HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Yakima Basin Coho Reintroduction Project
Species or Hatchery Stock:	Coho Salmon (*Oncorhynchus kisutch*)
Agency/Operator:	Yakama Nation (lead agency) in cooperation with WDFW and BPA as funding agency
Watershed and Region:	Yakima River Subbasin/Columbia Plateau Province
Date Submitted:	May 2010
Date Last Updated:	April 2004; updated July 2005, Nov 2007, Jan 2009; January 7, 2010; May 10, 2010

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program: Yakima Basin Coho Reintroduction Project

Brief History and Description: This project was initiated as part of the U.S. v Oregon Columbia River Fish Management Plan with a stated purpose of providing "for a directed tribal harvest within the Yakima River system". Through the mid-1980s and early 1990s approximately 700,000 coho were imported and released annually as pre-smolts in the Yakima River below the Wapato irrigation diversion dam. In 1996, the scope of the project was expanded under the Yakima-Klickitat Fisheries Project, "to determine the feasibility of re-establishing a naturally spawning population and a significant fall fishery for coho in the Yakima River Basin" (BPA 1996). The first phase of this effort (referred to as Phase I in this document) was aimed at moving release sites to locations above the confluence of the Yakima and Naches rivers and evaluating the extent and "feasibility" of naturally spawning coho in the Yakima Basin. This effort was considered successfully completed in 2003 and results were published in Bosch et al. (2007). The second phase of this effort is ongoing and is referred to as Phase II in this document. The goal of Phase II is to increase spawning in tributaries and to phase out imported releases of coho in the Yakima Basin replacing them with fish reared from locally collected brood stock. Phase II is expected to culminate in the development of a long-term Master Plan for Yakima Basin coho in 2011-2012. The Master Plan will discuss options, strategies, and recommendations for long-term production of coho in the Yakima Basin. It is expected that this HGMP will again be updated pursuant to submittal of the Master Plan for review through the Northwest Power and Conservation Council's (NPCC) 3-step review process.

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

Coho Salmon (*Oncorhynchus kisutch*)
ESA Status: Not listed and not a candidate for listing

1.3) Responsible organization and individuals

Indicate lead contact and on-site operations staff lead.

Name (and title): Joe Blodgett, Fish Production Biologist and Facility Manager
Agency or Tribe: Yakama Nation
Address: P.O. Box 151, Toppenish, WA 98948
Telephone: (509) 865-5121, ext. 6706
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Email: joewb@earthlink.net

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

Co-Operators	Role
Bonneville Power Administration	Funding Entity- Administrator
U.S. Bureau of Reclamation	Owner of facility land; and minor funding entity for facility upgrades and public education
U.S. Fish and Wildlife Service	Mitchell Act Funds (Eagle Creek Fish Production / Acclimation of Out of Basin Production); Decision on Listed Species; Fish Pathology Monitoring & Analyses

National Marine Fisheries Service	Decision on Listed Species
Washington Department of Fish & Wildlife	Co-Manager
Northwest Power and Conservation Council (NPCC)	Makes Fish and Wildlife Program decisions under the Northwest Power Act.

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

Funding sources: Bonneville Power Administration, Yakama Nation, U.S. Bureau of Reclamation (Funds for facility improvements, public education, in-kind land contribution), Mitchell Act, NOAA Fisheries.

Staffing and annual operational costs:
Prosser Hatchery
9 scientific technicians, 2 management biologists, total of 11 full time equivalent staff. Annual operating cost: $1,141,042. These data include staff and costs for both Yakama coho and fall Chinook programs.

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.

Note that in the past out-of-basin coho had been received from the Little White Salmon/Willard NFH Complex (LWS/Willard) but was discontinued due to funding cuts. Currently out-of-basin coho salmon come from Washougal State Hatchery and the Eagle Creek NFH. All broodstock collection and rearing activities at these facilities will not be described in this document. An HGMP for the Eagle Creek NFH coho salmon program which supplies coho salmon to this program has been submitted to NMFS for approval and is available at:
http://www.fws.gov/Pacific/fisheries/hatcheryreview/Reports/columbiagorge/EC--002COS_hgmp_5_04.pdf. The Eagle Creek NFH Coho program is currently covered under a Section 7 Biological Opinion date November 27, 2007 (http://www.nwr.noaa.gov/Salmon-Harvest-Hatcheries/Hatcheries/Sec-7-USFWS-Columbia.cfm).
An HGMP for the Washougal State Hatchery coho salmon program is available at:
http://wdfw.wa.gov/hat/hgmp/

Broodstock source	Yakima River and out-of-basin sources (See note above).
Broodstock collection location (stream, RKm, subbasin)	Prosser Dam- Right Bank Fish Ladder, Yakima, RKm 75.4. Also at Roza on Upper Yakima and at Cowiche, and Wapatox Dams in the Lower Naches system.
Adult holding location (stream, RKm, subbasin)	Prosser Hatchery (Off river of the Yakima River ~0.75 miles downstream of Prosser Dam , RKm 75.1, Yakima Subbasin
Spawning location (stream, RKm, subbasin)	Prosser Hatchery (Off river of the Yakima River ~0.75 miles downstream of Prosser Dam , RKm 75.16Yakima Subbasin
Incubation location (facility name, stream, RKm, subbasin)	Prosser Hatchery (Off river of the Yakima River ~0.75 miles downstream of Prosser Dam , RKm 75.16, Yakima Subbasin
Rearing location (facility name, stream, RKm, subbasin)	Prosser Hatchery (Off river of the Yakima River ~0.75 miles downstream of Prosser Dam , RKm 75.1, Yakima Subbasin

WRIA code for Prosser Dam and Hatchery: 37

Acclimation Sites
Naches River (WRIA code 38):
Stiles Ponds (T14N, R18E, Sec 31, SW ¼; RM 9.0; WRIA code 38)
Lost Creek Ponds (T17N, R14E, Sec 35, NE ¼; RM 38.6; WRIA code 38)
Yakima River (WRIA code 39):
Holmes Property (RM 160; WRIA code 39)
Boone Pond (RM 180.5; WRIA code 39)
Hundley Pond (RM 191; WRIA code 39)
Brunson Pond (Wilson Creek RM 6.8; WRIA code 39)
Reecer Creek Acclimation Pond (Reecer Creek RM .5 WRIA code 39)
Courier Creek Acclimation Pond (Courier Creek RM 1.5 WRIA code 39)
Lake Cle Elum (from net pens above dam; WRIA code 39)
Mobile Acclimation:
Mobile acclimation unit rotating yearly between the following tributaries:
Toppenish Ck (WRIA code 37), Cowiche Ck (WRIA code 38), Ahtanum Ck (WRIA code 37), Rattlesnake Creek (WRIA 38)

1.6) Type of program.

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

This is an integrated program to provide fish for harvest and recovery. Initially this was a *U.S. v Oregon* production (mitigation) program designed to provide upriver production for the Tribal fisheries. In 1996, the program was adopted into the Yakima-Klickitat Fisheries Project (YKFP) as an effort to test the feasibility of using supplementation to re-establish self-sustaining populations in the basin. Providing fish for harvest continues to be a goal of the program as well.

1.7) Purpose (Goal) of program.

Define as either: Augmentation, Mitigation, Restoration, Preservation/Conservation, or Research (for Columbia Basin programs, use NPCC 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".

Consistent with federal treaty obligations, existing laws and plans, the purposes of this program are to: mitigate for historical losses in tribal usual and accustomed fishing areas, provide fish for harvest, and contribute to regional conservation, recovery, research and education goals.

The Yakima Coho Reintroduction Program's short-term goal (Phases I and II) is to determine the feasibility of re-establishing a naturally spawning coho population and a

significant fall fishery for coho within the Yakima River Basin, while keeping adverse ecological impacts within acceptable limits.

The long-term goal is to design and implement a hatchery production program based on outcomes from the short-term feasibility study. The YKFP Policy Group will determine the course of actions (i.e., supplementation of naturalized populations, harvest augmentation, alternative production program, etc.) to be pursued for the long-term program. This decision will be consistent with YKFP goals, the *U.S. vs. Oregon* decision and the Columbia River Fisheries Management Plan (CRFMP). The timeline for implementation of a long-term Yakima Basin coho production program is as follows:
2011 – Update and resubmittal of Yakima Basin coho Master Plan to NPCC for step review (with concurrent update of this HGMP)
2012-2013 – NPCC step review and approval of Master Plan
2013-2014 – construction of required coho facilities
2015 and beyond - implementation

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).

- Wild stocks of coho salmon were once widely distributed within the Columbia River Basin, including the Yakima River. However, coho salmon were extirpated from the Yakima River in the early 1980s.
- As stated in Section II.F and III.A of the *U.S. v Oregon* 2008-2017 Management Agreement (2008): "The Parties recognize that the actions defined in this Agreement reflect the Parties' best efforts at reaching a negotiated agreement to protect, rebuild, and enhance upper Columbia River coho while providing harvests for both treaty Indian and non-treaty fisheries. … The Parties intend to use artificial production techniques where appropriate, among other strategies, to assist in rebuilding weak runs and mitigating for lost production. … The Parties hereby commit to a good faith effort to meet the juvenile release programs identified in Tables B1, B2, B3, B4 (A or B), B5, B6, and B7."
- This project meets the definition of "Restoration" from NPCC document 99-15: "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."
- To contribute to scientific knowledge regarding the effects of hatchery supplementation on natural salmon populations. For example, the Yakima and mid-Columbia coho restoration programs have documented evidence that any domestication effects from long-established hatchery stocks may be reversed after just a few generations of being re-established in native wild habitats (Murdoch et al. 2006; Bosch et al. 2007).

The program is included in the *United States versus Oregon* 2008-2017 Columbia River Fish

Management Plan and the recently signed Columbia River Accords between the Columbia River Tribes and the Bonneville Power Administration. The program is consistent with the Yakima Subbasin Salmon Recovery Plan (Freudenthal et al. 2005).

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 NPCC "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.

Example: " (1) Conserve the genetic and life history diversity of Upper Columbia River spring chinook populations through a 12 year duration captive broodstock program; (2) Augment, restore and create viable naturally spawning populations using supplementation and reintroduction strategies; (3) Provide fish to satisfy legally mandated harvest in a manner which minimizes the risk of adverse effects to listed wild populations; (4)....".

See Section 3.4 and Section 6 of the master plan (Hubble et al. 2004). The master plan's objectives correspond to Performance Standards, and its strategies correspond to Performance Indicators (see 1.10 of this HGMP).

Objective 1. Attempt to establish naturally producing coho populations in the upper and lower Yakima River and tributaries, and in the Naches River and tributaries.
Objective 2. Continue to investigate the coho life history in the Yakima basin.
Objective 3. Assess ecological interactions.
Objective 4. Develop and test use of additional culturing, acclimation and monitoring sites.
Objective 5. Determine long-term facility needs.

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 NPCC "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.*").

Performance Indicators Addressing Benefits		
Indicator	Performance Standard	Indicator is Monitored
Total number of fish harvested in tribal fisheries targeting this program.	Program contributes to fulfilling tribal trust responsibility mandates and treaty rights, as described in *U.S. v. Oregon* management agreements	*U.S. v OR* TAC and YN monitoring
Number of fish released by program, returning, or caught, as applicable to given mitigation requirements.	Program contributes to mitigation requirements.	*U.S. v OR* TAC and YN monitoring
Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated incidental mortalities, by fishery.	Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding overharvest of non-target species.	*U.S. v OR* TAC and YN monitoring documents total harvest of coho in fisheries; proportion Yakima would need to be derived from available information such as release numbers, dam counts, etc.
Annual escapements of natural populations that are affected by fisheries targeting program fish.		YN conducts annual redd counts of naturally spawning coho in the Yakima Basin. In addition, since all hatchery-released coho are marked (see 7.3), enumeration of hatchery and natural coho migrating upstream at Prosser Dam is accomplished through video monitoring at the left and center ladders plus sampling of approximately 40% of the return passing upstream by way of the Prosser right bank denil trap and sampling facility.
Annual number of spawners on spawning grounds, by age.	Artificial propagation program contributes to an increasing number of spawners returning to natural spawning areas.	YN estimates Yakima River run size from Prosser dam count, harvest, and redd count data. Age composition can be estimated from Prosser Denil passage and Prosser hatchery broodstock scale sampling.
Annual number of redds in selected natural production index areas.		YN conducts annual redd counts of naturally spawning coho in the Yakima Basin

1.10.2) "Performance Indicators" addressing risks.

(*e.g. "Evaluate predation effects on listed fish resulting from hatchery fish releases."*).

Performance Indicators Addressing Risks		
Indicator	Performance Standard	Indicator is Monitored
Marking rate by mark type for each release group.	Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.	Yes, marking rates for each mark group are documented. See 7.3 and response to "Annual escapements of natural populations…" above.
Temporal distribution of broodstock collection, and of naturally produced population at point of collection.	Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of the population from which broodstock is taken.	Yes, see response to "Annual escapements of natural populations…" above.
Age composition of broodstock collected, and of naturally produced population at point of collection.		Scale samples are taken from all brood collected for age composition.

Number of spawners of natural origin removed for broodstock.	Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas.	Proportion of Hatchery- and natural-origin fish used for brood is documented via mark sampling at brood collection and spawn time.
Number and origin of spawners migrating to natural spawning areas.		Number and origin of natural spawners is documented. See response to "Annual escapements of natural populations…" above.
Number of eggs or juveniles placed in natural rearing areas.		Juveniles are released from acclimation sites in natural juvenile rearing areas. These numbers are documented annually.
Life history characteristics	Life history characteristics of the natural population do not change as a result of this artificial production program.	The following characteristics are monitored on an annual basis: Juvenile migration timing (at Chandler), juvenile size at outmigration (Chandler and hatchery release sampling operations), adult return timing (at Prosser), adult return age and sex composition and size at return (Prosser Denil and brood sampling), Spawn timing and distribution (comprehensive spawner surveys), fecundity and egg size (hatchery spawn sampling)
Carrying capacity criteria for basin-wide and local habitat, including method of calculation.	Annual release numbers do not exceed estimated basin-wide and local habitat capacity, including spawning, freshwater rearing, and migration corridor.	Yakima Basin carrying capacity determined using EDT and AHA model analysis.
Annual release numbers from all programs in basin and subbasin, including size and life-stage at release, and length of acclimation, by program.		YN documents these data.
Location of releases and natural rearing areas.		YN documents these data.
Timing of hatchery releases, compared to natural populations.		Timing of hatchery releases is known. Timing of wild/natural migration determined from Chandler juvenile trap monitoring.
Genetic profiles of naturally produced adults, as developed at program's outset (e.g. through DNA or allozyme procedures) and compared to genetic profiles developed each generation.	Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.	This is not presently a program priority. However, DNA samples could be taken from fish at the Prosser Denil and during spawning if sufficient funding were made available.
Total number of natural spawners reaching the collection facility.	Collection of broodstock does not adversely impact the genetic diversity of the naturally spawning population.	Hatchery and natural origin returns are known (see above).
Total number of spawners estimated to pass the collection facility to spawning areas, compared to minimum effective population size (when established) required for those natural populations.		Total number of natural spawners is known (see above); minimum effective population size could be determined using EDT and AHA model analysis.
Timing of collection compared to overall run timing.		See above.
The ratio of observed and/or estimated total numbers of artificially produced fish on natural spawning grounds, to total number of naturally produced fish, for each significant spawning area.	Artificially produced origin adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.	Hatchery and natural origin returns are known (see above).
Observed and estimated total numbers of naturally produced and artificially produced adults passing a counting station close to natural spawning areas.		Hatchery and natural origin returns are known (see above).
Location of juvenile releases.	Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.	Fish are released from acclimation sites currently located at Boone and Holmes properties in Upper Yakima, and at Stiles and Lost Creek sites in Naches.
Length of acclimation period.		Fish are reared to and released as yearlings
Release type, whether forced, volitional, or direct stream release.		Volitional release.
Level of smoltification at release, compared to a regional smoltification index (when developed). Release type, whether forced, volitional, or direct stream release.	Juveniles are released at fully smolted stage.	Volitional release as smolt yearlings.

Number of adults available for broodstock (moving geometric mean, based on number of ages at return for this species).	The number of adults returning to the hatchery that exceeds broodstock needs is declining.	Prosser dam counts should provide an index with which to make this determination.
Scientifically based experimental design, with measurable objectives and hypotheses.	The artificial production program uses standard scientific procedures to evaluate various aspects of artificial propagation.	Yes. A Master Plan exists. Phase I results have been published (Bosch et al. 2007). See also http://www.efw.bpa.gov/searchpublications/ YKFP M&E annual report for latest year's results.
Monitoring and evaluation framework including detailed time line.	The artificial propagation program is monitored and evaluated on an appropriate schedule and scale to address progress toward achieving the experimental objective and evaluate beneficial and adverse effects on natural populations.	See above
Annual and final reports.		See http://www.efw.bpa.gov/searchpublications/ YKFP M&E annual report for latest year's results.
Annual reports indicating level of compliance with applicable standards and criteria.	Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, INAD, and MDFWP.	See http://www.efw.bpa.gov/searchpublications/ Lower Yakima O&M annual report for latest year's results
Discharge water quality compared to applicable water quality standards and guidelines, such as those described or required by NPDES, IHOT, PNFHPC, and Co-Managers of Washington Fish Health Policy tribal water quality plans, including those relating to temperature, nutrient loading, chemicals, etc.	Effluent from artificial production facility will not detrimentally affect natural populations.	See http://www.efw.bpa.gov/searchpublications/ Lower Yakima O&M annual report for latest year's results
Water withdrawals compared to applicable passage criteria.	Water withdrawals and instream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	See http://www.efw.bpa.gov/searchpublications/ Lower Yakima O&M annual report for latest year's results for all performance indicators for this standard.
Water withdrawals compared to NMFS, USFWS, and WDFW juvenile screening criteria	Water intake meets criteria.	Water intake structures inspected to ensure criteria met.
Number of adult fish aggregating and/or spawning immediately below water intake point.		Will be monitored at Prosser Hatchery and at the acclimation sites. Fish may be used as backup broodstock or for adult planting in tributaries.
Number of adult fish passing water intake point.		
Proportion of diversion of total stream flow between intake and outfall.		
Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence.	Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens.	USFWS fish health professionals sample and certify all releases.
Number and location(s) of carcasses or other products distributed for nutrient enrichment.	Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal, and federal carcass distribution guidelines.	See http://www.efw.bpa.gov/searchpublications/ Lower Yakima O&M annual report for latest year's results for all performance indicators for this standard.
Statement of compliance with applicable regulations and guidelines.		
Spatial and temporal spawning distribution of natural population above and below weir/trap, currently and compared to historic distribution.	Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally produced population.	Derived from spawner survey (temporal and spatial) and Prosser Dam counts (temporal).
Mortality rates in trap.	Weir/trap operations do not result in significant stress, injury, or mortality in natural populations.	Mortality rates are documented.

Prespawning mortality rates of trapped fish in hatchery or after release.		Mortality rates are documented.
Size at, and time of, release of juvenile fish, compared to size and timing of natural fish present.	Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.	These data are available for analysis (see above).
Total cost of program operation.	Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.	See 1.4 above.
Sum of ex-vessel value of commercial catch adjusted appropriately, appropriate monetary value of recreational effort, and other fishery related financial benefits.		This calculation will be difficult to do accurately since these fish are harvested in marine fisheries from Alaska possibly as far south as Northern California and inland to Prosser Dam and as expressed above, the proportion of Yakima fish in the total coho harvest in these fisheries can only be roughly estimated.
Total cost of program operation.	Juvenile production costs are comparable to or less than other regional programs designed for similar objectives.	See 1.4 above.
Average total cost of activities with similar objectives.		
Number of adult fish available for tribal ceremonial use.	Non-monetary societal benefits for which the program is designed are achieved.	YN documents this use.
Recreational fishery angler days, length of seasons, and number of licenses purchased.		See relevant U.S. v OR TAC and WDFW documentation.

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 affected 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).

In-basin broodstock collection varies depending on run size. Up to 960 local brood fish may be collected at Prosser (either hatchery swim-in trap or right bank denil ladder at Prosser Dam), Roza, and/or Cowiche Dams in the Yakima Basin. If fewer fish are available in-basin they may be augmented with coho from lower Columbia River hatcheries. See also Appendix A of Yakima Coho Master Plan (Hubble et al. 2004).

The long-term goal of the in-basin brood stock program is to use 100% natural-origin brood stock (pNOB). This will occur when sufficient numbers of natural-origin fish are returning from local brood releases. In 2004 the pNOB approached 70% (Table 1.11.1.1), but in most years releases from in-basin brood production remained too low to achieve sufficient adult returns with which to establish a local-origin brood stock. Therefore, the YN maintains an interim policy of allowing use of hatchery-origin fish returning to the vicinity of Prosser Dam for the local brood program. As returns of local-origin fish increase, more of these fish will spawn naturally, eventually resulting in sufficient returns of natural-origin fish to the Yakima Basin to meet the 100% pNOB goal.

Table 1.11.1.1. Percentage of local hatchery- and natural-origin and out-of-basin

hatchery-origin fish used in the Yakima Basin local brood stock coho program, 2000-2008.

	Yakima Basin		Out-of-Basin
Year	Hatchery-Origin	Natural-Origin	Hatchery-Origin
2000	0.58	6.93	92.49
2001	12.58	4.06	83.36
2002	13.24	38.21	48.55
2003	20.68	49.26	30.06
2004	1.29	69.56	29.15
2005	2.74	4.13	93.13
2006	9.72	5.21	85.07
2007	13.52	12.14	74.34
2008	25.21	2.63	72.16

The project presently has no established criteria for managing for specific proportion of natural influence (PNI) or proportion of hatchery-origin spawners (PHOS). These criteria may be established as data and results from short-term efforts are further evaluated pursuant to development of the long-term Master Plan.

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/Parr	Parr releases will be conducted in: North Fork Little Naches, Little Naches River, Pile Up Creek, Quartz Creek, Blow Out Creek, Little Rattlesnake Creek, Nile Creek, Cowiche Creek, Ahtanum Creek, Toppenish Creek, Reecer Creek, Wilson Creek, Big Creek, and the Crystal Spring area of the Upper Yakima River.	3,000 per stream (to be subtracted from program total of 1 million juveniles – smolts and parr - released per year)

Life Stage	Release Location	Annual Release Level
Yearling	Naches River: Stiles Ponds (T14N, R18E, Sec 31, SW ¼; RM 9.0) Lost Creek Ponds (T17N, R14E, Sec 35, NE ¼; RM 38.6) Yakima River: Holmes Property (RM 160) Boone Pond (RM 180.5) Hundley Pond (RM 191) Brunson Pond (Wilson Creek RM 6.8) Reecer Creek Pond (Reecer Creek RM .5) Courier Creek Pond (Courier Creek RM 1.5) Lake Cle Elum (from net pens above dam) Mobile Acclimation: Mobile acclimation unit rotating yearly between the following tributaries: Toppenish Ck, Cowiche Ck, Ahtanum Ck, Rattlesnake Ck	~500,000 from local brood stock – (total 1 million juveniles – smolts and parr, local and out-of-basin stock - released per year)
Yearling	Naches River: Stiles Ponds (T14N, R18E, Sec 31, SW ¼; RM 9.0) Lost Creek Ponds (T17N, R14E, Sec 35, NE ¼; RM 38.6) Yakima River: Holmes Property (RM 160) Boone Pond (RM 180.5) Hundley Pond (RM 191) Brunson Pond (Wilson Creek RM 6.8) Lake Cle Elum (from net pens above dam) Mobile Acclimation: Mobile acclimation unit rotating yearly between the following tributaries: Toppenish Ck, Cowiche Ck, Ahtanum Ck, Rattlesnake Ck.	Up to 700,000 from out-of-basin hatchery stock (total 1 million juveniles – smolts and parr, local and out-of-basin stock - released per year)

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.

The adult return data provided in the following table and graph also serve as approximate escapement data.

Table 1.12.1. Preliminary estimates of smolt-to-adult survival (SAR) indices for adult returns from hatchery- and natural-origin coho for the Yakima reintroduction program, juvenile

migration years 2000-2007. Data source: B. Bosch, YN.

Juvenile Migration Year	Hatchery-origin Chandler Smolts[a]	Hatchery-origin Prosser Adults[b]	Hatchery-origin SAR Index	Natural-origin Chandler Smolts[a]	Natural-origin Prosser Adults[b]	Natural-origin SAR Index
2000	165,056	3,819	2.31%	37,359	2,985	7.99%
2001	442,249	211	0.05%	40,605	332	0.82%
2002	30,006	768	2.56%	19,859	1,767	8.90%
2003	13,854	552	3.98%	9,092	1,935	21.28%
2004	164,135	2,443	1.49%	18,787	511	2.72%
2005	214,694	2,976	1.39%	31,631	1,584	5.01%
2006	41,260	2,123	5.15%	8,298	1,205	14.52%
2007	88,575	3,252	3.67%	8,665	698	8.06%

[a] Yakama Nation estimates of coho smolt passage at Chandler (for details see Neeley 2000).
[b] Yakama Nation estimates of age-2 and age-3 coho returns to Prosser Dam for this juvenile migration cohort.

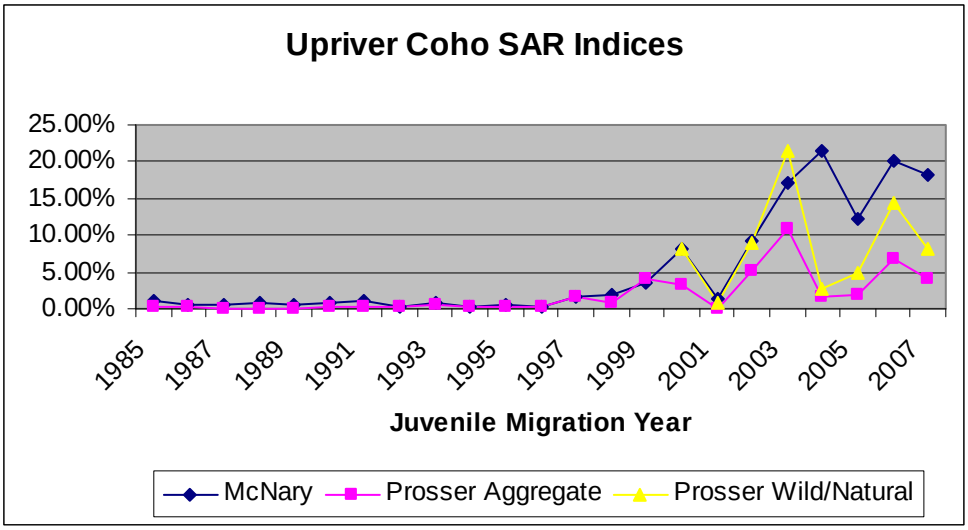


Figure 1.12.1. Aggregate smolt-to-adult survival (SAR) indices at Chandler/Prosser and McNary Dams for mid- and upper-Columbia (Yakima, Snake, and Upper Columbia) coho reintroduction programs, juvenile migration years 1985 to 2007 and Yakima natural-origin SAR indices for juvenile migration years 2000 to 2007. Data source: B. Bosch, YN.

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

Out-of-basin stocks have been outplanted into the Yakima Subbasin since 1981. Locally collected coho were first spawned and reared at the Prosser Hatchery in 1997.

1.14) Expected duration of program.

Phase I of the feasibility study was completed in 2003. Phase II is in progress with public and environmental review of a preliminary Master Plan (Hubble et al. 2004) conducted from 2004 to

2007 and implementation of this phase scheduled for completion in 2011. At that time the co-managers will develop and submit a long-term Master Plan to NPCC step-review. The Master Plan will recommend how the program should proceed.

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

Yakima River Subbasin/Columbia Plateau Province. Yakima Basin, including the Naches subbasin, middle and upper Yakima subbasins, and tributaries. See 1.5 for WRIA codes.

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

A variety of planning and evaluation processes have led the program to this point. Alternatives to the YKFP program were evaluated in the Yakima Fisheries Project EIS (BPA 1996). The program continues to be adjusted, based on the principles of adaptive management adopted by the YKFP. Those changes were described in sections 2 & 3 of Hubble et al. (2004). In addition, Section 6 (various subsections) of Hubble et al. (2004) identified alternatives to the current proposed program that were considered. Also from 2003 HGMP provincial meetings:

1.16.1 Brief Overview of key issues
The primary goal for this program is the reintroduction of coho into historical habitats in the upper Yakima and Naches River Basins. Hatchery reared pre-smolts are trucked to sites near natural coho habitat where they are acclimated and released. The strategy to meet this goal is to develop a locally adapted stock from adults returning to Prosser, Roza, and/or Cowiche dams resulting from releases of a Lower Columbia hatchery donor population.

Key issues preventing the achievement of this goal are:
1. The present main station for local brood capture, holding, spawning, and rearing is Prosser Dam and Prosser Hatchery. Unfortunately, this facility has poor water quality and water temperatures typical of this lower portion of the Yakima River. This can sometimes reduce our success in producing adequate numbers of locally adapted smolts for release. In addition, Prosser Dam may be too low in the Basin to collect fish that are adapted to migrate to the upper portions of the basin where they are targeted to spawn and rear naturally. Development of new spawning and rearing facilities are needed in the upper Yakima and Naches Basins.
2. Cowiche Dam on the Naches River is insufficiently developed as a brood capture facility.
3. Some irrigators may not be supportive as they do not want fish (coho or steelhead) above their diversion dams.
4. The complexity and length of time required to conduct monitoring and evaluation on coho interactions with other salmonid species.

1.16.2 Potential alternatives to the current program
1. Do not attempt reintroduction.
2. Plant fry.
3. Increase the numbers of released smolts.
4. Collect local brood in-basin but spawn and rear these fish out-of-basin. Bring the smolts back

for acclimation and release from upriver sites.

1.16.3 Potential reforms and investments

1. Collect local brood at Roza and Cowiche, upgrading the Cowiche collection facility as necessary.
2. Build a full facility and smaller satellite facilities in the upper Yakima Basin as necessary.

It is anticipated that these alternatives and others that may arise will be further explored and evaluated through the NPCC Master Planning 3-step review process.

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.

This document is intended to be consistent with NOAA (2008) which states (RPA 39):

> The FCRPS Action Agencies will continue funding hatcheries in accordance with existing programs… Consultation under the ESA on the operation of hatchery programs funded by the FCRPS Action Agencies [will] include[e] the submittal of updated and complete HGMPs. Updated and complete HGMPs are to be submitted to NOAA Fisheries and ESA consultation should be initiated by … July 2009 for hatchery programs in the Middle Columbia … ESA consultations should be completed by January 2010 for hatchery programs in the Middle Columbia …

Project sponsors are also aware of direction in NOAA (2009) calling "for consultations on hatchery programs within the MCR Steelhead DPS to be completed by January 2010". Project sponsors remind NOAA of its statement in this document that "mitigation obligations will not be diminished under this process". The Yakama Nation considers this project essential to meeting federal commitments to honor the Treaty of 1855, and to "protect, rebuild, and enhance" anadromous salmon populations throughout tribal usual and accustomed fishing areas as described in the 2008-2017 *United States v Oregon* Management Agreement and in the Columbia River Fish Accords. As such, any changes to program parameters described herein which would diminish the number of adult salmon returning to tribal usual and accustomed fishing areas that result from this HGMP development and consultation process will not be implemented unless and until they are considered and approved in appropriate policy fora.

The program has the following permits or authorizations: A biological assessment was submitted to NMFS in 1999 that addressed the effects of the program on steelhead. A biological opinion has never been completed. YKFP projects have been operating under a "Section 7(d) Letter" dated 4/6/01 from Robert Beraud to Rob Jones which states that BPA is proceeding with the program under the 7(d) provision of the ESA regulations with the understanding that NMFS has no concern that YKFP activities would be in violation of ESA. An electronic copy of the letter is not available but could be mailed via U.S. mail if desired. The Yakama Nation also prepared a

previous version of this HGMP and submitted it to NMFS in 2005. BPA also holds Section 10 permit 1426 for steelhead adult collection, radio-tagging, and release at Roza Dam (expires 12/31/2007) as part of the overall Yakima Fisheries Project (but not specific to the coho program). In addition, the BPA environmental coordinator for the YKFP has prepared NEPA documents which cover all the environmental aspects of the project. Copies of this documentation are available from Patricia R. Smith, BPA, 503-230-7349 (prsmith@bpa.gov).

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

- 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).*

None

- 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).

Populations of wild steelhead Oncorhynchus mykiss in the Columbia River Basin have declined dramatically from historical levels (Nehlsen et al. 1991; NRC 1996; Williams et al. 1999). Average abundance of wild steelhead in the Yakima River Subbasin over the last two decades is only 2% of pre-1890 abundance levels reported by Howell et al. (1985). Causes of these declines include a host of environmental and human-induced factors (NRC 1996; Williams et al. 1999). In 1997 steelhead in the upper Columbia River were listed as endangered under the Endangered Species Act (ESA) and those in the Snake River were listed as threatened (62 FR 43937-43954). Stocks originating in mid-Columbia Basin tributaries (including the Yakima River) were listed as threatened in 1999 (64 FR 14517-14528). No hatchery fish have been released in the Yakima Subbasin since 1993. Regional plans recognize the need to protect and enhance weak upriver steelhead populations and their habitat while maintaining the genetic integrity of those stocks (NPPC 1994).

Steelhead in the Yakima Basin are divided into four populations: the Satus Creek, Toppenish Creek, Naches River, and Upper Yakima River populations. The NOAA Interior Columbia Technical Recovery Team (ICTRT) identifies the Satus Creek population as steelhead that spawn in the Satus Creek drainage on the Yakama Indian Reservation, the mainstem Yakima River

below Satus Creek, and tributaries to the lower mainstem. For management purposes, local planners have subdivided the Satus population into the Satus block, which spawns in the Satus Creek drainage, and a mainstem block, whose current and historic status is uncertain. The Toppenish population consists of steelhead that spawn in Toppenish Creek, its tributaries and the short stretch of the mainstem between Toppenish and Satus creeks, and is entirely on the Yakama Reservation. The Naches population includes steelhead spawning in the Naches River and its tributaries (including the Tieton, Little Naches, American, and Bumping rivers and Cowiche, Rattlesnake and Nile creeks), the mainstem Yakima from the Naches confluence to the Toppenish Creek confluence and the tributaries to that reach of the Yakima, including Ahtanum Creek. The Upper Yakima population consists of all steelhead that spawn in the Yakima River and its tributaries upstream of the Naches confluence. Together these four populations make up the Yakima MPG.

Risks for Yakima Basin coho restoration feasibility study objectives and strategies are discussed in Section 6 of the Coho Master Plan. Risks of the coho program generally fall into three categories:

- Physical effects on environmental resources caused by facility development
- Effects on target fish (coho) and non-target taxa (NTT) caused by monitoring and broodstock collection activities (e.g., trapping, marking, handling, etc.)
- Interaction risks to non-target fish from the presence of reintroduced coho.

As documented in Hubble et al. 2004, all the risk levels are relatively low and do not warrant additional monitoring beyond what is currently proposed.

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

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

- 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.

- 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).*

- 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.

Adult and juvenile passage estimates for Yakima Basin projects are available at www.ykfp.org and Columbia River DART. Estimated counts of juvenile steelhead migrating past Prosser for recent years are:

Table 2.2.1. Prosser Dam Steelhead Juvenile (Downstream) Migration Estimates

Juv. Migr. Year	Wild	Hatch.	Total	%Wild
1988	42,522	14,636	57,158	74.4%
1989	22,345	5,056	27,401	81.5%
1990	21,805	6,499	28,304	77.0%
1991	21,309	612	21,921	97.2%
1992	33,096	549	33,645	98.4%
1993	17,165	3,109	20,274	84.7%
1994	17,977	602	18,579	96.8%
1995	17,765	16	17,781	99.9%
1996	43,366	14	43,380	100.0%
1997	44,631	0	44,631	100.0%
1998	85,360	0	85,360	100.0%
1999	38,266	0	38,266	100.0%
2000	42,696	0	42,696	100.0%
2001	28,428	0	28,428	100.0%
2002	38,560	0	38,560	100.0%
2003	29,641	0	29,641	100.0%
2004	32,428	0	32,428	100.0%
2005	46,741	0	46,741	100.0%
2006	18,838	0	18,838	100.0%
2007	31,898	0	31,898	100.0%
2008	26,327	0	26,327	100.0%
2009	28,754	0	28,754	100.0%
Average:	33,389	1,413	34,591	95.9%

Data source: YN databases (YakRSthdDB.xls)

Table 2.2.2. Yakima Basin Adult Steelhead Escapement and Spawning Summary						
Run Year	Prosser Dam Count	Redd Counts by Survey Stream				Roza Dam Count
		Satus	Toppenish	Ahtanum	Naches	
1987-88	2,840	445				
1988-89	1,162	404	45			
1989-90	814	289	26			
1990-91	834	125				
1991-92	2,263					116
1992-93*	1,184	73				15
1993-94	554	114				28
1994-95**	925	85				23
1995-96	505	148				92
1996-97*	1,106	76	5			22
1997-98*	1,113	190	13			51
1998-99	1,070	130	78			14
1999-00	1,611	169	185	11		14
2000-01	3,089	102	355	8		140
2001-02**	4,525	240	111	13		238
2002-03	2,235	172	354	8		134
2003-04	2,755	93	56	12	94	213
2004-05	3,451	108	99	16	140	227
2005-06**	2,005	60	20	1	19	117
2006-07	1,537	87	42**	4**	44	61
2007-08	3,310	110	68*	8*	11**	169
2008-09	3,450	119	79	3	29**	230

Blank = no data available
* Partial survey.
**Survey affected by access problems, high flows, or poor redd visibility

Hatchery releases were discontinued in the early 1990s. Recent 9-year average (since 1998-99 run year) escapement over Prosser Dam has been >98% wild; since 1983-84 the annual steelhead escapement has averaged about 92% wild. Data source: YN databases (YakRSthdDB.xls, SthdReddSummary.doc).

Available data indicates smolt-to-adult survival for naturally produced smolts in the Yakima Basin ranged from approximately 0.35% to 4.21% for calendar years 1985 through 2002 (C. Frederiksen, Yakama Nation Fisheries, personal communication).

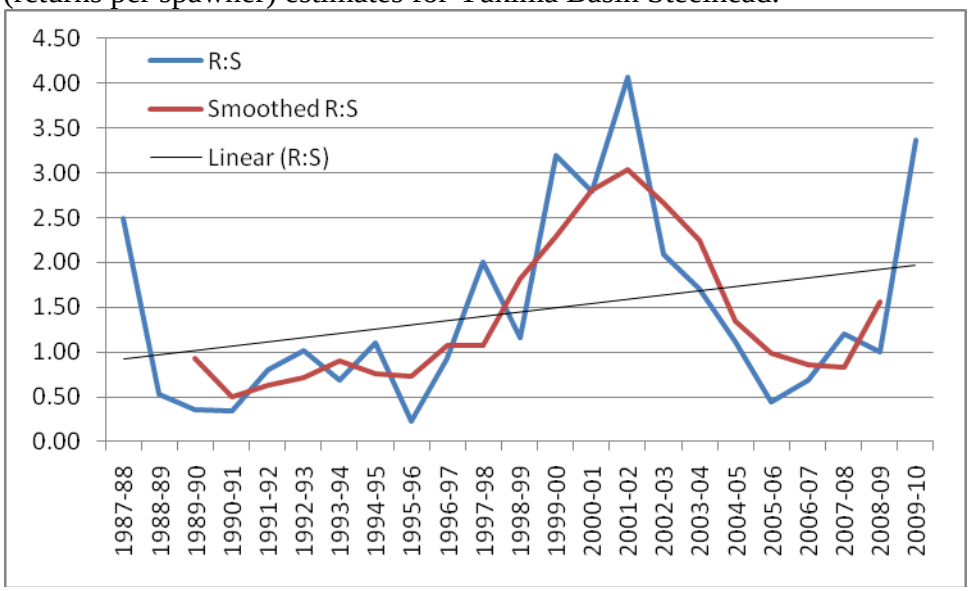
Table 2.2.3. Age-4 aggregate adult-to-adult productivity (returns per spawner) estimates for Yakima Basin Steelhead.

Run Year	Prosser Adult Count	Prosser Aggregate Age-4 Returns per Spawner	Smoothed Average Age-4 R:S
1983-84	1,140		
1984-85	2,194		
1985-86	2,235		
1986-87	2,465		
1987-88	2,840	2.49	
1988-89	1,162	0.53	
1989-90	814	0.36	0.93
1990-91	834	0.34	0.51
1991-92	2,263	0.80	0.63
1992-93	1,184	1.02	0.71
1993-94	554	0.68	0.90
1994-95	925	1.11	0.76
1995-96	505	0.22	0.74
1996-97	1,106	0.93	1.07
1997-98	1,113	2.01	1.08
1998-99	1,070	1.16	1.82
1999-00	1,611	3.19	2.29
2000-01	3,089	2.79	2.80
2001-02	4,525	4.07	3.03
2002-03	2,235	2.09	2.66
2003-04	2,755	1.71	2.25
2004-05	3,451	1.12	1.34
2005-06	2,005	0.44	0.99
2006-07	1,537	0.69	0.86
2007-08	3,310	1.20	0.83
2008-09	3,469	1.01	1.56
2009-10	6,743[1]	3.36	
Mean	2,108	1.44	1.39
Geometric Mean	1,740	1.10	1.20

[1] through May 6, 2010.

Data source: YN databases (YakRSthdDB.xls).

Figure 2.2.1. Graph of age-4 aggregate and smoothed average adult-to-adult productivity (returns per spawner) estimates for Yakima Basin Steelhead.



The data in Table 2.2.3 and Figure 2.2.1 are admittedly gross representations of adult-to-adult productivity. However, the geometric means for these metrics over a 26-year data set are greater than one and show an increasing trend. This indicates with high likelihood that combined artificial production and habitat restoration activities in the Yakima Basin are having a neutral or net positive impact on listed steelhead in the Basin.

Please see Yakima Basin steelhead HGMP (submitted to NOAA fisheries in 2005; available from YN) and Yakima Basin steelhead recovery plan for further information.

2.2.3) 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 *(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*").

Yakima Basin Coho: Hatchery activities assessed include broodstock collection and transfer to and release from acclimation sites. Parr releases will be conducted in: North Fork Little Naches, Little Naches River, Pile Up Creek, Quartz Creek, Blow Out Creek, Little Rattlesnake Creek, Nile Creek, Cowiche Creek, Ahtanum Creek, Toppenish Creek,

Reecer Creek, Wilson Creek, Big Creek, and the Crystal Spring area of the Upper Yakima River. Adults will be transferred and out planted into Ahtanum Creek, Toppenish Creek, Wilson Creek, Pile Up Creek, Cowiche Creek, Nile Creek, and Quartz Creek. M&E activities include: spawner surveys, PIT and radio tagging, juvenile and adult trapping and sampling operations, boat and backpack electroshocking, snorkeling, etc. See also Section 3.5 below.

ESU / Population	Mid-Columbia ESU, Yakima wild/natural steelhead
Activity	Prosser adult trap monitoring and broodstock collection operation Adult Broodstock capture at Roza, Wapatox and Cowiche Dams.
Location of hatchery activity	Prosser Adult Facility (right bank denil ladder and trap), Yakima River, 75.6 RKm
Dates of activity	Approximately Sept. 1 – November 30 annually
Hatchery Program Operator	Joe Blodgett, YN

Although not specifically enumerated, risks for Yakima Basin coho restoration feasibility study objectives and strategies are fully discussed in Section 6 of the Coho Master Plan.

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

Juvenile passage estimates at Prosser and adult counts of steelhead at Prosser and Roza Dam were given above in 2.2.2.

See also take table at end of this HGMP. Annual adult and juvenile passage estimates for Yakima Basin projects are also available at http://www.ykfp.org.

- **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.*
See Take Table at end of document.

- 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 inseason to exceed the 1988-99 maximum observed level of 100 fish."*)

We do not anticipate exceeding take levels specified in this HGMP. At Prosser Dam, steelhead can use three ladders and only the right bank Denil ladder contains an adult sampling facility. Historically, only 10-20% of the annual steelhead run passes upstream at Prosser via the Denil ladder and monitoring facility and the adult monitoring facility only operates during the fall (first 40-60% of the adult steelhead migration).

Contingency plans for YKFP projects are addressed by the YKFP Policy Group on a timely basis using adaptive management. For example, in the drought emergency of 2003, the Policy Group determined that coho survival could likely be improved with an earlier release and fish were volitionally released in April instead of May.

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 NPCC *Annual Production Review* Report and Recommendations - NPCC 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.").*

A Yakima Subbasin salmon recovery plan is presently being developed in cooperation with the Yakima Subbasin Fish and Wildlife Recovery Board. A draft document is available for public review at http://www.ybfwrb.org/Draft%20plan/RecPlanFinal.pdf. Yakima Basin coho production activities will be consistent with this recovery plan and the Middle Columbia River DPS recovery plan. The program is included in the *United States versus Oregon* 2008-2017 Columbia River Fish Management Plan and the recently signed Columbia River Accords between the Columbia River Tribes and the Bonneville Power Administration. The project is implementing HSRG recommendations to move to local brood stock and phase out (or segregate) out-of-basin releases.

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.*

Document Title	Type
Treaty of 1855. Asserted the right of the Yakama Nation to "take fish at all usual and accustomed fishing areas". Federal courts have held that this right means more than the right of Indians to hang a net in an empty river (*Washington v Washington State Commercial Passenger Fishing Vessel Association, 1979*).	Federal Treaty
United States versus Oregon. 2008-2017 United States v. Oregon Management Agreement, May 2008. Section II.K of the original Columbia River Fish Management Plan described provisions for moving coho production to upriver areas. See also 1.8 above.	Federal Court Order
US v Washington	Federal Court Order
Northwest Power and Conservation Council (NPCC), Fish and Wildlife Program.	Northwest Power Act

BPA. 1996. Yakima Fisheries Project. Final Environmental Impact Statement. Bonneville Power Administration. Washington Department of Fish and Wildlife. Yakama Indian Nation. January, 1996. DOE/EIS-0169. DOE/BP-2784. Portland, OR.	NEPA document
Mitchell Act annual Congressional Appropriations language. The primary purpose of the Mitchell Act is to mitigate for fishery losses due to hydroelectric development in the Columbia River Basin. Congress has recognized that it is appropriate to mitigate these losses in upriver areas where the losses occurred.	Mitchell Act
WY-KAN-USH-MI WA-KISH-WIT	Columbia River Anadromous Fish Restoration Plan of the Columbia River Tribes
Yakama Nation and US Bureau Reclamation Prosser Hatchery Agreement	MOU
Yakama Nation and US Fish & Wildlife Service Fish Health Agreement	MOU
2008 Columbia Basin Fish Accords Memorandum of Agreement between the Three Treaty Tribes and FCRPS Action Agencies	MOA

Since the 1990s, various entities in the Pacific Northwest have renewed the region's focus on reintroduction of coho to the mid-Columbia.

The four Columbia River Treaty Tribes (Nez Perce, Umatilla, Warm Springs, and Yakama) identified coho reintroduction in the mid-Columbia as a priority in the Wy-Kan-Ush-Mi-Wa-Kish-Wit document, commonly referred to as the Tribal Restoration Plan (TRP) (CRITFC 1995). It is a comprehensive plan put forward by the Tribes to restore the Columbia River fisheries. This project is an essential component of implementing that long-term vision in the mid-Columbia region.

In 1996, the Northwest Power and Conservation Council (NPCC) recommended the tribal mid-Columbia reintroduction project for funding by BPA, which has responsibilities under the Northwest Electric Power Planning and Conservation Act of 1980 to protect, mitigate, and enhance fish and wildlife that have been affected by the construction and operation of the Federal Columbia River Power System. It was identified as one of fifteen high-priority projects for the Columbia River basin, and was incorporated into the NPCC's Fish and Wildlife Program (program measures 7.1H, 7.4A, 7.4F, and 7.4O). The project will be subject to a Step-Two Review by the Council once the feasibility phase is completed and the time is ripe to consider full implementation of the long-term vision.

The release of coho from lower Columbia hatcheries into mid-Columbia tributaries is also recognized in the Columbia River Fish Management Plan, a court-mandated plan under the jurisdiction of *U.S. v. Oregon*, involving Federal, state and tribal fish managers in the Columbia basin (CRITFC 1988, 2008). The CRFMP and associated management agreements call for a release of approximately 700,000 to 1.0 million coho annually in the Yakima Basin. These agreements are recognized and incorporated into the Columbia River Fish Accords.

The draft Yakima Coho, Project Status Review (YKFP 2001) prepared by the YKFP, Monitoring Implementation Planning Team (MIPT) provided direction for objectives and strategies for short-term feasibility efforts.

The U.S. District Court ruled on March 22, 1974 that the Yakama Nation and Washington Department of Fish and Wildlife co-manage fish resources in Washington State. This decision is commonly referred to as the Boldt Decision.

A Memorandum of Understanding, dated 12/27/93, stipulates that the Wenatchee National Forest (WNF) and the YN will cooperatively manage fish resources on the Wenatchee National Forest.

The YN has a Memorandum of Understanding with the BOR, which stipulates responsibilities between the two parties pertaining to the Prosser Hatchery facility.

The YN has a subcontract with the USFWS to monitor fish health at the main hatchery facility and satellite acclimation facilities.

Mitchell Act funds are used for in-basin acclimation of out-of-basin fish transported to the Yakima Basin.

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.

Stated harvest objectives for this project are general in nature. BPA (1996) stated the goal for the preferred alternative was to "determine the feasibility of re-establishing a naturally spawning population and a significant fall fishery for coho in the Yakima River Basin". Hubble et al. (2004) stated the following objective: "Expand harvest opportunities for treaty Indian and sport fisheries inside and outside of the Yakima River Basin while meeting objectives for genetics, experimentation, natural production and ecological interactions."

Present efforts are focused on improving survival and establishing a locally adapted broodstock. These objectives are considered highest priority and achieving these goals (especially improving survival) will obviously facilitate achievement of harvest objectives. The project has temporarily moved away from using the adipose-fin-clip to mass mark releases in an effort to improve survival because this mark is used in highly successful mark-selective fisheries in Buoy 10 and the lower Columbia River. Instead, coded or blank wire tags are used to identify hatchery-origin fish in adult return sampling and brood stock collection efforts (see 7.3). Unfortunately, this makes it difficult to determine mortality rates in fisheries because adipose-present fish are not sampled for wire tags. We presently assume that Yakima Basin coho are harvested at the same rate as other unmarked coho in fisheries. Marking regimes will be re-evaluated and specific numerical objectives for harvest may be established pursuant to development of the long-term

Master Plan.

The Yakama Nation has set an in-basin coho subsistence fishery since the mid-1990's, however, in-basin harvest has been virtually zero. This is largely due to the commercial Zone 6 fishery, which overlaps in time to a large extent with the Yakima fishery season.

In 1998 WDFW instituted an in-basin sport harvest in the Yakima basin and in recent years there has been substantial effort and catch in this fishery near the Yakima River mouth. There is an unofficial harvest maximum of 10% of the adult escapement to the river mouth. The two agencies cooperate in setting the geographic boundaries and fishing season. The WDFW is also providing bio-sample data from fish caught in the fishery to the YKFP monitoring and evaluation program.

See also section 4.1.1 of Hubble et al. (2004) for more details of past coho harvest.

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 NPCC document 99-15, section II.C. as guidance in indicating program linkage with assumptions regarding habitat conditions.

Major inhibiting factors to coho production are:

1) Sublethal to lethal water temperatures typically by June below Prosser Dam (RM 47).

2) Low flow conditions (especially in poor water years) between Prosser Dam and the Chandler power plant outfall.

3) Predation by birds (especially in poor water years), and both native and exotic piscivorous fish (especially smallmouth bass).

4) Loss of structurally complex rearing habitat.

5) Excessive sediments from irrigation drains (though this is being slowly addressed in recent years) in major spawning areas.

6) Smolt mortality associated with predation in the vicinity of bypass outfalls at Wapato, Sunnyside and Prosser Dams, and a number of smaller Yakima Basin dams (e.g., Marion Drain re-use diversion, Columbia and Richland Ditches at Horn Rapids Dam).

7) Adult mortality associated with mainstem Columbia dams.

8) Smolt mortalities associated with traversing mainstem Columbia dams and impoundments.

These limiting factors in the Yakima Subbasin and strategies to address them are well described in the Yakima Subbasin Plan (YSFWPB 2004) and Freudenthal et al. (2005). In addition, YKFP

habitat actions to date have resulted in: the protection of almost 1,000 acres of prime floodplain habitat, reconnection and screening of over 15 miles of tributary habitat, substantial water savings through irrigation improvements, and restoration of over 80 acres of floodplain and side channels. Additional habitat improvements implemented by other entities, including the Conservation Districts, counties and private interests are also continuing in the basin.

To review the Yakima Subbasin Plan or for additional information, please refer to the Northwest Power and Conservation Council's website at:
http://www.nwcouncil.org/fw/subbasinplanning/yakima/plan/
or visit the Yakima Basin Fish and Wildlife Recovery Board's web site at:
http://www.ybfwrb.org/

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.

The following ESA-listed species co-occur to a significant degree with the program fish in either freshwater or early marine life stages.

- Steelhead
- Chum
- Sockeye
- Coho
- Chinook
- Bull Trout

Describe salmonid and non-salmonid fishes or other species that could:

(1) negatively impact program

Pikeminnows, smallmouth bass, and avian predation have a large but un-quantified impact on coho hatchery smolts. Mergansers have been identified as a problem at certain acclimation sites. Gulls, especially during low flow periods are a known predator at the fish bypass outfall sites (i.e. Chandler) for all salmonid smolts. These impacts by both piscivorous fishes and birds are being investigated through two YKFP funded predation studies- one directed toward fish and the other towards birds.

(2) be negatively impacted by program

No significant impacts to other salmonid species have been demonstrated. A two-year coho smolt predation study was initiated in 1998 to investigate the potential predation of hatchery coho smolts on newly emergent spring chinook fry in the upper Yakima (Dunnigan 1999).

Impacts of these hatchery coho smolt releases were concluded as having no significant impact on the wild spring chinook population. To date there has been very little information on interaction between coho and steelhead. We are continuing to investigate possible interactions on a limited scale. There has been extensive research since 1999 on interactions between Spring Chinook Salmon and RBT/Steelhead in the Teanaway River. In general, this work has found that ecological impacts to valued non-target taxa were within containment objectives or impacts that were outside of containment objectives were not caused by spring Chinook supplementation activities. The most recent results from these studies were documented in:

> Pearsons, T. N. and G. M. Temple. 2007. Impacts of Early Stages of Salmon Supplementation and Reintroduction Programs on Three Trout Species. North American Journal of Fisheries Management 27:1-20.

(3) positively impact program

There is presently no directed effort to study this issue. However, it is expected that other aspects of the YKFP are likely to positively impact this project.

(4) be positively impacted by program

Though not rigorously investigated, the addition of carcasses to tributaries and side channels, especially in the upriver reaches, is a benefit for nutrient enrichment to the stream itself, as well as, to terrestrial animals, which feed on the carcasses.

See also Section 6 of Hubble et al. (2004), Sampson et al. (2009), the Mid-Columbia Coho Restoration Master Plan (Yakama Nation 2005), and ykfp.org for additional data and links to current results from species interactions studies.

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.

Prosser Hatchery operates under NPDES permit WAG135017.

Prosser Hatchery has the ability to use 30 cfs Yakima River water, and has three wells that contribute 3200 gallons per minute. The river water supply is used from March through July for juvenile fish rearing and September through January for adult broodstock. The surface water is gravity flow from Chandler Canal behind the fish screens. One well is used from September through April to incubate eggs. The well is capable of pumping 800 gallons per minute. The other two wells are used all year to rear juvenile salmon and adult steelhead kelts. Each well is

able to pump 1,200 gallons per minute. The well water is constant 57 degrees, and the surface water temperature changes with the seasons. The water used meets or exceeds the recommended Integrated Hatchery Operations Team (IHOT) guidelines.

The Yakima River (Chandler Canal) and two wells supply the water needed to operate the Prosser Hatchery. Lost Creek, Holmes, and Boone ponds are all side channels with a natural river water source. The influent water at these ponds is not screened, but the effluent is to keep smolts in the pond for specified acclimation periods. Stiles pond is fed through a screened natural river water source. Hundley and Brunson ponds are off-channel ponds which are only connected during periods of high water, so additional small-scale infrastructure is planned for these sites. Mobile acclimation sites will utilize screened gravity-fed local water sources.

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.").

The production from this facility falls below the minimum production requirement for an NPDES permit, but the facility operates in compliance with state or federal regulations for discharge. Chandler Canal is screened to prevent juvenile salmonids from entering the canal and the hatchery intake. See also 4.1.

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.

Prosser Hatchery is presently the primary facility for coho restoration activities. It is expected that new or additional facilities for coho will be proposed as part of the long-term Master Plan that will be developed in 2011-2012. In addition, use and proposed expansion of the Prosser Hatchery for on-going fall and summer run Chinook will be further described in that Master Plan which is expected to be completed in 2010.

5.1) Broodstock collection facilities (or methods).

Since 1997, some local broodstock have been collected at the Prosser Dam right bank adult denil ladder and trap. These fish are supplemented with the progeny of fish collected at other facilities (see HGMPs for Eagle Creek NFH and Washougal State Fish Hatchery and section 1.5 of this document).

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)

1	Vinyl line Raceway	22000	150	50	4	1100

Coho broodstock currently are collected at the Prosser Dam steep-pass ladder and trucked ½ mile to the holding ponds at Prosser Hatchery. In addition to collecting broodstock at Prosser, the future program proposes also to collect broodstock at existing facilities at Roza Dam on the upper Yakima and at Cowiche or Wapatox dams on the Naches River. The potential for incidental interaction with adult steelhead during coho broodstock collection at Roza, Cowiche and/or Wapatox is minimal. Typically, passage at Roza Dam, Cowiche and/or Wapatox is at or fewer than 5 steelhead (each dam) during the month of December when coho broodstock collection would occur. Coho brood stock collection would typically end in mid-December. See also Master Plan, Section 6.1, Strategy 1d.

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

Equipment Type	Capacity (gallons)	Supplemental Oxygen (y/n)	Temperature Control (y/n)	Normal Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Adult Transfer Tanker Truck	700	Y	N	5	Light dose MS	
Juvenile Transfer Tanker Truck	2500	Y	N	150		

Adults are captured at the steep pass denil ladder at Prosser Dam and trucked ½ mile to Prosser Hatchery. Transportation meets IHOT guidelines.

5.3) Broodstock holding and spawning facilities.

Spawning for this program takes place at the Prosser Hatchery where adults are held in large holding ponds (150 ft by 50 ft) and treated with formalin and checked weekly for ripeness. The holding ponds meet IHOT adult holding guidelines for adult holding, density, water quality, alarm systems and predator control measures to provide the necessary security for the broodstock. Fish are spawned in the spawning shed. The unfertilized gametes are taken to the incubation room where eggs are fertilized.

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Vinyl line Raceway	22000	150	50	4	1100

5.4) Incubation facilities.

Prosser Hatchery has four deep troughs used for initial incubation (to eyed-stage) and 15 (16 trays/stack) vertical stacks (Heath trays) used for final incubation to hatch-out.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu.ft.)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Deep Trough with perforated plates (10 cells per trough)- Prosser Hatchery	5	10	12	100,000 per cell	nya
Vertical Stack (16 trays/stack)- Prosser Hatchery	15 stacks	8	nya		5000

5.5) Rearing facilities.

Fry are ponded at 1,100 fpp from the vertical stacks into the three upper, outside raceways. When the parr reach 500 fpp they are transferred to the four lower, outside raceways.

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Maximum Flow Index	Maximum Density Index
16	Stainless Wall with Vinyl Line Raceways- Prosser Hatchery	3375	75	15	3	750		0.75
6	Raceways- Flow Through (Per Acclimation Site)[a] - Yakima Basin	5400	100	12	4.5	650	0.11	0.66

[a] Derived from Upper Yakima Spring Chinook Cle Elum Hatchery Procedures Manual, Working Draft, March 1998.

5.6) Acclimation/release facilities.

Coho acclimation sites on the upper Yakima have included the Easton D.O.T. Ponds, Holmes Pond, Hundley Ponds, Brunson Pond, Wilson Creek, and Boone Pond. There are two sites on the Naches- Lost Creek Ponds and Stiles Ponds.

Since 2003 releases from all sites have been volitional beginning the first week of April (unless drought conditions occur). Fish are delivered to their respective acclimation sites the last week of February or the first week of March. Since 2003 the main 4 acclimation sites have been Stiles, Lost Creek, Holmes, and Boone ponds.

The numbers of coho acclimated in each pond varies depending on the number of fish available each year. Generally, no more than 250,000 coho are acclimated in a pond. With the addition of Hundley and Brunson Ponds the numbers of coho acclimated will decrease in each pond,

however we will keep conducting our experimental in basin vs. out of basin releases. There are approximately 24,000 PIT tagged coho for all release groups (8 mark groups). The coho are brought into the acclimation sites at 17-22 fish/lb.

See also Appendix Table 1 of this document for additional information.

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

Water temperatures during the summer months at the Prosser hatchery are a problem and can lead to early smolting and disease problems. In 2011, when feasibility studies conclude, we intend to update the 2004 Master Plan to include new, permanent production facilities which are more appropriately sited and submit to NPCC step-review.

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.").

The facility is sited so as to minimize the risk of catastrophic fish loss from flooding, but experienced flooding in 1996 with no fish loss because fish were released into the river early. At Prosser Hatchery, staff members are on-site 24/7 during critical phases of the program, and the facility is enclosed in chain linked fence, and periodic patrols of law enforcement (local and tribal) maintain a security envelope of facility.

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.).

Yakima Broodstock Source:

Coho were extirpated from the Yakima Basin. We are developing a local brood source from adult coho returning to Prosser Dam. In recent years, progeny of local broodstock have ranged from about 10-30% of total releases. Of local broodstock, the proportion that were natural-origin fish collected at the Prosser denil ladder ranged from 25-75%. See 1.11.1 and Bosch et al (2007) for additional information on development of this local broodstock. We are optimistic that over the long-term this restoration effort will observe positive trends in coho survival and natural production in the Yakima Basin as this localized broodstock develops and as habitat conditions in the basin improve.

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.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Cascade Hatchery Early Run Coho (ODFW)	H	U	2004
Washougal Fish Hatchery (WDFW) Late run	H	2004	U
Eagle Creek National Fish Hatchery (USFWS)	H	2004	U
Little White Salmon/Willard NFH Complex (USFWS)	H	1983	2004
Yakima River	H and N	1997	U

The Yakama Nation (YN) has released between 85,000 and 1.4 million coho smolts in the Yakima Basin annually since 1985. All of these releases derive from a variety of stocks in the lower Columbia River Basin and most are believed to be of early-run origin reared in hatcheries near to or below Bonneville Dam (234 km/146 miles upstream from the Columbia River mouth). The history of lower Columbia River hatchery coho salmon was well described by Johnson et al. (1991). Given this history, the hatchery coho we are using in this Yakima Basin restoration effort have likely been in culture anywhere from 30 to over 100 years (10 to more than 30 generations), and are expected to successfully migrate and spawn in the Yakima River where they are released, which is between 500 and 650 km further than returning to their natal hatcheries.

In 1997 the Yakima program began collecting naturalized spawners at Prosser Dam. The project has relied less on the lower river stock (Washougal and Eagle Creek) as the Yakima basin adult returns increased. The long-term goal is to meet all smolt production goals using in-basin (Yakima NORs) broodstock (see 1.11.1). Eventually broodstock collection will occur at Cowiche (or Wapatox) and Roza dams as the numbers of natural spawners increase into these two subbasins.

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.

The program objective is to produce a self-sustaining natural population greater than 1,000 fish per generation. We intend to meet this objective by gradually increasing the use of local, natural-origin broodstock (eventually hoping to achieve 100% for all production and releases in the Yakima Basin) in this program. Passage of returning natural-origin coho at Prosser Dam was estimated at 1,500 fish or greater in 5 of the 9 return years from 2001-2009. Since, on average,

about 40% of the coho migrate upstream via the right bank denil ladder at Prosser, a substantial number of local, natural-origin fish are available annually for collection as broodstock.

Broodstock is randomly collected from adults returning to Prosser Dam/Chandler Canal area, and these fish are derivatives of introduced stocks from outside of the subbasin and adults from the localized broodstock. The in-basin broodstock are collected at Prosser Dam (RM 47), at the right ladder. Broodstock collection occurs between mid-September through mid-November, and fish are collected in proportion to the population run time past Prosser Dam. Based on the pre-season run forecast and the number of experimental and broodstock fish required, the total number of fish to be collected is proportioned in weekly increments throughout the run. This results in a pre-season, weekly collection target number (low in the tails of the run, and higher in the peak). At the beginning of a new week the steep-pass ladder is operated, and all fish are taken (no selection) until the week's target collection number is met.

In the past it was assumed that more than 10% of the broodstock were from naturally produced fish; this was due to the inability to discriminate between hatchery and naturally produced fish since fish have not been 100% marked. In recent years all hatchery production has been externally marked (see 7.3).

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.

Since 2000, the proportion of natural-origin coho used for the local broodstock program ranged from 3-70% (see Table 1.11.1.1). The project is using a stepped approach to increase returns from the local broodstock program (see 1.11.1). See also Section 1.12 and Appendix A of Yakima Coho Master Plan.

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.

Broodstock is derived from adults returning to the Yakima River. Generally these are naturally produced fish of hatchery ancestry. The primary reason for choosing Lower River brood stock to begin with is that it is the closest stock available geographically and it is the only early stock in the Columbia River basin. There are no differences between the hatchery and natural populations because the natural population was extirpated and the current hatchery populations are being used to develop the natural stock.

6.2.5) Reasons for choosing.
Describe any special traits or characteristics for which broodstock was selected.
The native stock has been extirpated, however the broodstock chosen is likely to adapt to the system based on life history and evolutionary history.

The question of reverse domestication is being investigated as part of the genetics monitoring and evaluation program. Part of the hatchery treatments is to investigate differences in survival

between in-basin and out-of-basin stocks. Preliminary results were published in Bosch et al (2007). Preliminary indices of smolt-to-adult survival for natural-origin coho were 3.5 to 17.0 times survival indices of hatchery-origin coho. The number of coho returning to historical native spawning habitats in upriver areas generally increased. Spawning surveys demonstrated the existence of robust and sustainable spawning aggregates in various locations in the basin. Hatchery releases from local brood source parents had significantly higher smolt-to-smolt survival than releases from out-of-basin hatchery broodstock, but some of these observed differences in survival could have been due in part to differences in smolt size. We concluded that hatchery-origin coho, with a legacy of as many as 10 to 30 generations of hatchery-influence, demonstrated their ability to reestablish a naturalized population after as few as 3 to 5 generations of outplanting in the wild.

Survival differences between the various stocks used for brood are evaluated annually and published in project annual reports, most recently in Sampson et al. (2009). The selected broodstocks are meeting the management objectives set forth in this phase of the program.

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*.").

Risks for Yakima Basin coho restoration feasibility study objectives and strategies are discussed in Section 6 of the Coho Master Plan. Risks of the coho program generally fall into three categories:

- Physical effects on environmental resources caused by facility development
- Effects on target fish (coho) and non-target taxa (NTT) caused by monitoring and broodstock collection activities (e.g., trapping, marking, handling, etc.)
- Interaction risks to non-target fish from the presence of reintroduced coho.

As documented in Hubble et al. 2004, all the risk levels are relatively low and do not warrant additional monitoring beyond what is currently proposed. See also section 6 of Yakima Coho Master Plan.

SECTION 7. BROODSTOCK COLLECTION

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

Generally, adults for the local-origin broodstock are collected for brood stock from the Prosser right bank denil ladder. See table 7.4.2.1 of this HGMP. In the future, brood stock may be collected at Roza Dam on the Upper Yakima (trap operations there in the fall of 2009 encountered nearly 1,000 returning adult coho). Brood collection at Cowiche or Wapatox Dams on the Naches River is also a possibility in the future; however, upgrades to existing facilities may be required to make this truly feasible. Thus, brood collection in the Naches system will be

considered further in development of the long-term Master Plan.

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.

Broodstock for program is randomly collected at Prosser Dam facility over the adult run entry pattern. Broodstock collection occurs between mid-September through mid-November, and fish are collected in proportion to the population run time past Prosser Dam. Based on the pre-season run forecast and the number of experimental and broodstock fish required, the total number of fish to be collected is proportioned in weekly increments throughout the run. This results in a pre-season, weekly collection target number (low in the tails of the run, and higher in the peak). At the beginning of a new week the steep-pass ladder is operated, and all fish are taken (no selection) until the week's target collection number is met.

See also Appendix A in Yakima Coho Master Plan.

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.

Marking techniques are used to distinguish among hatchery population segments. One hundred percent (100%) of the hatchery fish released are marked so that they can be distinguished from the natural population. Natural-origin fish comprise approximately 30-50% of the broodstock for this program annually.

Beginning with the 2001 adult return (2000 smolt release) 100% of all hatchery-origin coho were adipose fin-clipped and coded-wire-tagged in the snout. This marking scheme occurred through the 2004 smolt release. For 2005-2009 smolt releases, all coho smolts, both of in-basin (local) and out-of-basin brood hatchery-origin were adipose fin-clipped. Beginning with smolt release year 2010, all in basin brood coho will receive blank wire tags and all out of basin coho smolts will be adipose clipped.

Since smolt release year 2001, PIT tags have been used to evaluate survival differences between in basin and out of basin brood coho. Generally, up to 24,000 PIT tags (12,000 per release group) have been used to evaluate smolt survival from Yakima River acclimation sites. PIT tags are also used to evaluate survival of summer parr releases as all releases are PIT-tagged.

7.4) Proposed number to be collected:

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

The broodstock goal is 960 local origin adults to meet the 1 million production goal (500,000 smolts and 500,000 parr). See Appendix A of Yakima Coho Master Plan.

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

Collection of local origin broodstock from the Prosser right bank denil ladder from 1997 to present were:

Table 7.4.2.1. Prosser Denil Broodstock Collection

Brood	Adults			Jacks		
Year	Total	Hat.	Nat.	Total	Hat.	Nat.
1997		32				
1998		48				
1999	282	282		4		
2000	448			21	2	19
2001	586	445	141	12	8	4
2002	87	25	62	47	13	34
2003	467	139	328	20	5	15
2004	265	7	258	5	0	5
2005	157	66	91	11	1	10
2006	401	263	138	3	0	3
2007	274	3	271	1	0	1
2008	415	380	107	23	13	10

Data source: B. Bosch/T. Newsome. YN Fisheries. YakRCoho.xls

On average, local brood collection resulted in production of up to 300,000 local brood origin smolts for release annually. Up to 700,000 pre-smolts were imported from out-of-basin (lower Columbia River hatcheries) and released from acclimation sites to meet program goals. Brood stock varies from year to year depending on the run size. The increase in Hatchery Origin Broodstock noted above, is the direct result of the difficultly in capturing enough Natural Origin Brood to fulfill program goals. The Prosser Steep Pass Denil attracts on average 40% of the coho run depending on the water year and ladder conditions. In the future to meet broodstock goals, broodstock will be collected at Roza Dam in the upper Yakima River and at Cowiche or Wapatox Dams in the lower Naches River.

Table 7.4.2.2. Denil passage and Proportion Hatchery/ Wild Escapement

Return Year	Denil Passage	Hatchery Percentage	Wild Percentage
2001	42.5%	71.6%	28.4%
2002	41.8%	31.3%	68.7%
2003	43.8%	30.4%	69.6%
2004	47.7%	23.5%	76.5%
2005	35.2%	78%	22%
2006	33.9%	59.3%	40.7%
2007	37.6%	59.5%	40.5%

2008	33%	73.8%	26.2%

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.

Because fish are collected from sites adjacent or near Prosser Hatchery according to a pre-defined collection schedule, no fish have been collected in surplus of broodstock needs at the Prosser Hatchery. The program only imports as many pre-smolts from lower Basin facilities as necessary to supply annual program release goals.

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.

Equipment Type	Capacity (gallons)	Supplemental Oxygen (y/n)	Temperature Control (y/n)	Normal Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Adult Transfer Tanker Truck	700	Y	N	5	Light dose MS	nya
Juvenile Transfer Tanker Truck	2500	Y	N	150	NONE	nya

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Vinyl line Raceway	22000	150	50	4	1100

Adults are captured at steep pass at Prosser Dam and trucked ½ mile to Prosser Hatchery and held in large holding ponds. They are treated with formalin and checked weekly for ripeness. Broodstock are collected and held in a manner that results in less than 10% prespawning mortality. IHOT guidelines for transport are followed for this program.

7.7) Describe fish health maintenance and sanitation procedures applied.

Integrated Hatchery Operations Team (IHOT 1995), Pacific Northwest Fish Health Protection committee (PNFHPC), state or tribal guidelines are followed for broodstock fish health inspection, transfer of eggs or adults and broodstock holding and disposal of carcasses. Fish transfers into the subbasin are inspected and accompanied by notifications as described in these guidelines.

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

Carcasses are distributed within the subbasin to provide ecological benefits in late winter (January and February) either by foot or boat. Using guidelines developed by USFWS fish health specialists, the fish carcasses are prepared by gutting them and removing the heads, then bagging and cooking the fish at over 100 degrees Fahrenheit for a minimum of 4 hours. The fish are then frozen for at least 2 weeks. Each bag usually has up to four coho (4-6 pounds each) or two fall Chinook (10 pounds each).

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").

Coho broodstock collection activities at Prosser Dam (right bank denil ladder and sampling facility) occur during the early portion of steelhead passage at Prosser Dam. It should be noted that the Prosser denil sampling facility is operated in the fall for multiple purposes, two of which are to enumerate and sample returning coho and to collect broodstock for the locally-adapted coho program. Steelhead sampling at the denil during the fall could, and probably would, occur regardless of coho sampling activities at the denil. Steelhead encounter rates at the denil during fall season sampling activities for recent years are given in table 7.9.1.

Table 7.9.1. Yakima River Prosser Dam right bank denil ladder/trap sample rate for steelhead, 2000-2009.

	Hatchery			Wild			Total		
Year	TotCount	Denil	Denil%	TotCount	Denil	Denil%	TotCount	Denil	Denil%
2000	57	5	8.8%	3,032	82	2.7%	3,089	87	2.8%
2001	34	5	14.7%	4,491	472	10.5%	4,525	477	10.5%
2002	45	7	15.6%	2,190	175	8.0%	2,235	182	8.1%
2003	16	7	43.8%	2,739	575	21.0%	2,755	582	21.1%
2004	74	6	8.1%	3,377	987	29.2%	3,451	993	28.8%
2005	10	2	20.0%	1,995	359	18.0%	2,005	361	18.0%
2006	14	4	28.6%	1,523	196	12.9%	1,537	200	13.0%
2007	285	3	1.1%	3,025	274	9.1%	3,310	277	8.4%
2008	25	1	4.0%	3,425	244	7.1%	3,450	245	7.1%
2009[1]	95	8	8.4%	4,359	619	14.2%	4,454	627	14.1%

[1] "TotCount" fields are preliminary; data through late December, 2009. For all other years these data represent Steelhead return years, e.g., July 1 through June 30.

All steelhead were released to the river unharmed following sampling. In these recent years of brood collection activities only one steelhead mortality is known to have occurred (fish jumped out of trapping/holding area and was found dead).

The primary objective of the coho program is the restoration/recovery of a natural spawning population using hatchery and hatchery/natural derivatives. The program recognizes the Proportion Natural Influence (PNI) concept as recommended by the HSRG and is working to increase both the proportion of natural-origin fish in the local broodstock composition (PNoB) and on the spawning grounds (see 1.11.1).

See also Bosch et al 2007 and section 6 of the Yakima Coho Master Plan.

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).

Broodstock are selected to represent the full spectrum of the run.

At Prosser Hatchery spawning occurs on a weekly basis utilizing whatever females and males are ripe for that particular week. Males and females available on a given day are mated randomly.

Eggs are fertilized with more than one male whenever possible, however, to the extent possible, males are only used once (one-to-one spawning). Jacks are incorporated into the mating scheme.

8.2) Males.

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

Eggs are fertilized with more than one male whenever possible, however, to the extent possible, males are only used once (one-to-one spawning). Jacks are incorporated into the mating scheme. Precocious males (jacks) are used as a set percentage or in proportion to their contribution to the adult run. Back-up males are also used in the spawning protocol if necessary. Beginning in 2009, back-up males will be live-spawned and milt used to fertilize all out-of-basin (Eagle Creek) females. This strategy will increase the proportion of local brood stock parentage in the overall population over time.

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.

Eggs from one female are placed into an individual bucket, and fertilized with a single male. After approximately one minute, the gametes from the buckets containing eggs of three females are combined to allow some pooling to occur prior to water hardening.

IHOT, PNFHPC, tribal, and federal guidelines are followed for culture practices for this program. Disinfection procedures that prevent pathogen transmission between stocks of fish are implemented during spawning.

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.

Cryopreserved gametes are not used.

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

The program is attempting to increase diversity by incorporating as many natural-origin fish into the local broodstock program as possible. See also above sections.

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.

At Prosser Hatchery, the egg take has ranged from 50K to 350K since broodstock collection was initiated in 1997. The egg take goal is 1M parr/smolts. The rearing protocol allows for an egg-to-smolt survival rate of 65%. The Prosser Hatchery has warmer water than is preferable for coho spawning. This has created elevated mortality rates for all spawning and rearing life stages. In an attempt to increase survival, we now use a chiller to cool water to the adult holding pond. This has decreased the water temperature by about 10 degrees F. Egg-to-smolt survival remains highly variable and is generally lower than observed for most Columbia Basin coho facilities. As stated in 5.7 above, an updated facility will be included in the program's long-term Master Plan expected to be submitted to the NPCC for step-review after 2011.

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 culling of eggs or juveniles has occurred for this program except for dead and diseased eggs.

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).

Vertical Stack incubators are used at Prosser with a loading density of approximately 5,000 eggs per tray (Heath). Individual families are not maintained within spawning groups and are mixed randomly at ponding. Integrated Hatchery Operations Team (IHOT) species-specific incubation recommendations were followed for water quality, flows, temperature, substrate and incubator capacities.

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.

Incubation water is an on-site shallow well source that is probably recharged from sources similar to the Chandler Canal/Yakima surface water. Integrated Hatchery Operations Team (IHOT) species-specific incubation recommendations are followed for water quality, flows, temperature, substrate and incubator capacities. Eggs are incubated under conditions that result in equal survival of all segments of the population to ponding. Families within spawning groups are mixed randomly at ponding so that unintentional rearing differences affect families equally. Fish are monitored regularly for temperature units.

In 2000 we had soft shell in the coho eggs. No formal fish health screenings occur during incubation. However, adult broodstock are screened for routine bacteria and viruses at the time of spawning by USFWS.

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.

Fry are moved from vertical trays to outside ponds at nearly 100% button up. This occurs at approximately 1,400 TUs. Fry are approximately 35mm in fork length at ponding. Any remaining fry are ponded the end of March.

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.

Disinfection procedures are implemented during incubation to prevent pathogen transmission between stocks of fish on site. Following eye-up stage, eggs are inventoried, and dead or undeveloped eggs removed and disposed of as described in the disease control guidelines. Dead or culled eggs are discarded in a manner that prevents transmission to receiving watershed.

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.")*

See above responses.

9.2) <u>Rearing</u>:

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.

See 9.1.1 above.

9.2.2) Density and loading criteria (goals and actual levels).
Include density targets (lbs fish/gpm, lbs fish/ft3 rearing volume, etc).

The juvenile rearing density and loading guidelines used at the facility are based on: standardized agency guidelines and staff experience (e.g. trial and error). IHOT standards are followed for: water quality, alarm systems, predator control measures to provide the necessary security for the cultured stock, loading and density. The goal is 0.50 lb fish per cubic foot of rearing space.

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).

Settleable solids, unused feed and feces are removed periodically to ensure proper cleanliness of rearing containers. IHOT standards are followed for: water quality, alarm systems, predator control measures to provide the necessary security for the cultured stock, loading and density. The juvenile rearing density and loading guidelines used at the facility are based on standardized agency guidelines and staff experience (e.g. trial and error). Rearing containers are cleaned daily. Rearing containers are treated according to the Agency Disinfection and Sanitation Guidelines. The goal is 0.50 lb fish per cubic foot of rearing space.

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.

The following data were compiled using an average for the most recent 3 years. Fish per pound (fpp) was actually measured, with lengths estimated using Piper et al. (1982).

Rearing Period	Length (mm)	Weight (fpp)
February	33.9	1200
March	41	662
April	51	257
May	66.2	165
June	76	104
July	88	66
August	102.5	43
September	111.7	33
October	120	27

November	126.6	23
December	132.6	20
January	134.7	19
February	137.4	18
March	142.5	16
April	149.5	14

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 9.2.4.

The correct amount and type of food is provided to achieve the desired growth rate and condition factors for the species and life stages being reared. Moore Clark dry pellets appropriate to size of fish being fed is used. Fish are fed according to body size, water temperature, and desired release size (ranging from 1½-5% of body weight).

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*).

See 9.2.5.

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

IHOT fish health guidelines are followed to prevent transmission between lots of fish on site or transmission or amplification to or within the watershed. The juvenile rearing density and loading guidelines used at the facility are based on standardized agency guidelines and staff experience (e.g. trial and error). Juveniles are screened monthly for routine bacteria, viruses and parasites by USFWS. The goal is 0.50 lb fish per cubic foot of rearing space.

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

The migratory state of the release population is determined by volitional release.

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

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size such that smoltification occurs within nearly the entire population, which will reduce retention in the streams after release. Rearing on parent river water or acclimation for several weeks to parent river water is done to ensure homing to the stream reaches geographically adjacent to the acclimation sites. Fish are volitionally released in March or April depending on annual flow conditions. Releases are volitional from all four sites.

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.")*

See above responses.

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	42,000		Last week of July	Yakima and Naches Watersheds, See Appendix A
Yearling	700,000-1,000,000	17-22/lb	Volitional Early April	Yakima and Naches Watersheds, See Appendix A

See also Section 1.11.2.

10.2) Specific location(s) of proposed release(s).
Stream, river, or watercourse: *(include name and watershed code (e.g. WRIA) number)*
Release point: (*river kilometer location, or latitude/longitude*)
Major watershed: (e.g. "Skagit River")
Basin or Region: *(e.g. "Puget Sound")*

See Section 1.11.2. Coho acclimation sites are located at: Boone Pond (Rkm 290.5) and L.D. Holmes' property (Rkm 257.5) on the Upper Yakima River. In the Naches Basin, acclimation sites are located at Lost Creek Pond (Rkm 62.8) and Stiles Pond (Rkm 14.5). The new proposed acclimation sites are Hundley Pond (Rkm 307.3) and Brunson Pond (Wilson Creek Rkm 10.9). Parr release locations are provided in Appendix Table 1 of this document.

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.*

Table 10.3.1. Yakima Basin Coho Release Numbers and Stock, release years 1999-2008. Prior to 1999, all releases were from Little White Salmon stock. See Section 9.2.4 for average size of fish at release.

Year	Subbasin	Total Numbers Released	Site	Stock	Date of Release[a]	Pit Tagged Number Released
1999	Upper Yakima	210,000	Cle Elum	Cascade	Early	799
				Yakima	Early	1158
				Cascade	Late	809
				Yakima	Late	1181
		226,000	Jack Creek	Cascade	Early	1245
				Yakima	Early	1243
				Cascade	Late	1246
				Yakima	Late	1229
	Naches	1,020,000	Lost Creek	Cascade	Early	1160
				Yakima	Early	1047
				Cascade	Late	1220
				Yakima	Late	1144
		237,000	Stiles	Cascade	Early	1274
				Yakima	Early	1244
				Cascade	Late	1248
				Yakima	Late	1240
2000	Upper Yakima	125,591	Cle Elum	Willard	Early	2487
		125,545		Willard	Late	2462
		125,501	Easton	Willard	Early	2476
		125,518		Willard	Late	2476
	Naches	125,567	Lost Creek	Willard	Early	2489
		125,539		Willard	Late	2488
		125,532	Stiles	Willard	Early	2488
		125,601		Willard	Late	2493
2001	Upper Yakima	96,373	Cle Elum	Willard	Early	**1219**
		36,131		Yakima	Early	**1207**
		85,122		Willard	Late	1197
		36,183		Yakima	Late	1240
		86,980	Easton	Willard	Early	**1234**
		34,042		Yakima	Early	**1249**
		87,721		Willard	Late	1234
		36,320		Yakima	Late	1247

Year	Subbasin	Total Numbers Released	Site	Stock	Date of Release[a]	Pit Tagged Number Released
	Naches	86,421	Lost Creek	Willard	Early	**1245**
		35,428		Yakima	Early	**1250**
		85,122		Willard	Late	1240
		31,213		Yakima	Late	1251
		86,680	Stiles	Willard	Early	**1237**
		9,953		Yakima	Early	**1249**
		87,217		Willard	Late	1236
		7,364		Yakima	Late	1249
2002	Upper Yakima	62,530	Easton	Willard	Early	1248
		62,525		Willard	Late	2497
	Naches	62,604	Lost Creek	Willard	Early	1249
		30,494		Yakima	Early	1192
		62,542		Willard	Late	1247
		30,133		Yakima	Late	1250
		62536	Stiles	Willard	Early	1249
		34,992		Yakima	Early	1250
		62,562		Willard	Late	1251
		34,041		Yakima	Late	1250
2003	Upper Yakima	310,726	Holms,Easton	Willard	Volitional	4960
				Yakima	Volitional	3355
	Naches	166,803	Lost Creek	Willard	Volitional	2497
		17,824		Yakima	Volitional	3333
		166,547	Stiles	Willard	Volitional	2501
		6,356		Yakima	Volitional	3332
2004	Upper Yakima	264000	Holmes	Willard	Volitional	2500
		14000	Boone	Yakima	Volitional	
		125000		Cascade	Volitional	2500
	Naches	14000	Lost Creek	Yakima	Volitional	2500
		125000		Cascade	Volitional	
		268000	Stiles	Willard	Volitional	2500
2005	Upper Yakima	261,207	Holmes	Eagle Creek	Volitional	2500
		52000	Boone	Yakima	Volitional	2500
	Naches	52000	Lost Creek	Yakima	Volitional	2500
		239,494	Stiles	Eagle Creek	Volitional	2500
2006	Upper Yakima	18750	Holmes	Yakima	Volitional	2500
		40000		Washougal	Volitional	
		97487		Eagle Creek	Volitional	2500
		18750	Boone	Yakima	Volitional	2500
		50000		Washougal	Volitional	

Year	Subbasin	Total Numbers Released	Site	Stock	Date of Release[a]	Pit Tagged Number Released
		97430		Eagle Creek	Volitional	2500
	Naches	18750	Lost Creek	Yakima	Volitional	2500
		50000		Washougal	Volitional	
		97482		Eagle Creek	Volitional	2500
		18750	Stiles	Yakima	Volitional	2500
		50000		Washougal	Volitional	
		97473		Eagle Creek	Volitional	2500
2007	Upper Yakima	30382	Holmes	Yakima	Volitional	2500
		57381		Washougal/EC	Volitional	
		150000		Eagle Creek	Volitional	2500
			Boone	Yakima	Volitional	2500
		50117		Washougal/EC	Volitional	
				Eagle Creek	Volitional	2500
	Naches		Lost Creek	Yakima	Volitional	2500
		101016		Washougal/EC	Volitional	
		150000		Eagle Creek	Volitional	2500
		9199	Stiles	Yakima	Volitional	2500
		51300		Washougal/EC	Volitional	
		150000		Eagle Creek	Volitional	2500
	Prosser	80000	Prosser	Washougal/EC	Volitional	1000
		40,000	Prosser	Eagle Creek	Volitional	
2008	Upper Yakima	77793	Holmes	Yakima	Volitional	2500
				Washougal/EC	Volitional	
		150000		Eagle Creek	Volitional	2500
			Boone	Yakima	Volitional	
		39726		Washougal/EC	Volitional	
				Eagle Creek	Volitional	2500
	Naches	81674	Lost Creek	Yakima	Volitional	2500
				Washougal/EC	Volitional	
		100000		Eagle Creek	Volitional	2500
		85079	Stiles	Yakima	Volitional	2500
				Washougal/EC	Volitional	
		100000		Eagle Creek	Volitional	2500
	Easton	100000	Easton	Eagle Creek	Volitional	2500
		89328	Easton	Washougal	Volitional	
	Prosser		Prosser	Washougal/EC	Volitional	
		41,000	Prosser	Eagle Creek	Volitional	1250

[a] Early releases occurred on or about May 6-17. Late releases occurred on or about May 25-31. Volitional releases began in early April.

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.

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size such that smoltification occurs within nearly the entire population, which will reduce retention in the streams after release. Rearing on parent river water or acclimation for several weeks to parent river water is done to ensure homing to the stream reaches geographically adjacent to the acclimation sites. See above for release dates. Since 2003, fish have generally been released volitionally beginning in March or April depending on annual flow conditions. Releases are volitional from all four sites. Fish are volitionally released over a two week period and forced out of the rearing units at the end of the two week period, during the latter part of the natural outmigration window. The program specifies release times and sizes for fish (See 9.2.9).

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.

Equipment Type	Capacity (gallons)	Supplemental Oxygen (y/n)	Temperature Control (y/n)	Normal Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Adult Transfer Tanker Truck	700	Y	N	5	Light dose MS	nya
Juvenile Transfer Tanker Truck	2500	Y	N	150	nya	nya

Above information applies to Prosser Hatchery

Summer parr are transported in pickup trucks using 500 gallon aerated tanks. Smolts (from both out-of-basin and in-basin programs) are transported using large trucks supporting 2500 gallon tanks.

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

Pre-smolts are acclimated approximately six or nine weeks depending on flow conditions and snow pack. Remote pit tag detectors are checked daily. Typical fish culture activities include net pond maintenance, pond cleaning (if applicable), mortality assessments, and growth and fish health measurements.

Approximately 17,000 summer coho parr will be raised at the LaSalle High School grounds and scatter-planted in Ahtanum Creek (below the forks) as part of a cooperative project with the school. Up to 45,000 coho will be released as parr in late July from 2007-2011 to assess overwinter survival in the selected 14 tributaries and two lakes (see Overwinter Survival Studies in Section 1.5 of Appendix). Because parr are expected to rear for up to an additional year in freshwater after planting, they should be well acclimated to local waters prior to their smolt

outmigration.

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

Marking techniques are used to distinguish among hatchery population segments. One hundred percent (100%) of the hatchery fish released are marked so that they can be distinguished from the natural population.

Beginning with the 2001 adult return (2000 smolt release) 100% of all hatchery-origin coho were adipose fin-clipped and coded-wire-tagged in the snout. This marking scheme occurred through the 2004 smolt release. For 2005-2009 smolt releases, all coho smolts, both of in-basin (local) and out-of-basin brood hatchery-origin were adipose fin-clipped. Beginning with smolt release year 2010, all in basin brood coho will receive blank wire tags and all out of basin coho smolts will be adipose clipped.

Since smolt release year 2001, PIT tags have been used to evaluate survival differences between in basin and out of basin brood coho. Generally, up to 24,000 PIT tags (12,000 per release group) have been used to evaluate smolt survival from Yakima River acclimation sites. PIT tags are also used to evaluate survival of summer parr releases with up to 3,000 PIT tags per release group.

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

No surpluses have occurred in the program; all fish reared and acclimated to smolt phase are released.

10.9) Fish health certification procedures applied pre-release.

All fish are examined for the presence of "reportable pathogens" as defined in the PNFHPC disease control guidelines, within 3 weeks prior to release by USFWS pathologist under contract. Fish transfers into the subbasin are inspected and accompanied by notifications as described in IHOT and PNFHPC guidelines.

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

Pull screens and boards, and allow fish to exit the facility volitionally into Yakima and/or Naches Rivers.

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").*

See above responses.

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.

Plans and methods are generally set forth in the Yakima/Klickitat Fisheries Project relative to collecting data that is responsive to monitoring and evaluating program performance standards/indicators.

Specific program performance objectives as stated in the Planning Status Report (PSR) for the YKFP.
-Estimate annual life stage survival rates

- Egg-to-smolt: derived from adult counts, known fecundity rate and estimated smolt count past CJMF.

- Smolt-to-smolt (natural and hatchery): derived from PIT data analysis at CJMF and the lower Columbia mainstem dams.

- Smolt-to-adult (natural and hatchery): derived from, 1) PIT tag data and 2) estimated smolt divided into the Prosser adult counts.

-Temporal and spatial spawning distribution: Radio telemetry study and selected foot surveys.

-Hatchery Experimental Design (location, release time, and stock): PIT tag and CWT data analysis from the various treatment groups.

-Smolt Production: Monitored annually at CJMF.

-Adult Returns: Monitored annually at Prosser and Roza dams. May be monitored in the future at Cowiche and/or Wapatox Dams in the Naches system pending infrastructure upgrades; this issue will be addressed in the long-term Master Plan.

-Genetic monitoring of reverse domestication: Develop and implement a genetics monitoring plan.

-Predation on other species (NTTOC): Monitored through the YKFP indirect and direct predation studies.

-Other potential ecological interactions: Monitored through snorkel surveys in the upper Yakima and Naches rivers.

See also Hubble et al. (2004) and Bosch et al. (2007).

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

BPA Fish & Wildlife Program funding available for Yakima Fisheries Project M&E activities (Project #199506325).

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.)"*

Risks for Yakima Basin coho restoration feasibility study objectives and strategies are discussed in Section 6 of the Coho Master Plan. Risks of the coho program generally fall into three categories:

- Physical effects on environmental resources caused by facility development
- Effects on target fish (coho) and non-target taxa (NTT) caused by monitoring and broodstock collection activities (e.g., trapping, marking, handling, etc.)
- Interaction risks to non-target fish from the presence of reintroduced coho.

As documented in Hubble et al. 2004, all the risk levels are relatively low and do not warrant additional monitoring beyond what is currently proposed.

See also section 6 of Hubble et al. 2004.

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 ultimate goal of the Yakima coho reintroduction project is to determine whether adaptation and recolonization success is feasible and to reestablish sustainable populations in the wild. The program has been separated into two phases. To date, we have concluded that it is feasible to use out of basin founding stocks and create a naturalized population (Bosch et al. 2007). We are presently working to re-establish coho into tributaries and to determine which tributaries give the coho recovery its best chance at success. This project integrates other federal and state agencies as well as local property owners, irrigators and conservation districts.

We are continuing work to determine the optimal locations, life stage, release timing, and brood source that will maximize opportunities to achieve the long-term objective. We also continue to monitor trends in returning adults (e.g., abundance of natural- and hatchery-origin returns, spawning distribution, return timing, age and size at return, etc.) to evaluate progress towards achieving objectives.

The overall focus is on evaluating the survival parameters of the hatchery releases. The project has investigated survival differences between the Naches and upper Yakima subbasins, date of smolt release (early vs late) and stock effect (in basin vs out-of-basin). We are presently evaluating the survival of adult and parr outplants in tributaries. For most recent results see Sampson et al. (2009). There are other YKFP projects that indirectly provide information to address reintroduction feasibility questions (i.e. predation studies, EDT modeling).

The following summarizes findings from our research to date:

Historical returns of coho salmon to the Yakima River Basin were estimated to range from 45,000 to 100,000 fish annually but declined to zero by the 1980s after decades of overexploitation of fishery, water, and habitat resources. In 1996 the Yakama Nation and cooperators initiated a project to determine the feasibility of reestablishing a naturally spawning coho population in the Yakima River. The Yakima coho project explored whether successful recolonization was feasible when multi-generational, hatchery-reared coho were reintroduced to native habitats. After 10-20 years of outplanting, we compared data for adult returns of known natural- and hatchery-origin coho. We found that natural-origin coho returned at a significantly larger size than hatchery-origin coho. Mean egg mass and mean egg size of natural-origin females were greater than those of hatchery-origin females, though the differences were statistically significant for only one of three sample years. Natural-origin adults returned (2 to 9 days) and spawned (5 days) later than their hatchery-origin counterparts. Preliminary indices of smolt-to-adult survival for natural-origin coho were 3.5 to 17.0 times survival indices of hatchery-origin coho. The number of coho returning to historical native spawning habitats in upriver areas generally increased. Spawning surveys demonstrated the existence of robust and sustainable spawning aggregates in various locations in the basin. Hatchery releases from local brood source parents had significantly higher smolt-to-smolt survival than releases from out-of-basin hatchery broodstock, but some of these observed differences in survival could have been

due in part to differences in smolt size. We conclude that hatchery-origin coho, with a legacy of as many as 10 to 30 generations of hatchery-influence, demonstrated their ability to reestablish a naturalized population after as few as 3 to 5 generations of outplanting in the wild.

For additional detail and results see:
Dunnigan, J.L., Feasibility and Risks of Coho Reintroduction in Mid-Columbia, Monitoring and Evaluation 1999 Annual Report, Prepared for U.S. Dept. of Energy, Bonneville Power Administration, Division of Fish and Wildlife, Project #9604000, Portland, OR.

Dunnigan, J.L., Yakima coho monitoring and evaluation, Project Annual Report 1999, Bonneville Power Administration, Portland, OR.

Dunnigan, J. L., W. J. Bosch, and J. D. Hubble. 2002. Preliminary results of an effort to re-introduce coho salmon in the Yakima River, Washington. In "Hatchery Reform: the Science and the Practice", Proceedings of the International Congress on the Biology of Fish, July, 2002, Don MacKinlay, editor, 555 West Hastings St., Vancouver BC V6B 5G3 Canada.

Bosch, W. J., T. H. Newsome, J. L. Dunnigan, J. D. Hubble, D. Neeley, D. T. Lind, D. E. Fast, L. L. Lamebull, and J. W. Blodgett. 2007. Evaluating the Feasibility of Reestablishing a Coho Salmon Population in the Yakima River, Washington. North American Journal of Fisheries Management 27:198-214.

For additional information on objectives, strategies, and methods see:
Yakima Coho Master Plan, Hubble et al. (2004).

12.2) Cooperating and funding agencies.

The YN and WDFW conduct studies associated with the coho program. Fish for this program are generally reared, transferred (if out-of-basin brood), marked and acclimated using Mitchell Act funds. Bonneville Power Administration is the funding agency for monitoring and evaluation (Project 199506325).

12.3) Principle investigator or project supervisor and staff.

Joe Blodgett, YN Hatchery Manager (for Yakima and Marion Drain),
Dr. David Fast, YKFP Research Manager,
Bill Bosch, YKFP Data Manager, and
Todd Newsome, YN Fisheries Biologist, principle M&E investigator.

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

Same as section 2.

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

A large portion of the M&E relies upon analysis of marks (PIT and CWT) to answer key feasibility questions. Monitoring for PIT tags is done at CJMF and at the lower Columbia River projects. Marks are also recovered in the broodstock collection, spawner surveys and the fisheries. Fish are enumerated as smolts at the CJMF and as adults at Prosser, Cowiche (partial video depending on conditions) and Roza dams using video. Adults used in the telemetry study are drugged for insertion of the tag and bio-sampling. All parr releases are 100% PIT tagged. See also 7.3.

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

Smolt releases are made in the spring (May) and tagging activities associated with these releases occurs in the preceding fall or winter. Predation studies occur in the spring during the outmigration period. Residualism surveys occur in the summer period. The radio-telemetry study occurs in the fall with tagging at Prosser, and continues into early winter with the tracking phase. PIT-tagged parr will be detected at downstream sites when they outmigrate as smolts. Spawning ground surveys occur annually from October through December.

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

See section 9 of this HGMP.

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

Coho are not being killed for research purposes, however, in 1998 and 1999 hatchery fish were collected for the direct predation study in the upper Yakima River. Steelhead adults intercepted at Prosser steep-pass ladder for the coho adult radio-telemetry study are passed directly back to the river (water-to-water transfer; See Section 7.9 for additional information). Electrofishing will be limited. Electrofishing is planned for certain tributaries that are part of interactions studies between coho and RBT's however, snorkeling and seining will be the main monitoring techniques. Nearly all tributaries have Rainbow Trout/Steelhead in them, however, we have not documented any mortality on previous activities, i.e., electro fishing, seining, in tributaries and maintsem streams. We do not expect any mortality. See take table (Table 1) and the Appendix at end of this document for additional information.

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).

Mid-Columbia ESU (Yakima Basin) Steelhead

ESU / Population	Mid-Columbia ESU, Yakima Basin wild/natural steelhead
Activity	Summary for all Yakima Basin coho-related program activities (listed separately in section 2.2.3
Location of hatchery activity	Various
Dates of activity	Year round
Hatchery Program Operator	Joe Blodgett/YN, Bill Fiander/YN, Todd Newsome/YN

Potential for / estimates of injury or mortality, and methods to reduce either is minimal for both coho and other salmonids. No problems have been experienced to date with any field activities. See Section 2 of this HGMP and take table at end of this document.

12.10) Alternative methods to achieve project objectives.

None. This is the approved level of M&E agreed upon by the TWG to address all issues associated with coho reintroduction in the Yakima Basin. Alternative methods were explored during the extensive planning and public comment period and none were identified. See also Section 1.16 of this HGMP.

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

Potential take is minimal for both coho and other salmonids. No problems have been experienced to date with any field activities. Some of the proposed tributary work is designed to look into the interactions between coho and rainbow trout and effects of coho on rainbow trout (Tanuem Creek and Nile Creek). The results of this work will guide the future work in tributaries. Any take related to this work is included in the take Table 1.

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.").*

See other sections of this HGMP and section 6 of the Yakima Coho Master Plan.

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.

Please contact YN or visit ykfp.org "Technical Reports and Publications" for copies of additional documents or citations.

Bosch, W. J., T. H. Newsome, J. L. Dunnigan, J. D. Hubble, D. Neeley, D. T. Lind, D. E. Fast, L. L. Lamebull, and J. W. Blodgett. 2007. Evaluating the Feasibility of Reestablishing a Coho Salmon Population in the Yakima River, Washington. North American Journal of

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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: ___Steelhead/RBT_____ ESU/Population:___Mid-Columbia Steelhead_____ Activity:__R, M & E_____				
Location of hatchery activity:___ Yakima Basin _____ Dates of activity:__Year-round_____ Hatchery program operator:___YN_____				
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile-parr	Adult	Carcass
Observe or harass a) (snorkeling activities, spawning surveys?)		<500	<500 Resident Adults	
Collect for transport b)				
Capture, handle, and release c) (electrofishing/seining, broodstock collection at Prosser and Roza Dams)			See Yakima fall Chinook HGMP	

Listed species affected: ___Steelhead/RBT_____ ESU/Population:___Mid-Columbia Steelhead_____ Activity:__R, M & E_____				
Location of hatchery activity:___ Yakima Basin _____ Dates of activity:__Year-round_____ Hatchery program operator:___YN_____				
Capture, handle, tag/mark/tissue sample, and release **Electrofishing Tributaries** • **Reecer Creek** • **Wilson Creek** • **Taneum Creek** • **Rattlesnake Creek** • **Big Creek** • **Nile Creek** • **Cowiche Creek** • **Toppenish Creek** **Toppenish Creek** **Snorkeling Tributaries** • **Taneum Creek (120 females and 160 males)** • **Reecer Creek** • **Big Creek** • **Wilson Creek** **- Naches and Little Naches River tributaries** • **Pile Up Creek** • **Quartz Creek** • **Rattlesnake Creek** • **North Fork Little Naches (2009-2011)** • **Nile Creek** • **Cowiche Creek** **- Mid Yakima River tributaries** • **Ahtanum Creek** • **Toppenish Creek** **Redd Capping** **Taneum Creek** **Spawning Surveys** **All Tributaries listed above** **Coho Acclimation Ponds**		< 500 Juvenile RBT per Tributary,Except Tanuem Creek < 1000 RBT No Effect No Effect No Effect	<500 Resident RBT adults per Tributary Spawning Surveys < 500 Resident Adults per Tributary No Effect	

Listed species affected: ___Steelhead/RBT_____ ESU/Population:___Mid-Columbia Steelhead_____ Activity:__R, M & E_____				
Location of hatchery activity:___ Yakima Basin _____ Dates of activity:__Year-round_____ Hatchery program operator:___YN_____				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g) (electrofishing/seining)		No more than 5 per tributary		
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 primarily 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 primarily 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 primarily 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 primarily 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 primarily 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	SIZE CRITERIA Grams/fish
X	Chinook Yearling	<=20	>=23
X	Chinook (Zero) Fingerling	>20 to 150	3 to <23
X	Chinook Fry	>150 to 900	0.5 to <3
X	Chinook Unfed Fry	>900	<0.5
X	Coho Yearling 1/	<20	>=23
X	Coho Fingerling	>20 to 200	2.3 to <23
X	Coho Fry	>200 to 900	0.5 to <2.3
X	Coho Unfed Fry	>900	<0.5
X	Chum Fed Fry	<=1000	>=0.45
X	Chum Unfed Fry	>1000	<0.45
X	Sockeye Yearling 2/	<=20	>=23
X	Sockeye Fingerling	>20 to 800	0.6 to <23
X	Sockeye Fall Releases	<150	>2.9
X	Sockeye Fry	> 800 to 1500	0.3 to <0.6
X	Sockeye Unfed Fry	>1500	<0.3
X	Pink Fed Fry	<=1000	>=0.45
X	Pink Unfed Fry	>1000	<0.45
X	Steelhead Smolt	<=10	>=45
X	Steelhead Yearling	<=20	>=23
X	Steelhead Fingerling	>20 to 150	3 to <23
X	Steelhead Fry	>150	<3
X	Cutthroat Trout Yearling	<=20	>=23
X	Cutthroat Trout Fingerling	>20 to 150	3 to <23
X	Cutthroat Trout Fry	>150	<3
X	Trout Legals	<=10	>=45
X	Trout Fry	>10	<45

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

Appendix A. **Yakima Coho Program Description**

1.1. Background

Historical returns of coho salmon to the Yakima River Basin were estimated to range from 45,000 to 100,000 fish annually, but declined to zero by the 1980s after decades of overexploitation of fishery, water, and habitat resources. In 1996, the YN and cooperators initiated a project to determine the feasibility of reestablishing a naturally-spawning coho population. This project contains two steps, each with two phases:

Step 1: Feasibility Studies
- Phase I - Feasibility studies (covered in previous Section 7 Consultation).
- Phase IB - Study quality of habitat for juvenile survival and adult spawning (this Section 7 Consultation).

Step 2: Final Development, and Submittal of the Yakima Coho Master Plan (scheduled for 2010 and beyond)
- Phase I - Implement Master Plan, construct facilities (later Section 7 Consultation)
- Phase IB - Full scale program implementation and adaptive management (later Section 7 Consultation).

Step 1, Phase I of the project explored whether successful adaptation and recolonization were feasible when multi-generational, hatchery-reared coho were reintroduced to native habitats (documented in Dunnigan et. al. 1999, 2002 and Bosch et. al. 2007).

After 10-20 years of outplanting, known natural- and hatchery-origin returns were compared for four years. Natural-origin coho returned significantly larger than hatchery-origin coho. Mean egg mass and mean egg size of natural-origin females were greater than those of hatchery-origin females, though the differences were statistically significant for only one of three sample years. Natural-origin adults returned (2 to 9 days) and spawned (5 days) later than their hatchery-origin counterparts.

Indices of smolt-to-adult survival for natural-origin coho were 3.5 to 16.9 times survival indices of hatchery-origin coho and 0.5 to 6.9 times survival indices of wild/natural spring Chinook. Smolt-to-adult survival indices between coho and spring Chinook were compared, since both are stream-type (yearling migrant) salmon. For seven juvenile migration years from 1997-2003, mean smolt-to-adult survival for returns from all hatchery-influenced coho production was 3.7 percent, or approximately 76 percent of the estimated mean survival for wild/natural spring Chinook (4.9 percent) over the same period. Releases from local brood source parents had significantly higher smolt-to-smolt survival than releases from out-of-basin brood source parents. Hatchery-origin coho, with a legacy of as many as 10 to 30 generations of hatchery-influence, showed evidence of local adaptation and increasing fitness after as few as 3 to 5 generations of outplanting in the wild.

Step 1, Phase IB of the project is the subject of this Section 7 Consultation. This phase will continue to develop an in-basin broodstock and includes reintroducing juveniles and adults into select tributaries to monitor and assess current rearing and spawning conditions. Phase IB also includes monitoring and assessing the feasibility of small scale mobile acclimation units that seed individual tributaries with coho, creating self-sustaining populations.

Step 2, Phase I of the project is to develop and implement a Master Plan, and begin construction of proposed facilities. Facilities may include two small-scale hatcheries, one in the Naches Basin and one in the Upper Yakima River. These hatcheries would provide an in-basin broodstock source for ongoing out plants, mobile acclimation, and mainstem acclimation. These activities would be the subject of a later Section 7 Consultation, since implementation would not begin prior to 2010.

Step 2, Phase IB of the project is to provide ongoing adaptive management and full-scale implementation of the

coho program. These activities would also be the subject of a later Section 7 Consultation.

1.2. Project Description

The coho project is part of the YKFP and has been ongoing since 1997. The overall feasibility of full coho reestablishment in the Yakima Basin is still being researched. Step 1, Phase I, has been completed and is currently awaiting publication. The conclusion of Phase I found that reintroduction of an extinct salmonid species using a non-native stock is feasible. The feasibility results indicated that natural origin coho can be produced from F1 generation hatchery returns. In addition, natural origin recruits survive at a higher smolt-to-adult rate than F1 hatchery smolts. Radio tracking and redd surveys have identified three major areas of mainstem spawning. Over 90 percent of the coho redds are in the mainstem Naches and Yakima rivers, which leaves possible reintroduction efforts in these areas exposed to potentially adverse environmental conditions. However, with the conclusion of Phase I, questions remain. If a fully reestablished, self-sustaining, resilient coho population is to exist, tributaries in the Yakima Basin must be in included in the reintroduction. Therefore, the YN proposes expanding research into 14 identified tributaries and two reservoirs in Step 1, Phase IB. The focus will primarily be on researching and assessing the quality of tributary habitat for juvenile survival and adult spawning. Additionally, small-scale mobile acclimation is being proposed as a new way to help reintroduce coho into the tributaries. Tributaries were chosen using three criteria: 1) relatively healthy watershed, 2) functional stream system, and 3) presumed and known historic use by coho. Appendix B shows these streams.

Genetics

Currently, the genetics of the Yakima coho are mixed from various sources. The original Yakima coho has been extinct since 1985. All genetics that are currently residing in the Yakima coho now are a mixture of lower Columbia River coho populations. The current out-of-basin sources being used are Washougal River and Eagle Creek coho stocks. Both have proven to be excellent fish. Other than length of adult migration, no specific change in the genetic make-up has occurred or is expected.

1.3. Propagation Activities

Broodstock Collection

Broodstock collection for the continuing coho reintroduction feasibility project is currently occuring at Prosser Dam at the existing Denil ladder structure on the right bank and at the Prosser Hatchery swim-in trap. Development of localized broodstock is crucial in the future success of coho reintroduction. In the future, coho broodstock will be taken from Roza Dam for the upper Yakima group and Cowiche Dam for the Naches group. Prosser Dam and Roza Dam have existing infrastructure to capture broodstock. At Roza Dam, the existing ladder and trap will be used, which traps 100 percent of the fish that ascend the fish ladder. Cowiche Dam collection will be accomplished with a trap fabricated for the YN. Coho collected at these locations will have traveled approximately 100 miles farther than adults being collected at the Prosser Dam.

Up to approximately 960 adult coho will be collected throughout the run from the first week of September through the first week of December. All non-target fish intercepted during broodstock collection at Cowiche and Roza dams will be immediately passed back to the river to minimize stress and potential mortality. During the broodstock collection operation, any fish detected with a PIT tag (inserted as juveniles) will be radio tagged, released and tracked to determine their spawning locations and timing (see monitoring section below).

The Bureau of Reclamation is planning to retrofit Wapatox Dam with an adult trap in the near future. When that is completed, broodstock will be collected there instead of at Cowiche Dam.

Adult Releases/Out Planting

Adults will be racked into Tanuem Creek for up to two weeks. Up to 150 female and 150 male adult coho will be placed in three different 200 meter (218 yard) sections of Tanuem Creek. These three sections have been sampled by WDFW for approximately 12 years, so they represent an excellent baseline. This will allow research to be done on spawning conditions, impacts to native fish, and overall spawning success.

The racks will be constructed of heavy metal tubing and will be bolted to one another (see Appendix B for a photo). The spaces in the racks will be wide enough to allow juvenile fish to pass, but will prevent adults from moving through them. The racks will be in the creek no longer than necessary (generally up to two weeks). Fisheries technicians, (both state and tribal) will check each site daily to process carcasses and check for debris. Bull trout have not been documented in Taneum Creek, so it is unlikely that bull trout would be caught against the racks. However, as a precaution to protect any unknown bull trout populations and other fish species, and to prevent channel erosion, the racks would be removed during any flood events.

Up to 20 pairs of adults will be outplanted in other select tributaries including Cowiche Creek, Pile Up Creek, Ahtanum Creek, Nile Creek, Wilson Creek, Reecer Creek, Quartz Creek, and Toppenish Creek. Additionally, North Fork Little Naches River will be included for outplanting in 2009-2011. Wooden framed or PVC racks, each approximately 5 feet high and 5 feet wide with 3-inch hardware cloth screens attached, will be placed in each creek. The frames will be attached to one another and left in place for only 24 hours before being removed. This will keep adults from running downstream immediately after release. In addition, technicians will be on site to keep the screens free of debris. It is unlikely that bull trout would get caught in the screens, because the racks will be in the creeks for less than 24 hours and the racks will be removed if the water rises. The coho outplanting areas will be located in fairly secluded areas where there is moderate to good habitat and good road access. To ensure the coho will spawn soon after outplanting, they will be held at the Prosser facility until they begin to ripen, and then transported to the selected tributary. A Hydraulic Project Approval (HPA) will be obtained from WDFW habitat biologists for installing adult racks in the streams.

1.4. Juvenile Releases

Continuing Hatchery Releases

Since 1999, up to 1,000,000 coho smolts have been released into the upper Yakima and Naches rivers. The total number of smolts ranges from 650,000 to 1,000,000 each year depending on brood success. During 2006-2010, the Yakima River coho program will release up to 1,000,000 smolts annually in the Yakima Subbasin. Of these fish, up to 500,000 will be produced from broodstock collected from returning adults. The remaining 500,000 will be smolts from lower Columbia River hatcheries, Eagle Creek National Fish Hatchery and Washougal Fish Hatchery.

Smolts will be acclimated and released from two locations in the Naches subbasin, three locations in the upper Yakima Basin, and from La Salle High School on Ahtanum Creek. Releases in the Naches Subbasin will continue to occur at the existing Lost Creek Pond and Stiles Pond acclimation sites. In the Yakima Basin, acclimation facilities include the existing Holmes Pond, Boone Pond, and Easton Ponds, and two new sites, Brunson Pond and Hundley Pond.

All acclimation sites are existing off-channel ponds. Boone Pond is fed by ground water, Stiles Pond is fed through a WDFW fish screen, Holmes Pond is also fed by ground water, and only becomes a fish bypass system when the Cascade Canal is flowing, at which time the coho are allowed to leave the pond. Lost Creek is the only pond with a direct water source from the creek. The water is piped approximately 150 yards underground from Lost Creek and sent through the two Lost Creek ponds, and then back to Lost Creek. Fish are held in these sites from late February to early April. None of the above acclimation sites or proposed sites dewater any part of the associated stream or river. Approximately 17,000 summer coho parr will be raised at the LaSalle High School grounds and scatter-planted in Ahtanum Creek (below the forks) as part of a cooperative project with the school. All coho smolts will be volitionally released from each location on the first Monday of April (up to 1,000,000 season total). Up to 45,000 of the total 1,000,000 coho will be released as parr in late July each of the next 4 years to assess overwinter survival in the selected 14 tributaries and two lakes (see Overwinter Survival Studies below).

Stream Seeding

The YN proposes to test mobile acclimation units for 3 years on Toppenish Creek, Ahtanum Creek, Rattlesnake Creek and Cowiche Creek. The units are portable aluminum raceways that are 20 feet long, 4 feet wide and 4 feet tall, and will have gravity fed or pumped water into and out of the tanks. In addition, a small emergency generator will be connected to a float that will activate an aerator. The mobile acclimation units will be placed near the streams in areas that have existing disturbance (such as spur roads), and plumbed into the creek. The two proposed units will hold up to 10,000 coho smolts for up to 4 weeks. A small portion of smolts will be PIT tagged to evaluate smolt-to-smolt survival and smolt-to-adult survival. Once the smolts are released, the units will be removed until the following season. The stream seeding may reduce flows to a small portion of each creek; however, this activity would take place during the winter and spring when stream flows are relatively high and would not cause dewatering of any stream reaches.

1.5. Monitoring and Evaluation Activities

Juvenile Collection at Roza Dam

The juvenile fish trap at Roza Dam will be operated all winter and into the spring. This trap will assess coho parr and smolt out migration. Operation of the trap is intended to collect juvenile wild and hatchery coho smolts. Once collected, the coho will be PIT tagged and released directly back into the river. These activities are designed to determine the overall survival of hatchery fish as compared to wild fish and those migrating hatchery fish as compared to those fish migrating later.

Juvenile Collection at Chandler Canal

Juvenile collection at Chandler Canal will be similar to that described in the spring Chinook section.

Other Juvenile Collection Facilities

Ahtanum Creek

This existing trap is operated under the Yakima Reservation Watersheds Project, and has been in operation for 7 years. The trap is run from early December through May. The trap is visited once or twice daily depending on stream flows.

Toppenish Creek

This existing rotary trap has been in full operation for approximately 7 years. Its purpose is to monitor and assess summer steelhead production from Toppenish Creek and its tributaries. The trap is operated from early November through May. The trap is visited once or twice daily depending on flows.

Naches River

A new box trap in the Wapatox Diversion will be operated from April through May. This location will be used because of problems with the Selah Naches Diversion location. A 3 by 3-foot box trap will be operated four days a week from April 1 until May 31. Fisheries technicians will check the trap up to twice daily, depending on the fish capture numbers. The trap will be operated to collect baseline data on migrating salmonid smolts.

Spawning Surveys

Coho spawning surveys are conducted annually on the Ahtanum, Cowiche, Wide Hollow and Satus creeks. They are also conducted in the mainstem Naches River from Cowiche Dam to the confluence with the Yakima and in the

Yakima River between Selah and Union Gap. Spawning ground surveys will be expanded among the proposed tributaries and reservoirs. Surveys will also be expanded to include other suitable tributaries if found. The creek surveys will continue to be conducted on foot, while the mainstem surveys are by raft and power boat. As more coho return to the basin, the index reaches for surveys will be expanded. Data including length, sex and scales for age analysis, are collected from spawned-out carcasses.

Visual surveys will also be conducted in the upper Yakima and Naches subbasins near the acclimation sites described above from mid-September through Late November. Surveys will consist of either walking stream margins or floating stream reaches to count and record the spatial distribution of coho redds in these areas.

Migration timing, habitat utilization and spawning distribution will continue to be monitored for up to 200 adult coho radio-tagged at Prosser Dam from 2006 through 2010 by using a combination of fixed and mobile radio telemetry gear located throughout the Yakima Basin from mid-September through November. Weekly jet boat and automobile surveys will be conducted, in addition to fixed monitoring sites which may include Sunnyside, Roza, Cowiche, and Wapatox dams.

Snorkel Surveys

Snorkeling spot checks will be conducted near acclimation release sites and throughout both entire river systems from spring through fall. These checks will determine whether coho have residualized, and if so, to what extent. The presence of coho will allow fisheries managers to find and collect naturally-rearing coho to PIT tag.

Redd Capping

Redd caps are large nets that are buried around a select redd. The net funnels newly-emergent fry into a small holding vessel were they can be enumerated and released. The nets are inverted and the edges are buried 6 inches down and up to 3 feet from the redd. The net is then allowed to fall over the redd and tail out below it. This is the location of the capture vessel. Redd caps will not impact other species of fish. Selected redds will be capped in tributaries that are fairly stable with good flow. It is possible that redd capping may be done on all 14 tributaries. However, it is impossible to know before the adult coho are racked into the spawning areas, whether the cap is feasible in the tributary. Redd caps will be checked daily and used to assess percent survival of dug redds in tributaries.

Over-winter Survival Studies

Up to 3,000 PIT-tagged summer parr will be released into 14 select tributaries in early August. The parr will range from 75-90 mm (2.95-3.5 inches) to closely resemble the size of naturally-rearing coho. The coho survival for each tributary will be monitored using the PIT tag detectors on the mainstem Yakima River and Columbia River dams. Late summer snorkeling and shocking will also occur to look for presence and absence of these coho.

In addition, summer parr will be released into the Upper Cle Elum River.. The spillway on Lake Cle Elum has been retrofitted to surface spill water through two PIT tag detectors. Bumping Lake has no such detectors; however, engineering plans are currently being drawn for downstream juvenile monitoring sites using PIT tag detectors on mainstem dams in the Yakima and Columbia rivers. Because once the fish are released there will be no way to tell if the fish remain in the tributaries over winter or move into the mainstem systems, replication will be planned for 4 years. Over the span of 4 migration years, different environmental changes will occur and juvenile coho survival in the tributaries should reflect the changes.

Lake Cle Elum coho activities will be done in conjunction with the Bureau of Reclamation and their feasibility studies of providing upstream and downstream passage at the two projects.

Non-Target Taxa of Concern

Interaction evaluations will be conducted on Taneum Creek, Quartz Creek, and Nile Creek. Baseline studies identifying weight/length relationships in rainbow/steelhead trout and sculpin have been conducted on these tributaries. Adult coho will be racked into these monitoring areas to assess changes in resident fish populations.

Evaluations will be conducted in the summer by electrofishing and snorkeling monitoring reaches.

Adult outplanting in Taneum Creek will be performed annually during the spawning season. This work is intended to determine if 1) coho adults will successfully spawn in Taneum Creek and will produce desirable numbers of juvenile parr, and 2) an increase in natural production of coho will negatively affect existing non-target taxa (NTT; e.g., rainbow trout, cutthroat trout), 3) the total combined biomass of juvenile salmonids increases (target + NTT). We will evaluate the net ecological benefit or cost by evaluating the potential benefits of carcass nutrient enhancement and the potential costs of interspecific competition among juveniles. NTT monitoring will utilize the BACIP study design to evaluate changes in the status of the NTT. Adult coho will be racked into three index sites on Taneum Creek for up to two weeks. Up to 150 female and 150 male adult coho will be divided evenly among each of three, 400 meter long (437 yard) sections of the creek (treatment sites). Half of the index site length (200 m) in these three sections have been sampled annually by WDFW for approximately 17 years, so they represent an excellent baseline for the BACIP test. The other 200 m in the 400 m long sections provide additional area to capture and PIT tag NTT for evaluating potential changes in the growth rate of individually tagged NTT. Two or three additional 400 meter long sites in Swauk Creek that will not have coho introduced will serve as control sites and 5 additional 200 m long in-stream control sites will be sampled in Taneum Creek. Sampling treatment and control sites before vs. after coho planting provides a powerful statistical design for evaluating impacts to NTT abundance, mean size, and instantaneous growth. Even with this rigorous sampling design, preliminary power analysis suggests it may take 10 or more years of sustained stocking/or significant natural production to detect changes in the abundance or size structure of NTT in index sites if a treatment effect exists.

Treatment and control sites in Taneum and Swauk creeks will be sampled three times annually by WDFW. The first sampling will occur in the spring (probably March depending on water conditions), using a backpack electrofisher, to collect and PIT tag NTT in 200 m of the 400 m index sites. Then in July and August, index sites will be electrofished following mark-recapture protocols to obtain population abundance estimates of NTT and coho for the BACIP test. A final electrofishing sample will be performed in the fall (October) to recapture PIT tagged NTT and to obtain estimates of summer growth rates of tagged NTT in both treatment and control areas. All electrofishing will be performed following the NMFS electrofishing guidelines.

Carcass Distribution

Approximately 400-500 adult coho and fall Chinook broodstock fish carcasses will be distributed in tributaries where coho are known to overwinter. In addition, carcasses will be put into side channels and beaver ponds of the Upper Yakima River, Naches River and Little Naches River. Carcasses will be put out in late winter (January and February) and distributed either by foot or boat. The fish carcasses will be prepared by gutting them and removing the heads, then bagging and cooking the fish at over 100 degrees Fahrenheit for a minimum of 4 hours. The fish will then be frozen for at least 2 weeks. Each bag will usually have up to four coho (4-6 pounds each) or two fall Chinook (10 pounds each).

Appendix Table 1. Existing and Proposed Coho Reintroduction Feasibility Program (new Phase 1B proposed activities highlighted in bold type)

Activity	Location, Numbers, Timing
Hatchery rearing and broodstock development	- Prosser Hatchery: Up to 500,000 smolts reared - Lower Columbia River hatcheries: between 500,000 – 1 million fry/smolts reared Total production not to exceed 1 million fish for release

Acclimated volitional smolt releases from mainstem sites (smolt-smolt survival studies)	900,000 annually, spring volitional release • 450,000 Upper Yakima River (Easton (RM 201), Boone (RM 180) , Holmes (RM 160), **Brunson (Wilson Creek RM 6.8)**, **Hundley (RM 191) , Reecer Creek RM .5 (2009), and Courier Creek RM 1.5 (2009)** acclimation ponds) 1,250 of these fish acclimated over winter and released from Easton Lake in the Keechelus Easton Reach • 450,000 Naches River (Stiles RM 9) and Lost Creek (RM 39) acclimation ponds)
Acclimated volitional smolt releases from new tributary sites (smolt-smolt survival studies)	**Annually 5-10,000 smolts released in spring from a mobile acclimation unit rotating yearly between the following tributaries:** • **Toppenish Creek** • **Cowiche Creek** • **Ahtanum Creek** • **Rattlesnake Creek**
Cle Elum Dam passage study smolt releases	10-12,000 smolts released from net pens to study downstream passage at dam
Parr releases – scatter plant (over-winter survival studies)	**3,000 each site, up to 42,000 total annually, in July[1]** **- Upper Yakima River tributaries** • **Crystal Springs/Easton-Keechelus Reach** • **Big Creek** • **Upper Cle Elum River (above Cle Elum Lake)** • **Reecer Creek** • **Wilson Creek** **- Naches River tributaries** • **North Fork Little Naches** • **Little Naches River** • **Quartz Creek (Little Naches River tributary)** • **Upper Bumping River (above Bumping Lake)** • **Nile Creek** • **Little Rattlesnake Creek** • **Cowiche Creek** **- Mid Yakima River tributaries** • **Ahtanum Creek** • **Toppenish Creek** **In addition, 17,000 parr released in Ahtanum Creek from the LaSalle High School rearing project.**
Adult releases (egg-fry survival and F2 surrogate studies)	**Up to 20 pairs each site (except Taneum Creek), in fall** **- Upper Yakima tributaries** • **Taneum Creek (120 females and 160 males)** • **Reecer Creek** • **Wilson Creek** • **North Fork Little Naches (2009-2011)** **- Naches and Little Naches River tributaries** • **Pile Up Creek** • **Quartz Creek** • **Nile Creek** • **Cowiche Creek** **- Mid Yakima River tributaries** • **Ahtanum Creek** • **Toppenish Creek**

Broodstock **and adult collection**	Prosser, Roza, and Cowiche dams. Wapatox Dam may be substituted for Cowiche Dam in the future. Collect no more than 50% natural origin, or 75% hatchery origin returns for broodstock. Up to 500 fish collected for broodstock **and 560 for adult outplanting**. Oct. 1–Dec. 30.
Radio-telemetry	Tag up to 100 adults, release from lower river sites (Mabton, RM 56 and Granger, RM 84) and track from jet boats, planes, and autos and at fixed dam sites (Prosser, Cowiche, Roza, and Wapatox) Mid-Sept. through Nov.
Redd Capping	**Adult release sites as proposed. Temperature monitors will be placed near redd. Each tributary will be evaluated for redd capping. Spring freshets may determine which tributaries can be capped.**
Spawning surveys (foot/boat)	September 15-November 30 - Mainstem Yakima (Keechelus Dam to Granger) - Mainstem Naches (Little Naches to confluence) - Ahtanum, Cowiche, Wide Hollow, and Satus creeks - **Other tributaries where coho are being released as needed**
Juvenile collection/rotary trapping	- Roza Dam juvenile trap: Up to 3,000 Yakima River naturally produced winter migrants will be PIT tagged (Nov.-Mar.) - Chandler Juvenile Monitoring Facility: Count, measure, PIT tag up to 3,000 coho (Nov. 15–July 15) - Ahtanum Creek rotary trap (RM 2.8) Nov. 1–June 30 - Toppenish Cr. rotary trap (RM 26.5) Nov. 1–June 30 - Naches R. (Wapatox Diversion (RM 18.4)) box trap, April 1 through May 31
Snorkeling – coho distribution, habitat use	Preferred habitat (side channel areas and mainstem pools) in the following streams: - Upper Yakima: systematic sampling (10%) of preferred habitat from Easton to Ellensburg - Naches mainstem: systematic sampling (10%) of preferred habitat from Little Naches R. to confluence **- Release tributaries (Taneum, Ahtanum, Toppenish, Pileup, Nile) - systematic sampling of preferred habitat. Specific reach generally will coincide with release reaches.** Summer, 3 days for each major subbasin, 1-2 days each for tributaries
Juvenile electro-fishing surveys (boat)	Yakima mainstem: systematic sampling of preferred habitat, 10 half-mile reaches between Roza Dam (RM 128) and Granger (RM 83). One in summer, one in fall/winter
Juvenile electro-fishing surveys (backpack)	<u>Distribution surveys (presence/absence)</u> Backwater channel areas in the following rivers: - Upper Yakima mainstem (Easton Dam to Wilson Cr.) - Naches mainstem: confluence to the Little Naches R. - Little Naches R.: confluence to North Fork and lower half mile of tributaries (based on presence of redds) - **Tributaries near adult and parr release areas** Nov.-Feb., 5-10 days/month, not every area annually <u>Non-Target Taxa of Concern surveys</u> - Upper Yakima: Taneum Cr. (treatment), Swauk Cr. (control) - Naches: Nile Cr. (treatment), Quartz Cr. (control)
1. All parr releases would be PIT tagged. If numbers prove too small for reliable estimates of survival, releases would be increased, probably to no larger than 5,000 per group.	