancing (June 2005) but facilities are not yet available. During 2004 and 2005, temporary facilities were installed at Tall Timbers Ranch to acclimate 2002 and 2003 brood F_2 progeny of captive broodstock. The facility consisted of an array of four 8 ft diameter circular tanks supplied with surface water pumped from the White R.

Facility design will meet rearing criteria as presented in Section 1.10 above. Rearing containers will be configured as raceways with dimensions approximating 30:3:1 and flow rates approximating 1.5 water exchanges per hour. Approximately 1 cfs of groundwater will be required for winter operations.

Adult-based Supplementation:

The adult-based supplementation phase will use the same facilities described above for the juvenile-based program.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.
No disasters or major operational difficulties have occurred to date.

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.

(e.g. "The hatchery will be staffed full-time, and equipped with a low-water alarm system to help prevent catastrophic fish loss resulting from water system failure.").

Juvenile-based Captive Brood:

- The captive broodstock facilities at AquaSeed Inc. are protected by a number of systems from catastrophic loss to listed fish.Both sites have backup generators to supply power to pumps.
- Both sites have backup oxygen supplies available.
- Water supplies have alarms to detect loss of flow and level.
- Both sites have alarm systems with both telephone and 2 way radio signals.
- Both sites have 24 hour on-call personnel with pagers and cell phones.
- Site 001 has a burglar alarm system
- Site 002 has an on-site residence.
- All groups are reared at minimum pond loading densities to minimize the risk of loss due to disease and to maximize survival.
- All broodstock groups are split between the two sites to avoid complete loss of any group.
- Effluent water is treated with a chlorination/dechlorination system to protect all resources in receiving waters.
- All activities are conducted in accordance with the WDFW Fish Health Manual (WDFW 1996) and the Co-Managers Salmonid Fish Disease Control Policy (1997).
- All lots/groups of fish are separated according to disease certification status.

Adult-based Supplementation:

The proposed White R. Hatchery and acclimation facilities will be protected by at least the following:

- All sites will have backup generators to assure continue electrical power in the event of power service failure.
- All water supplies and rearing vessels will have alarms for water flow and water level.
- Protocols will be in place to test standby generators and all alarm systems on a routine basis.
- All facilities will be staffed full time during operation, providing for protection of fish from vandalism and predation, and allowing for a rapid response in the event of power and water loss or freezing.
- Fish weirs used to collect broodstock will be staffed on a continuous basis during operation to ensure effective operation, safe capture and holding of fish, and to prevent poaching.
- All facilities will be sited in areas that are not flood-prone to minimize the risk of fish loss due to flooding.
- All groups are reared at minimum pond loading densities to minimize the risk of loss due to disease and to maximize survival.
- All hatchery staff responsible for collection and propagation will be trained in proper fish handling, transport, rearing, biological sampling, and WDFW fish health maintenance procedures to minimize the risk of fish loss due to human error.

- All fish will be handled, transported and propagated in accordance with WDFW Fish Health Manual (1996), Co-Managers Salmonid Fish Disease Control Policy (1997), and Pacific Northwest Fish Health Protection Committee (PHFHPC 1989) model program.
- Hatchery effluent will conform to conditions of the National Pollutant Discharge Elimination System (NPDES) permit.
- Water intake systems will be screened according to NMFS and WDFW standards to prevent mortality from impingement or removal of listed species from the natural habitat.

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.

List all historical sources of broodstock for the program. Be specific (e.g., natural spawners from Bear Creek, fish returning to the Loon Creek Hatchery trap, etc.).

Eggs are removed from redds created by naturally spawning adults in the White River, tributary to the Wenatchee R. watershed

6.2) Supporting information.

6.2.1) History.

Provide a brief narrative history of the broodstock sources. For listed natural populations, specify its status relative to critical and viable population thresholds (use section 2.2.2 if appropriate). For existing hatchery stocks, include information on how and when they were founded, sources of broodstock since founding, and any purposeful or inadvertent selection applied that changed characteristics of the founding broodstock.

The broodstock source for this program is the population segment of the Upper Columbia River Spring-run Chinook Salmon ESU spawning in the White R, and tributary to the Wenatchee River (WRIA #45). The White R. population segment as well as all other population segments within the ESU are endangered and at risk of extinction.

The White R. spawning aggregation was one of three proposed for captive broodstock rearing to reduce the immediate risk of extinction (BAMP 1998). Eyed eggs were first collected from the redds of naturally spawning adults in the White R. in 1997. Egg collection has continued at varying levels for each ensuing year with the exception of 1999 and 2001. Prior to 2002, funding uncertainty and limitations on access to redds were limiting factors.

6.2.2) Annual size.

Provide estimates of the proportion of the natural population that will be collected for broodstock. Specify number of each sex, or total number and sex ratio, if known. For broodstocks originating from natural populations, explain how their use will affect their population status relative to critical and viable thresholds.

See response to Section 2.2.3 and Table 1

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

If using an existing hatchery stock, include specific information on how many natural fish were incorporated into the broodstock annually.

Because all captive broodstock are collected from natural redds in the natal stream, 100% of broodstock are natural fish. After the program transition to adult-based supplementation, the ratio of natural- and hatchery-origin fish in the broodstock will be determined each year by the JFP and will be proportioned based on genetic considerations and numerical abundance. However, all broodstock collected will be of White R. origin. Consistent with the intent of an integrated program, the objective of this strategy is to prevent differentiation of the hatchery and natural components of the White R. spawning aggregation.

6.2.4) Genetic or ecological differences.
Describe any known genotypic, phenotypic, or behavioral differences between current or proposed hatchery stocks and natural stocks in the target area.

There are no known genetic or ecological differences between the hatchery and natural components of the White R. natural spawning aggregation. As of 2005, there has been no natural spawning of adult returns generated by the captive broodstock program. The monitoring and evaluation program will assess any changes to the natural population subsequent to the return of adults from the captive broodstock program. The program is designed to retain genetic and ecological traits of the listed target populations.

Phenotypic differences have been observed within captive broodstock at the time of spawning; age-at-maturity, size-at-maturity, and fecundity. Captive broodstock tend to mature at relatively younger ages when compared to natural spawners observed in the White R. which mature exclusively at 4- (μ=67.1%) and 5-yrs (μ=32.8%) of age (Tonseth personal communication). Captive brood spawners from three stocks assessed over four brood years matured predominantly as 2-yr-olds (61.1%) followed by 3-yr-olds at 18.8%, 4-yr-olds at 16.9% and 3.2% as 5-yr-olds. These shifts in size are thought to be phenotypic rather than genotypic. It is expected that progeny of natural spawning adults will display normal age distribution. The monitoring and evaluation plan will assess this assumption.

Fecundity of White R. captive broodstock has averaged 1,161 over three brood years reported in Murdoch and Hopley (2005). Typical fecundity for Upper Columbia spring Chinook salmon is 4,400 (BAMP 1998). Average size of White R. female spawners at age has been 1,628g (age 3), 1,987g (age 4), and 1,582g (age 5). These sizes are significantly smaller than natural spawning adults which average approximately 15 pounds (6,800g) at maturity. These size and fecundity reductions are typical of those experienced among captive broodstock programs in the region (Murdoch and Hopley 2005). It is assumed these departures in phenotypic traits will revert to natural values when natural spawning occurs.

6.2.5) Reasons for choosing.
Describe any special traits or characteristics for which broodstock was selected.

Broodstock was selected to prevent extinction of the White River spawning aggregation.

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.
(e.g. "*The risk of among population genetic diversity loss will be reduced by selecting the indigenous chinook salmon population for use as broodstock in the supplementation program*.").

Broodstock selection criteria are discussed in BAMP, p. 82-83 and in Hopley 2002. The broodstock collection sampling design (see Section 7.2) includes risk aversion measures. In addition, other practices help reduce genetic and ecological risks to the populations. These include:

- "Allow natural production to continue concurrent with the captive rearing program by limiting the removal of pre-emergent fry from each redd and monitoring the post-emergent fry collection adjacent to each redd." (BAMP 1998, p. 82).
- "The captive rearing program will be done for no more than two consecutive salmon generations (8 years) to lessen the risk of domestication effects." (BAMP 1998, p.82). See Hopley, 2002 (attached) for a complete accounting of risk aversion measures that would be taken for this program.

SECTION 7. BROODSTOCK COLLECTION

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

Juvenile-based Captive Brood:

Eggs or alevins.

Adult-based Supplementation:

An adult collection facility will be developed in the White R. to assure that broodstock is representative of the local spawning aggregation. Facilities on the mainstem Wenatchee R. (Tumwater Dam) might be used at some future time if techniques can be developed to identify individual adults by tributary of origin.

7.2) Collection or sampling design.

Include information on the location, time, and method of capture (e.g. weir trap, beach seine, etc.) Describe capture efficiency and measures to reduce sources of bias that could lead to a non-representative sample of the desired broodstock source. Juvenile-based Captive Brood**:**

White R. spring Chinook required to continue the captive brood program will be obtained through removal of a limited number of eyed eggs and pre-emergent fry from selected redds in the drainage using standard hydraulic sampling methods (Young and Marlowe 1995). White R. spring Chinook typically spawn between the second week in August and the fourth week in September. Redds will be identified during routine spawning surveys and their positions triangulated for subsequent sampling of eyed eggs and pre-emergent fry. Marked hatchery adults from other tributaries will be identified and redds on which they have spawned will be identified and precluded from collections to assure the genetic basis for the White River population. Redd sampling will occur between approximately September 9 and November 19.

Adult-base Supplementation:

The White R. recovery program is expected to transition away from a captive brood strategy and into an adult-based supplementation strategy at the completion of the interim rebuilding phase. The shift to an adult-based program could occur at an earlier time if the captive broodstock program does not achieve performance expectations or growth of the White R. group exceeds expectations. Unless technologies are developed to accurately identify and sort White R. origin adults at downstream trapping location, White R. broodstock will be trapped and collected within the White R. Trapping and adult handling facilities must provide for intensive management of adult escapement including variable operations windows, effective passage of adults upstream, and interrogation of individual adults for marks or tags. Operating protocols must be developed annually to direct capture numbers, capture rates, mixture of hatchery- and natural-origin adults in the upstream escapement and in the hatchery broodstock, and management of strays from other tributaries.

7.3) Identity.

Describe method for identifying (a) target population if more than one population may be present; and (b) hatchery origin fish from naturally spawned fish.

Juvenile-based Captive Brood:

White R. eggs and alevins are collected from naturally produced redds in the natal streams. Redds are flagged at time of construction and adult spawners are observed during spawning to classify adults as natural or hatchery origin by observing the presence or absence of the adipose fin. A missing adipose fin denotes a hatchery-origin adult. All hatchery-origin adults with missing adipose fins are presumed to be from other tributaries or river systems. Only redds constructed by unmarked adults will be considered for sampling to exclude non-local hatchery adults from captive broodstock. An adult weir is proposed for construction on the lower White R. during 2007. The weir will facilitate interrogation of individuals to monitor the presence of non-local spawners and provide the opportunity to return them to their streams of origin.

Adult-based Supplementation:

Adults will be collected only from their natal streams or, if feasible, at mainstem Wenatchee facilities (Tumwater Dam) if individual adults can be identified by tributary of origin. Stray hatchery fish will be segregated from the local population by interrogating marks and removing adults from other tributaries.

7.4) Proposed number to be collected:

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

Juvenile-based Captive Brood:

Collect approximately 1700 pre-emergent fry for captive brood rearing based on a maximum sample size of no more than 100 fry per redd. The number of fry per redd should be adjusted each year to result in a total collection of 1700 representing up to 50 redds. When there are 25 or fewer redds it is encouraged that all redds be sampled.

Adult-based Supplementation:

A total of approximately 100 -200 adults from the White R will be captured when supplementation is fully implemented.

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

Year	Adults Females	Males	Jacks	Eggs (families)	Juveniles
1997				527 (8)	
1998				199 (4)	
1999				235 (7)	
2000				272 (7)	
2001				na	
2002				183 (3)	
2003				723 (8)	
2004				1529 (13)	

Data source: (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)

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

Describe procedures for remaining within programmed broodstock collection or allowable upstream hatchery fish escapement levels, including culling.

Juvenile-based Captive Brood:

The intent of the captive broodstock program is to use all maturing fish for spawning to ensure that every individual is represented in the genetic legacy of the population. Some male salmon mature at two years of age (precocial males). When possible, these males are used in the spawning operation. Milt from those not used in spawning will be cryopreserved if possible. The remainder are discarded after all tags are removed. The source of mortality for each individual is recorded.

Adult-based Supplementation:

Brood collection protocols will be devised annually (see attachment xxx for an example). Brood collection protocols will define the ratio of hatchery- and natural-origin adults upstream and in the hatchery broodstock.Stray adults, such as those anticipated from the Chiwawa program will be returned to the Chiwawa program or released for natural spawning into an appropriate system as defined in the protocol

7.6) Fish transportation and holding methods.
Describe procedures for the transportation (if necessary) and holding of fish, especially if captured unripe or as juveniles. Include length of time in transit and care before and during transit and holding, including application of anesthetics, salves, and antibiotics.

Juvenile-based Captive Brood:

Eggs and Fry - Eyed eggs are transported in small buckets or custom-designed cylindrical tubes resting on insulating material over ice within a cooler. Alevins and fry are transported in heavy duty freezer bags partially filled with water and inflated with oxygen. Bags are placed on a layer of insulation over ice within a cooler.
Adult-based Supplementation:

Facilities for adult collection and transport have not yet been constructed (June, 2005). Facilities will be designed and constructed to meet the following operating guidelines:
Haul all adults in 0.5 to 0.6% salt, regardless of duration of haul
Haul all adults at loadings no greater than 4.5ft^3 per fish or 34 gallons per fish
Haul all adults in 10 ppm MS-222
Haul from trap site at least daily but 2x-3x per day or more, as necessary.

Facilities for adult holding are described in Section 5.3 above.

7.7) Describe fish health maintenance and sanitation procedures applied. Juvenile-based Captive Brood:

Eyed eggs collected for captive broodstock are bathed in iodophore for 10 minutes immediately after arrival at the incubation facility. See Section 9.2.7 for description of fish health management during captive broodstock rearing.

Adult-based Supplementation:

Fish health management for adults following transition to adult-based supplementation is expected to follow guidance provided by Rogers et al. (2002):

- Remove adults from elevated water temperatures as soon as possible to a pathogen free source if available
- Initiate formalin treatments for control of external parasites and/or fungus as listed on label, INAD permit or through veterinary prescription. Treatments should be no less than 3 times per week, but may be daily based on recommendation of attending fish pathologist.
- Inject all fish, or at least all females, intraperitoneally within 2 weeks of collection or at time of first sorting of adults.
- If needed, repeat injections shall be administered no less than 20 days and no more than 30 days apart to all females.
- Inject with not less than 15mg/Kg of ERYTHRO-200 or equivalent
- Do not inject less than 14 days prior to spawn
- Do not exceed holding parameters greater than 1gpm/adult and 8ft3/adult (Chinook). Using estimates of 15lb chinook, this approximates a maximum of 16 lbs/gpm and 1.75 lbs/ft3.

Sanitation procedures employed to reduce the transfer and incidence of fish diseases are in accordance with Washington Co-Manager Fish Health Policy (1998), PNFHPC (1980), and IHOT (1995) guidelines.

7.8) Disposition of carcasses.
Include information for spawned and unspawned carcasses, sale or other disposal methods, and use for stream reseeding.

Carcasses resulting from out-of-basin operations at AquaSeed Inc. are frozen and delivered to a municipal refuse site. Carcasses resulting from the adult-based supplementation phase of the project may be distributed into the stream of origin for nutrient enhancement.

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.
(e.g. "The risk of fish disease amplification will be minimized by following Co-manager Fish Health Policy sanitation and fish health maintenance and monitoring guidelines").

Founding broodstocks will be established through collection of a representative sample of the total population to avoid reduction of existing genetic diversity. A total of 25 to 50 families will be sampled throughout the White R. spawning reaches each year for eight consecutive years (2002 – 2009). Each family will be identified by unique marks and maintained separately for future spawning.

- Broodstock removals will be limited within the region through designation of "non-intervention" areas where supplementation and captive brood programs will not be applied. The designation of "non-intervention" areas will prevent numerical reduction impacts for some of the region's populations and insulate the populations from genetic risks such as domestication selection.
- For those areas where supplementation and captive brood programs will be applied, upstream escapement of approximately 80 adults per population will be maintained as a minimum level for natural spawning.
- Removing only a portion of eggs from the redds of natural spawners for captive brood rearing assures that all returning adults contribute to the natural spawning population.

SECTION 8. MATING

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

8.1) Selection method.

Specify how spawners are chosen (e.g. randomly over whole run, randomly from ripe fish on a certain day, selectively chosen, or prioritized based on hatchery or natural origin).

Juvenile-based Captive Brood:

Mature captive broodstock are the surviving representatives of families collected as eyed eggs or fry from redd pumping three to five years previously (see Sections 2.2, 5.1, and 7.2). It is intended that all maturing captive broodstock will be used for spawning. Mature fish are spawned systematically as they become ripe, usually during one spawning session per week. Each individual fish is identified by a PIT tag and coded-wire tag denoting the specific family (redd) from which that fish was originally extracted. Each fish is spawned after ascertaining family and brood year by interrogation of the family-specific tag. The highest priority is to mate males and females from different brood years and, secondarily, from different families within brood years to assure the highest effective population size possible. When surplus males are generated, such as early maturation of two-yr-old precocial males, milt will be save through cryopreservation. Infrequently, an adult female may mature and ripen when a mate is not available. Use of non-sibling cryopreserved males would be used to fertilize the eggs. If this is not possible, biological data will be recorded and the individual will be sacrificed without spawning.

Adult-based Supplementation:

Broodstock will be collected randomly within a collection session but the number collected during any session will be proportional to the numerical abundance of the run at large at that point in time. Specific annual collection protocols will be developed to control the ratio of hatchery-origin and natural- origin spawners in the upstream natural spawning escapement and in the hatchery broodstock A broodstock collection protocol will be developed and agreed to each year by the Joint Fishery Parties.

8.2) Males.

Specify expected use of backup males, precocious males (jacks), and repeat spawners.

Juvenile-based Captive Brood:

It is intended that all males maturing during the spawning season will be used for fertilization. Males of differing age classes, including precocious males are routinely used in the ratio they occur during captive brood spawning. Program spawning protocols strive to achieve a 1:1 ratio of males and females, combined in 2x2, 3x3, or similar matrices to capture and maintain a substantial proportion of available genetic material. When large numbers of males mature at 2 yrs of age, milt will be cryopreserved; allowing the option for inclusion in subsequent spawning cycles and assuring availability of milt if an adequate number of live males are not available for spawning. Because the viability of cryopreserved sperm is generally low and highly unreliable, preference is given to using live males to achieve spawning objectives. Repeat spawners may be used when necessary if there is a shortage of males from appropriate families and age groups to meet mating protocols.

Adult-based Supplementation:

Specific spawning protocols for adult-based supplementation will be developed as the program transitions away from juvenile-based captive brood. Current protocols in use for other spring Chinook recovery and mitigation programs include 1:1 male to female ratios, individual matings, factorial matings using backup males, and inclusion of all age classes (jacks) in the ratio they occur.

8.3) Fertilization.

Describe spawning protocols applied, including the fertilization scheme used (such as equal sex ratios and 1:1 individual matings; equal sex ratios and pooled gametes; or factorial matings). Explain any fish health and sanitation procedures used for disease prevention.

Juvenile-based Captive Brood:

Spawning protocols call for a factorial spawning matrix, preferably with a 1:1 ratio of males and females and with a priority for matings between or among age classes or among families within age classes. The project strives for a minimum 2x2 factorial design to capture a large proportion of the genetic variance present in the population. At times more complex or unbalanced matrices such as 3x3 or 2x3 or greater may be incorporated if necessary to make sure that all available spawners are included.

The fertilized eggs from each individual cell within a factorial mating are held separately within incubators. Two elements are of importance. First, discrete matings (cells of a factorial design) can be monitored and evaluated to attribute sources (male or female) of high or low mortality rates through analysis of variance. Secondly, individual groups can be separated based on fish health status, especially bacterial kidney disease or viral status, following fish health screening.

During the spawning process, organ tissue from each female is sampled by a fish health expert to screen for pathogens, especially bacterial kidney disease. Ovarian fluid is also sampled and submitted to the WDFW Fish Health Laboratory for viral screening. Once fertilized, all eggs are water hardened in an iodophore solution to minimize transfer of disease organisms.

Adult-based Supplementation:

Specific spawning protocols for adult-based supplementation will be developed as the program transitions away from juvenile-based captive brood. Current protocols in use for other spring Chinook recovery and mitigation programs include 1:1 male to female ratios, individual matings, factorial matings using backup males, and inclusion of all age classes (jacks) in the ratio they occur.

8.4) Cryopreserved gametes.

If used, describe number of donors, year of collection, number of times donors were used in the past, and expected and observed viability.

Milt preserved in 1999:

1997-brood White R. males = 3
Preserved milt from two males has been used for White R. spawning to date. When used, preserved milt is expected to have viability ranging from zero to 90%. Average viability is reported to be about 30% (Greg Hudson, personal communication).

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.

(*e.g. "A factorial mating scheme will be applied to reduce the risk of loss of within population genetic diversity for the small chum salmon population that is the subject of this supplementation program".*).

Juvenile-based Captive Brood:

The greatest risk during spawning of captive broodstock is the loss of within-population genetic variance. Spawning protocols are in place specifically to minimize this risk. The captive brood spawning protocol requires that individual spawners be identified to family by interrogating coded-wire tags or PIT tags with codes unique to individual families. Tags are interrogated at time of spawning to allow design of factorial mating solutions and to assure that no full-sib matings occur. The priority is to produce matings across brood years (age classes) and across families within brood years. Milt from each male is checked for motility prior to use in matings.

A factorial mating scheme will be used to capture the maximum possible genetic variation. At minimum, a 2x2 factorial scheme will be used but at times more complex schemes such as 2x3 or 3x3 factorials may be used if appropriate to assure all mature spawners are included in the spawning population. In rare cases single males or females may be mated to maximize numerical abundance and to assure that all genetic material is captured for ensuing generations.

Adult-based Supplementation:

Specific spawning protocols for adult-based supplementation will be developed as the program transitions away from juvenile-based captive brood. As with captive broodstock, the greatest source of genetic risk is loss of within-population genetic variation. Current protocols in use for other spring Chinook recovery and mitigation programs to conserve genetic variation include 1:1 male to female ratios, individual matings, factorial matings using backup males, and inclusion of all age classes (jacks) in the ratio they occur.

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.

Provide data for the most recent twelve years (1988-99), or for years dependable data are available.

Survival rates to various life stages for several broods of White R. eyed eggs collected for captive broodstock (Murdoch and Hopley 2005)

Brood Year	Number of Eggs	Survival to Ponding(%)	Survival fry to Spawn (%)[1]
1997	527	100	4.0
1998	182	97	25.0
2000	272	96	31.7
2002	171	98	
2003	699	98	
	$\mu = 370$	$\mu = 97.8$	$\mu = 22.7$
[1] Data presented for complete brood years; goal is 30%			

Survival rates for various life stages for two broods of White R. second generation (F_2) eggs from spawning of captive broodstock (Murdoch and Hopley 2005)

Brood Year	% to eyed eggs	% eyed egg to ponding	% eyed egg to release[1]
2002	78	92	77
2003	37	94	
	$\mu = 57.5$	$\mu = 93.5$	
[1]Goal is 65%			

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

Describe circumstances where extra eggs may be taken (e.g. as a safeguard against potential incubation losses), and the disposition of surplus fish safely carried through to the eyed eggs or fry stage to prevent exceeding of programmed levels.

No surplus eggs have been collected during the duration of the program nor are surplus eggs expected.

9.1.3) Loading densities applied during incubation.

Provide egg size data, standard incubator flows, standard loading per Heath tray (or other incubation density parameters).

Each tray of a vertical incubator is populated with eggs from one female. Density per tray has ranged from 183 eggs to 1,529 eggs collected from one of more natural redds. Average density for F_2 progeny of captive broodstock has ranged from 985 to 1,548 over three years. The vertical style incubators are arranged in half stacks (eight trays) and receive 5 gpm of water flow each. The same protocols are expected during adult-based supplementation which is anticipated to result in approximately 4,400 eggs per tray of a vertical incubator assuming expected average fecundity of naturally spawning females within the ESU.

9.1.4) Incubation conditions.
Describe monitoring methods, temperature regimes, minimum dissolved oxygen criteria (influent/effluent), and silt management procedures (if applicable), and any other parameters monitored.

Juvenile-based Captive Brood:
Water flow system is monitored by alarm. Temperature is constant at 50^{o}F. Dissolved oxygen is tested periodically, usually when water flow has been adjusted. Dissolved oxygen is at saturation when water enters the incubators. Dissolved oxygen levels have decreased no more than 0.5 ppm at any check. Eggs were placed on chilled water starting with the 2005 brood year.

Adult-based Supplementation:

Incubation systems are not yet constructed. Operating criteria will be provided prior to operation.

9.1.5) Ponding.
Describe degree of button up, cumulative temperature units, and mean length and weight (and distribution around the mean) at ponding. State dates of ponding, and whether swim up and ponding are volitional or forced.

Juvenile-based Captive Brood:

Fry are presently ponded at button up directly from vertical incubators to 4 ft diameter tanks. Length and weight samples are not taken at ponding to minimize handling stress.

Adult-based Supplementation:

Facilities are not yet constructed. Operating criteria will be provided prior to operation.

9.1.6) Fish health maintenance and monitoring.
Describe fungus control methods, disease monitoring and treatment procedures, incidence of yolk-sac malformation, and egg mortality removal methods.

Juvenile-based Captive Brood:

Eggs in vertical incubators are treated periodically with formalin to control fungus. Vertical incubator trays are generally left undisturbed. Any mortality is removed by picking individual eggs. For second generation progeny, mortality is removed by picking individual eggs at the eyed stage after shocking.

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. (*e.g. "Eggs will be incubated using well water only to minimize the risk of catastrophic loss due to siltation.")*

Juvenile-based Captive Brood:

Eggs are incubated in pathogen-free well water at all times. Eggs are left undisturbed to maximize survival. Fungus is controlled with periodic formalin treatment. Water source has equipped with alarms and power supply is protected by back-up generators.

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..

Juvenile-based Captive Brood:

See Section 9.1.1

Broodstock:

Average survival from eyed egg to maturity has averaged 22.7% and ranged from 4% to 31.7% for the three brood years for which complete data are available (Murdoch and Hopley 2005).

Second generation F_2 progeny:

The F_2 survival from green to eyed egg has averaged 57.5% and ranged from 37% to 78% over two years of available data. Survival from eyed egg to ponding averaged 93.5% and ranged from 92% to 94%. Survival from eyed egg to release was 77% for 2002 brood smolts released in 2004 (Murdoch and Hopley 2005).

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

Include density targets (lbs fish/gpm, lbs fish/ft3 rearing volume, etc).

Juvenile-based Captive Brood:

Broodstock:

The density index for captive broodstock is 0.1lbs/ft^3/inch of length not to exceed 0.5lbs/ft^3 at 10g and larger (John Morrison, personal communication). Minimum flow index for captive broodstock is 1.8lbs/gpm/inch of length. Captive broodstock rearing is within these parameters.

Second generation progeny:
Density and loading criteria have recently been revised and implemented for second generation progeny of captive broodstock. The density index is .06 lbs/ft^3/inch of length for lots with BKD Eliza optical density (od) equal to or greater than 0.12; 0.125 lbs/ft^3/inch of length for lots with BKD Eliza od less than 0.12. Minimum flow index for BKD management is 0.6 lbs/gpm/inch of length for lots with BKD od equal to or greater than 0.12 and 0.125 lbs/gpm/inch of length for lots with BKD od values less than 0.12. Operational flow for circular tanks and raceways is 1.5 water exchanges per hour. Prior to May 2005, density and loading criteria for second generation progeny matched the WDFW Fish Health Manual standards. Rearing of White R. captive brood progeny has been within the criteria prescribed at the time.

<u>Adult-based Supplementation:</u>

Density and loading indices currently being used for hatchery design are the same as those presented above for second generation progeny (see also Section 1.10.1).

9.2.3) Fish rearing conditions
(Describe monitoring methods, temperature regimes, minimum dissolved oxygen, carbon dioxide, total gas pressure criteria (influent/effluent if available), and standard pond management procedures applied to rear fish).

<u>Juvenile-based Captive Brood:</u>

As fry reach button up, they are presently removed from the vertical incubators and placed by discrete family unit into semi-round 4ft rearing tanks with volume approximately 18ft^3 and approximately 5gpm of flow. Families are held in these tanks until they are marked with individual PIT tags denoting family and individual. The tagging scheme is necessary to differentiate families to develop mating strategies during spawning and to allow tracking of individual fish for growth and mortality assessment. In addition, a coded-wire tag denoting specific family is placed in the adipose fin to provide redundancy if the PIT tag is lost.

After tagging, broodstock fish are redistributed to 10, 20, and 50ft diameter circular rearing tanks with volumes of 235, 1256, and 6868 ft^3 and flows of 30, 125, and 250 gpm, respectively and reared for up to five years until mature. Each family is divided and reared at two locations to assure that no family is lost due to unanticipated catastrophic events. Feeding schedules are adjusted during the rearing season according to anticipated growth rates and feed conversions. Mortality is removed daily and each fish is recorded by family of origin. Fish health monitoring is performed by WDFW fish health specialists under contract to the District.

Temperature is constant at 50°F. Flow levels are adjusted periodically to stay within loading criteria. Oxygen and total gas levels are routinely monitored and checked in particular after any flow adjustments are made. Total dissolved gas is stabilized to approximately 102.5 by passing water through packed columns before delivery to incubators are rearing tanks. At least annually, a total water chemistry work-up is performed by a commercial lab and results are compared to established standards. Results have consistently been within acceptable ranges.

Other rearing sites are being investigated with priority sites in Eastern Washington and near the White R. Basin.

Adult-based Supplementation:

Facilities have not been constructed. Operating criteria will be provided prior to beginning of rearing operations and will be consistent with Section 1.10.1 above and with the 2002 Hopley document.

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.

Captive broodstock is not routinely sampled for length and weight to avoid additional stress. Size data is estimated from mortalities. The following weight estimates for 2002 brood captive broodstock are derived from monthly tank utilization records and are indicative of growth rates for captive broodstock through two years of rearing.

Month	Weight (g)	% gain	Month	Weight (g)	% gain
January '03	.39		January '04	45.0	50.0
February	.91	33.3	February	64.0	42.2
March	1.7	86.8	March		
April	3.0	76.4	April	98.0	53.3[1]
May	4.5	50.0	May	144.0	46.9
June	6.7	48.9	June	181.0	25.7
July	9.2	37.3	July	222.0	22.7
August	15.0	63.0	August	260.0	17.1
September	17.0	13.3	September	298.0	14.6
October			October	345.0	15.8
November			November		
December	30.0	76.5[1]	December	579.0	67.8[1]
[1] Gain over two or more months					

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.
Contrast fall and spring growth rates for yearling smolt programs. If available, indicate hepatosomatic index (liver weight/body weight) and body moisture content as an estimate of body fat concentration data collected during rearing.

See response to 9.2.4

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*).

Juvenile-based Captive Brood:

Broodstock:
Feed is procured from various suppliers depending on recommendations of fish health specialists and availability. Feed type is semi-moist or moist formulation and has been adjusted over the years as recommended. Feed sizes range from starter flakes or mash up to #6 brood pellets. Feed rates range from about 3.5% body weight per day for recently ponded fry to 0.5% per day for adult fish reaching maturity. Feeding is discontinued when fish mature and are near spawning. Feed conversion calculations are not applied during broodstock rearing because a slight excess of feed is provided to rearing tanks and accuracy would be suspect.

Second generation progeny:
Feeding rates range from 3.5% immediately following ponding to about 1% in the later stages of rearing and before release.

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

Juvenile-based Captive Brood:

Fish health monitoring is performed by WDFW fish health specialists under contract to the District. Routine visits are scheduled every two weeks. During those visits fish health examinations are performed on mortalities collected since the last visit and on moribund fish from the rearing tanks. Typical treatments are as follows:

- Formalin – prophylactic fungal treatment and post-handling.
- Aquamycin – fed for BKD treatment and prophylaxis.
- Erythromycin – fed and injected to manage BKD.
- Azithromycin – fed and injected to manage BKD.
- Choramin T – bath to treat external bacteria.

In addition, fish health specialists are present during spawning at which time they take pathogen and viral screening samples.

Adult-based Supplementation:

Fish health will be managed consistent with WDFW Fish Health Manual (1996), Co-Managers Fish Disease Control Policy (1997), and Pacific Northwest Fish Health Protection Committee (1989).

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

No biochemical smolt development indices have been used to date. Indicators of smoltification such as coefficient of variation in length and condition factor may be used as production levels increase. Length and weight data were taken at release in 2004 and 2005. Condition factors were subsequently calculated but were not used as predictors of smolt preparedness.

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

"Natures" type rearing has not been incorporated into the captive broodstock program. All rearing takes place within buildings or covered outdoor tanks. Lighting is therefore subdued but photoperiod is normal. Natural rearing methods may be incorporated into new F_2rearing facilities and the adult-based supplementation plan but planning has not matured adequately at this time (June 2005).

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. (*e.g. "Fish will be reared to sub-yearling smolt size to mimic the natural fish emigration strategy and to minimize the risk of domestication effects that may be imparted through rearing to yearling size.")*

Juvenile-based Captive Brood:

- Staffing allows for rapid response for protection of fish from risk factors (water loss, power loss, etc).
- Backup generators supply an alternate source of power during outages.
- Protocols are in place to test standby generators and all alarm systems on a routine basis.
- Multiple rearing sites or footprints for rearing each family of captive broodstock.
- Alarm systems installed and operating at each rearing vessel to detect loss of or reduced flow and reduced operating head in each vessel.
- Densities will be kept at minimum levels to reduce loss of fish to disease and reduce the risk of domestication.
- All equipment is disinfected between uses on different lots of fish including nets, crowders, boots, raingear, etc.
- Chilled incubation water will be used (beginning 2005) to delay initial fry ponding thereby reducing the first year growth period and limiting the number of precocial males.
- Fish culture practices will be adjusted to increase size and fecundity at maturation to better represent those found in the parent population.

- Lots of second generation progeny will be segregated according to BKD status of the parents.
- Survival will be maximized to the extent possible to improve numerical abundance and retain maximum available genetic variation.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program. *Specify any management goals (e.g. number, size or age at release, population uniformity, residualization controls) that the hatchery is operating under for the hatchery stock in the appropriate sections below.*

10.1) Proposed fish release levels. *(Use standardized life stage definitions by species presented in **Attachment 2**. "Location" is watershed planted (e.g. "Elwha River").)*

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling	Up to 90,000 (years 2007 – 09)	80 - 30	Variable	White River
Yearling	150,000	15	April	White River

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

Stream, river, or watercourse: *(include name and watershed code (e.g. WRIA) number)*

Release point: White River

Major watershed: Wenatchee

Basin or Region: Upper Columbia River

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

*For existing programs, provide fish release number and size data for the past three fish generations, or approximately the past 12 years, if available. Use standardized life stage definitions by species presented in **Attachment 2**. Cite the data source for this information.*

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
2004							2589[1]	8 ffp
2005							1946[2]	8.4 ffp
Average							2268	8.2 ffp

Data source: [1]Murdoch and Hopley 2005; [2]Tonseth personal communication

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

Provide the recent five year release date ranges by life stage produced (mo/day/yr). Also indicate the rationale for choosing release dates, how fish are released (volitionally, forced, volitionally then forced) and any culling procedures applied for non-migrants.

Second generation (F2) progeny of captive broodstock have been released into the White R. in two consecutive years. In each case, temporary acclimation tanks were installed by Grant Co. PUD at Tall Timbers Ranch located at river kilometer 18.5. Pre-smolts from 2002 brood spawning were transported to the acclimation facilities on 5 April 2004. They were force released on 22 April 2004 after receiving 17 days of acclimation. Pre-smolts from the 2003 brood spawning were transported to the acclimation site on 16 March 2005. They were force released on 2 May, 2005 after 47 days of acclimation. In each case, individual weight sample were taken as fish were being released.

10.5) Fish transportation procedures, if applicable.

Describe fish transportation procedures for off-station release. Include length of time in transit, fish loading densities, and temperature control and oxygenation methods.
Not applicable

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

See Section 10.4

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

All fish produced in the hatchery will be marked prior to release. Specific marking type has not been determined, but marks will be selected that can be interrogated without sacrifice to allow identification of individual adults by origin. Two small groups of White R. smolts have been released (see Sections 10.3 and 10.4) without artificial marks. This strategy was used because all other hatchery groups that might be encountered had an externally readable tag or external mark. In this situation, the absence of a mark is in itself considered equivalent to an identifiable mark.

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

The project is not expected to produce surplus fish for release. Fish resulting for the over capacity of program rearing space would be direct planted into their natal stream.

10.9) Fish health certification procedures applied pre-release.

Within two weeks of release a Fish Health Specialist will document smolt health through such indices as condition factor, fin condition, descaling and, if necessary, autopsy-based analysis such as organosomatic indexing. Epizootics may trigger review and recommendations by the JFP before release.

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

To protect temporary acclimation sites from water system failure, three levels of redundancy have been installed. Supplemental oxygen has been plumbed to release oxygen into rearing tanks if low flow is detected via the flow alarm system. Standby generators have been supplied to produce power in the event of electrical supply loss. Flow and power alarms are sent to staff who will respond and restore flow and release fish if necessary. Permanent acclimation facilities will be designed and constructed with a full array of alarm systems.

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.

(*e.g. "All yearling coho salmon will be released in early June in the lower mainstem of the Green River to minimize the likelihood for interaction, and adverse ecological effects, to listed natural chinook salmon juveniles, which rear in up-river areas and migrate seaward as sub-yearling smolts predominately in May").*

The risk of ecological hazards to listed spring Chinook resulting from liberations of hatchery-origin spring Chinook will be minimized through the following measures:

- Hatchery spring Chinook will be reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in the streams after release and promoting rapid seaward migration. Degree of smoltification may be assessed through measurement of coefficient of variation for fork length or average condition factor.
- Spring Chinook smolt releases will be timed with water budget releases from upstream dams to further accelerate seaward migration and reduce the duration of interactions with wild fish.
- Acclimation in natal stream water will contribute to smoltification, reducing the residence time in the rivers and mainstem corridors.
- Total number of smolts released is calibrated to be within the tributary carrying capacity.

The risk of genetic hazards to listed spring Chinook resulting from liberations of hatchery-origin spring Chinook will be minimized through the following measure:

- Hatchery spring Chinook smolts will be liberated after imprinting in the desired adult return location to minimize the risk of straying into other tributaries.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

This section describes how "Performance Indicators" listed in Section 1.10 will be monitored. Results of "Performance Indicator" monitoring will be evaluated annually and used to adaptively manage the hatchery program, as needed, to meet "Performance Standards".

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.

Major monitoring and evaluation objectives are presented below. For a detailed listing of tasks necessary to achieve these stated objectives, see Attachment Y.

NATURAL PRODUCTION

Objective 1: Determine that actions taken under the Grant Co. PUD compensation program result in increased natural production and conserve the genetic integrity and productivity of naturally spawning populations of spring chinook salmon in the target tributaries.

Objective 2. Determine if salmon released from Grant Co. PUD compensation facilities interact adversely with natural productivity of non-target taxa in the target tributaries.

ARTIFICIAL PRODUCTION

Objective 3: Determine that actions taken under the Grant Co. PUD captive brood program conserve the genetic integrity and long-term fitness of naturally spawning populations of spring chinook salmon in the target tributaries.

Objective 4: Determine that actions taken under the Grant Co. PUD adult-based supplementation program conserve the genetic integrity and long-term fitness of naturally spawning populations of spring chinook salmon in the target tributaries.

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Objective 5. Determine if salmon released from Grant Co. PUD compensation facilities interact adversely with natural productivity in the target tributaries.

Objective 6: Determine if the captive brood facilities used in the Grant Co. PUD compensation plan are capable of meeting artificial propagation objectives

Objective 7: Determine if the captive brood programs are meeting established performance criteria.

Objective 8: Determine if the adult-based supplementation facilities used in the Grant Co. PUD compensation plan are capable of meeting artificial propagation objectives.

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Objective 9: Determine if the Grant Co. PUD adult-based supplementation programs are meeting established performance criteria.

Objective 10: Evaluate the impacts of hydraulic egg/fry collection techniques on the overall survival of spring chinook eggs/fry remaining in sampled redds.

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 Biological Opinion for the Priest Rapids Hydroelectric Complex contains requirements for development and funding of a monitoring and evaluations program. Proposals will be reviewed and approved by the PRCC Hatchery Subcommittee, prior to review and approval by the Priest Rapids Coordinating Committee and funded by Grant County Public Utility District #2..

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.

(*e.g. "The Wenatchee River smolt trap will be continuously monitored, and checked every eight hours, to minimize the duration of holding and risk of harm to listed spring chinook and steelhead that may be incidentally captured during the sockeye smolt emigration period.)"*

SECTION 12. RESEARCH

Provide the following information for any research programs conducted in ***direct association with the hatchery program described in this HGMP. Provide sufficient detail to allow for the independent assessment of the effects of the research program on listed fish****. If applicable, correlate with research indicated as needed in any ESU hatchery plan approved by the co-managers and NMFS. Attach a copy of any formal research proposal addressing activities covered in this section. Include estimated take levels for the research program with take levels provided for the associated hatchery program in* ***Table 1****.*

12.1) Objective or purpose.

Indicate why the research is needed, its benefit or effect on listed natural fish populations, and broad significance of the proposed project.

The project is not a research project. The Monitoring and Evaluation Plan referenced above will produce significant data and information on the success and effects of captive brood and supplementation programs applied to the conservation and recovery of listed species.

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 period 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 or range of 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 objectives.

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.
(*e.g. "Listed coastal cutthroat trout sampled for the predation study will be collected in compliance with NMFS Electrofishing Guidelines to minimize the risk of injury or immediate mortality.")*.

SECTION 13. ATTACHMENTS AND CITATIONS

Include all references cited in the HGMP. In particular, indicate hatchery databases used to provide data for each section. Include electronic links to the hatchery databases used (if feasible), or to the staff person responsible for maintaining the hatchery database referenced (indicate email address). Attach or cite (where commonly available) relevant reports that describe the hatchery operation and impacts on the listed species or its critical habitat. Include any EISs, EAs, Biological Assessments, benefit/risk assessments, or other analysis or plans that provide pertinent background information to facilitate evaluation of the HGMP.

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SECTION 14. 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:_____________

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: _O. tshawytscha________ ESU/Population: Upper Col spring run_________ Activity:__Captive brood/supplementation

Location of hatchery activity:_AquaSeed/Wenatchee R Dates of activity:_Year-round_________ Hatchery program operator:_AquaSeed Inc/WDFW

Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				50
Collect for transport b)				
Capture, handle, and release c)		25,000	750	
Capture, handle, tag/mark/tissue sample, and release d)		Up to 250,000		5-1000
Removal (e.g. broodstock) e)	1700		200	
Intentional lethal take f)			255-495	
Unintentional lethal take g)		0-150,700		
Other Take (specify) h)				

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.

Instructions:

1. *An entry for a fish to be taken should be in the take category that describes the greatest impact.*
2. *Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).*
3. *If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.*

Attachment 1. Definition of terms referenced in the HGMP template.

Augmentation - The use of artificial production to increase harvestable numbers of fish in areas where the natural freshwater production capacity is limited, but the capacity of other salmonid habitat areas will support increased production. Also referred to as “fishery enhancement”.

Critical population threshold - An abundance level for an independent Pacific salmonid population below which: depensatory processes are likely to reduce it below replacement; short-term effects of inbreeding depression or loss of rare alleles cannot be avoided; and productivity variation due to demographic stochasticity becomes a substantial source of risk.

Direct take - The intentional take of a listed species. Direct takes may be authorized under the ESA for the purpose of propagation to enhance the species or research.

Evolutionarily Significant Unit (ESU) - NMFS definition of a distinct population segment (the smallest biological unit that will be considered to be a species under the Endangered Species Act). A population will be/is considered to be an ESU if 1) it is substantially reproductively isolated from other conspecific population units, and 2) it represents an important component in the evolutionary legacy of the species.

Harvest project - Projects designed for the production of fish that are <u>primarily</u> intended to be caught in fisheries.

Hatchery fish - A fish that has spent some part of its life-cycle in an artificial environment and whose parents were spawned in an artificial environment.

Hatchery population - A population that depends on spawning, incubation, hatching or rearing in a hatchery or other artificial propagation facility.

Hazard - Hazards are undesirable events that a hatchery program is attempting to avoid.

Incidental take - The unintentional take of a listed species as a result of the conduct of an otherwise lawful activity.

Integrated harvest program - Project in which artificially propagated fish produced <u>primarily</u> for harvest are intended to spawn in the wild and are fully reproductively integrated with a particular natural population.

Integrated recovery program - An artificial propagation project <u>primarily</u> designed to aid in the recovery, conservation or reintroduction of particular natural population(s), and fish produced are intended to spawn in the wild or be genetically integrated with the targeted natural population(s). Sometimes referred to as “supplementation”.

Isolated harvest program - Project in which artificially propagated fish produced <u>primarily</u> for harvest are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Isolated recovery program - An artificial propagation project <u>primarily</u> designed to aid in the recovery, conservation or reintroduction of particular natural population(s), but the fish produced are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Mitigation - The use of artificial propagation to produce fish to replace or compensate for loss of fish or fish production capacity resulting from the permanent blockage or alteration of habitat by human activities.

Natural fish - A fish that has spent essentially all of its life-cycle in the wild and whose parents spawned in the wild. Synonymous with *natural origin recruit (NOR).*

Natural origin recruit (NOR) - See *natural fish* .

Natural population - A population that is sustained by natural spawning and rearing in the natural habitat.

Population - A group of historically interbreeding salmonids of the same species of hatchery, natural, or unknown parentage that have developed a unique gene pool, that breed in approximately the same place and time, and whose progeny tend to return and breed in approximately the same place and time. They often, but not always, can be separated from another population by genotypic or demographic characteristics. This term is synonymous with stock.

Preservation (Conservation) - The use of artificial propagation to conserve genetic resources of a fish population at extremely low population abundance, and potential for extinction, using methods such as captive propagation and cryopreservation.

Research - The study of critical uncertainties regarding the application and effectiveness of artificial propagation for augmentation, mitigation, conservation, and restoration purposes, and identification of how to effectively use artificial propagation to address those purposes.

Restoration - The use of artificial propagation to hasten rebuilding or reintroduction of a fish population to harvestable levels in areas where there is low, or no natural production, but potential for increase or reintroduction exists because sufficient habitat for sustainable natural production exists or is being restored.

Stock - (see “Population”).

Take - To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Viable population threshold - An abundance level above which an independent Pacific salmonid population has a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame.

Attachment 2. Age class designations by fish size and species for salmonids released from hatchery facilities.

(generally from Washington Department of Fish and Wildlife, November, 1999).

	SPECIES/AGE CLASS	SIZE CRITERIA Number of fish/pound	Grams/fish
•	Chinook Yearling	<=20	>=23
•	Chinook (Zero) Fingerling	>20 to 150	3 to <23
•	Chinook Fry	>150 to 900	0.5 to <3
•	Chinook Unfed Fry	>900	<0.5
•	Coho Yearling 1/	<20	>=23
•	Coho Fingerling	>20 to 200	2.3 to <23
•	Coho Fry	>200 to 900	0.5 to <2.3
•	Coho Unfed Fry	>900	<0.5
•	Chum Fed Fry	<=1000	>=0.45
•	Chum Unfed Fry	>1000	<0.45
•	Sockeye Yearling 2/	<=20	>=23
•	Sockeye Fingerling	>20 to 800	0.6 to <23
•	Sockeye Fall Releases	<150	>2.9
•	Sockeye Fry	> 800 to 1500	0.3 to <0.6
•	Sockeye Unfed Fry	>1500	<0.3
•	Pink Fed Fry	<=1000	>=0.45
•	Pink Unfed Fry	>1000	<0.45
•	Steelhead Smolt	<=10	>=45
•	Steelhead Yearling	<=20	>=23
•	Steelhead Fingerling	>20 to 150	3 to <23
•	Steelhead Fry	>150	<3
•	Cutthroat Trout Yearling	<=20	>=23
•	Cutthroat Trout Fingerling	>20 to 150	3 to <23
•	Cutthroat Trout Fry	>150	<3
•	Trout Legals	<=10	>=45
•	Trout Fry	>10	<45

1/ Coho yearlings defined as meeting size criteria <u>and</u> 1 year old at release, <u>and</u> released prior to June 1st.
2/ Sockeye yearlings defined as meeting size criteria <u>and</u> 1 year old.