Appendix C
Okanogan River
Summer / Fall Chinook Salmon
Hatchery Genetic Management Plan

Chief Joseph Dam Hatchery Program

MASTER PLAN

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	OKANOGAN SUMMER/FALL CHINOOK
Species or Hatchery Stock:	UPPER COLUMBIA RIVER SUMMER/FALL CHINOOK
Agency/Operator:	COLVILLE CONFEDERATED TRIBES, WASHINGTON DEPT. OF FISH & WILDLIFE
Watershed and Region:	OKANOGAN & UPPER COLUMBIA RIVERS COLUMBIA CASCADE PROVINCE
Date Submitted:	2004
Date Last Updated:	April 30, 2004

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SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Okanogan River Summer/Fall Chinook

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

Upper Columbia River Summer/Fall Chinook - - *Oncorhynchus tshawytscha*
Not ESA-listed.

1.3) Responsible organization and individuals

Name (and title):	Joe Peone, Director F&W Department
Agency or Tribe:	Confederated Tribes of the Colville Reservation
Address:	P.O. Box 150, Nespelem, Washington 99155
Telephone:	509-634-2110
Fax:	509-634-4116
Email:	joe.peone@colvilletribes.com

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

U.S. Fish & Wildlife Service – tribal trust responsibilities; cooperates in monitoring and evaluation.

Washington Department of Fish and Wildlife - operates Similkameen Pond summer/fall Chinook program; traps summer/fall Chinook broodstock at Wells Dam; operates Eastbank Hatchery; cooperates in monitoring and evaluation.

Bonneville Power Administration – provides funding; tribal trust responsibilities; FCRPS mitigation.

Chelan County Public Utility District – provides funding for Eastbank Hatchery and Similkameen Pond.

Douglas County Public Utility District – operates Wells Dam

U.S. Bureau of Reclamation – provides funding; tribal trust responsibilities.

U.S. Army Corps of Engineers - supplies water to Chief Joseph Dam Hatchery.

National Marine Fisheries Service – reviews program for ESA compliance; tribal trust responsibilities.

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

The following funding and staffing information is pending review of this Hatchery and Genetic Management Plan (HGMP) by co-managers and negotiations with funding entities.

Existing and Anticipated Funding:

Capital:

The estimated capital cost of the new production facilities described in this HGMP is $17.4 million.

Grant PUD:	$ uncertain at this time
Douglas PUD:	$ uncertain at this time
BPA:	$ to be determined in Master Plan

Annual Operation and Maintenance (O&M):

The estimated annual O&M costs for the new production elements described in this HGMP are $860,000.

Grant PUD:	$ uncertain at this time	
Douglas PUD:	$ uncertain at this time	
Chelan PUD:	$1,772,000	Eastbank Hatchery O&M
	$230,000	Similkameen Pond O&M
BPA:	$ uncertain at this time	

Existing and Anticipated Staffing:

Propagation:		
Eastbank Hatchery:	6.5	FTE; WDFW
Chief Joseph Dam Hatchery:	5.0	FTE; CCT
Acclimation:		
Similkameen Pond:	2.0	FTE; WDFW
Bonaparte, Riverside, Omak Ponds:	0.75	FTE; CCT
Adult Collection:		
Wells Dam Eastbank Trap:	0.25	FTE; WDFW
	0.25	FTE; CCT
Future Okanogan Trapping:	1.0	FTE; CCT
Monitoring & Evaluation:		
BPA # 29033	4.8	FTE; CCT
		FTE; WDFW
Eastbank summer Chinook	3.5	FTE; WDFW
Other		FTE; WDFW
		FTE; USFWS

Anticipated Operational Costs:

Propagation:		
	Eastbank Hatchery:	$1,772,000
	Chief Joseph Dam Hatchery:	$600,000
Acclimation:		
	Similkameen Pond:	$230,000 O&M
	Bonaparte Pond:	$83,000 O&M
	Riverside Pond:	$83,000 O&M
	Omak Pond:	$94,000 O&M
Adult Collection:		
	Wells Dam Eastbank Trap:	$ uncertain at this time
	Future Okanogan Trapping:	$ uncertain at this time
Monitoring & Evaluation:		
	BPA # 29033	$452,000 annually
	Other	$

1.5) Locations of hatchery and associated facilities.

Hatcheries:

Eastbank Hatchery - located on the eastbank of the Columbia River near Rocky Reach Dam, 6.8 miles (11 kilometers) north of the city of Wenatchee.

Chief Joseph Dam Hatchery - proposed for construction on the right bank (rm 543) of the Columbia River immediately below Chief Joseph Dam, rm 544.6 (rkm 877).

Acclimation Facilities:

Similkameen Pond – located on the Similkameen River (WRIA 49-0325) at rm 3.1 (rkm 5), near the town of Oroville.

Bonaparte Pond - located on the left bank at rm 56 (rkm 90.2) of the Okanogan River about 1 mile downstream from the town of Tonasket.

Riverside Pond - proposed to be located on the left bank at approximately rm 49, (rkm 80) upstream from the town of Riverside. Tonasket Pond could be an interim facility or contingency facility should Riverside be infeasible.

Tonasket Pond – located on the right bank at rm 59 (rkm 95) of the Okanogan River about 2 miles upstream from the town of Tonasket. This is a contingency facility to the proposed Riverside Pond.

Omak Pond – proposed to be located on the left bank at rm 32 (rkm 51.5) of the Okanogan River in the town of Omak, near the confluence of Omak Creek.

Adult Collection Facilities:

Wells Dam Trap – located on the Columbia River (WRIA 48-0001) at river mile 515 (rkm 830).

Chief Joseph Dam Hatchery - proposed for construction on the right bank at rm 543 (rkm 874) of the Columbia River immediately below Chief Joseph Dam.

Live-Capture Gear - to be fished in the Okanogan River and in the Columbia River near the confluence of the Okanogan River, rm 533.5 (rkm 859).

1.6) Type of program.

This HGMP addresses a comprehensive program for the Upper Columbia River Summer/Fall Chinook ESU in the Okanogan subbasin and in the Columbia River from Chief Joseph Dam down to the confluence of the Okanogan River. This plan is intended to integrate existing and proposed summer/fall Chinook propagation programs with potential natural production capacity. Several plan components will be operated as Integrated Recovery Programs and others as Integrated Harvest Programs.

Upper Columbia River Summer/Fall Chinook migrate past Wells Dam from mid-July through November. Historically, propagation of this ESU used fish passing Wells Dam from July 10th through November 15th. However since 1987, the early portion of the run, those fish passing Wells Dam from July 10th through August 28th have been collected for broodstock. With implementation of this HGMP, the full Chinook run will again be propagated. In this plan, those Chinook passing Wells Dam from mid-July to August 28th are referred to as early-arriving summer/fall Chinook, while the Chinook passing the Dam from August 29th through November are referred to as later-arriving summer/fall Chinook. The summer/fall Chinook in the Okanogan River will be managed as a single population with a common broodstock, but recognizing the continuum in run timing and spawn timing from the upper Okanogan subbasin to the lower river reaches.

Current broodstock management mixes summer/fall Chinook destined for the Methow and Okanogan rivers. This management strategy will continue until separate broodstock collection capabilities are developed for the Okanogan subbasin and at the proposed Chief Joseph Dam Hatchery. Testing of live-capture, selective fishing gears has been proposed as the primary means of collecting summer/fall Chinook destined for the Okanogan River to supply broodstock for propagation programs in the subbasin. When selective collection capability has been established for the Okanogan subbasin, then broodstock collection at Wells Dam will be terminated.

Integrated Recovery Programs – The summer/fall Chinook program in the Okanogan River will be managed to primarily aid in the conservation of this ESU. Objectives will include increasing the abundance, distribution, and diversity of natural-origin summer/fall Chinook in the Columbia, Okanogan and Similkameen rivers. Production will be dispersed to fully utilize historical spawning habitats. Yearling, early-arriving summer/fall Chinook will be reared, acclimated, and released at Similkameen, Bonaparte, and Riverside ponds, and from Chief Joseph Dam Hatchery.
Yearling and sub-yearling, later-arriving Chinook will be reared, acclimated, and released from Omak Pond on the lower Okanogan River and from Chief Joseph Dam Hatchery to increase spawning in historical, Columbia River habitat. The later-arriving portion of this ESU was, but is not currently propagated in the Columbia Cascade Province. Hatchery-origin fish will be adipose fin clipped and most coded wire tagged to determine their role in population viability and to support tribal ceremonial and subsistence (C&S) fishing and recreational angling on hatchery-origin fish that are surplus to conservation needs. As soon as possible, the composite broodstock from Wells Dam Trap and, at times, Wells Hatchery will be replaced with broodstock collected specifically from the Okanogan River.

Additionally, the Tribe expects using 100 - 300 surplus adult summer/fall Chinook, collected with live-capture gear, to test the suitability of historical habitat in Rufus Woods Lake for reintroduction of Chinook above Chief Joseph Dam.

Integrated Harvest Program – Summer/fall Chinook will be reared and released at Chief Joseph Dam Hatchery to enhance tribal C&S and recreational angling in the Columbia River between Wells and Chief Joseph dams. The Chinook will also contribute to the natural spawning populations in the Columbia and Okanogan rivers.

1.7) Purpose (Goal) of program.

Restoration – The summer/fall Chinook programs in the Okanogan River and the Columbia River below Chief Joseph Dam are for the purpose of restoring the abundance, distribution, and diversity of summer/fall Chinook in the Okanogan and upper Columbia rivers. Summer/fall Chinook will also be used to test the suitability of habitat above Chief Joseph Dam.

This HGMP is based on initial spawning escapement goals of 3,500 early-arriving and 1,200 later-arriving summer/fall Chinook above Wells Dam. The monitoring and evaluation program that will be initiated with this propagation program will provide information needed to revise an escapement objective for the Okanogan River once the supplemented population is fully distributed throughout the subbasin.

A key element of this restoration goal is increasing utilization of lower-river spawning habitat by later-arriving summer/fall Chinook. Early spawning ground surveys reported the heaviest spawning in the lower Okanogan River (Bryant & Parkhurst 1950) where almost no spawning occurs today and dense spawning in the Riverside and Omak areas

(French & Wahle 1960, 1965) where habitat is currently underutilized. Also, the Hatchery Work Group (Bugert 1998) estimated the recent production of summer/fall Chinook in the Okanogan basin at 33% of carrying capacity. With the recent increases in 2001 to 2003 escapements, production has certainly increased above the 33% estimated level.

Mitigation - These Chinook programs will also help restore the Colville Tribes' C&S fishery and recreational angling impaired by the construction of Grand Coulee, Chief Joseph, five Public Utility District (PUD), and four Corps of Engineers (COE) dams on the Columbia River.

1.8) Justification for the program.

In its 1997 "Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California", NMFS stated that the Upper Columbia River Summer/Fall Chinook ESU were not in danger of extinction, nor were they likely to become so in the foreseeable future (Meyers et al. 1998). However, the Methow and Okanogan river stocks are considered depressed based on negative escapement trends. The long-term trend for the Okanogan population is –5.2% and –8.8% in the short term (1987-96) (Brown, 1999)

Summer/fall Chinook spawning occurs primarily in the Similkameen River associated with the WDFW artificial production program. Lesser amounts of spawning have occurred in the Okanogan River below Osoyoos Lake. Other than the Similkameen River, historic spawning habitat for summer/fall Chinook throughout the Okanogan River has been largely underutilized for decades.

In the past two years, however, returns of summer/fall Chinook to the Similkameen River and upper Okanogan have increased substantially. High smolt-to-adult survival of the hatchery fish from the Similkameen Pond has produced an extremely high spawner density in the Similkameen River (>400 redds/km). Unfortunately, this has not produced the expected increase in natural-origin fish (the capacity of the Similkameen spawning habitat is being exceeded due to redd superimposition). Of the returning adult hatchery fish between 1995-2000, 78% of the fish spawned in the Similkameen River. Of the hatchery fish that spawn in the Okanogan River, 76% spawn above Riverside (rkm 65). Thus, a large portion of the Okanogan River is underutilized by hatchery-origin fish and the spawning habitat is under seeded. This has led to a need for additional acclimation sites to disperse the returning adults to underutilized habitat. (H. Bartlett, per. comm.)

In 2000, the Bureau of Reclamation agreed with the Colville Confederated Tribes that the Federal government had not completed its authorized anadromous fish mitigation for construction of Grand Coulee Dam over 60 years ago. Planned artificial production programs were not implemented for the Okanogan River Basin when the outbreak of World War II halted non-war related construction projects. Of the mitigation that was provided for Grand Coulee Dam, all was located lower down the Columbia River unavailable and inaccessible to the peoples most harmed by the dam's construction.

Tribes of the Colville Reservation have been seriously harmed by the lack of Grand Coulee mitigation, with ceremonial and subsistence fisheries declining to minimal levels, even in years of substantial runs entering the Columbia River. Fishing opportunity is now severely limited to summer/fall Chinook immediately below Chief Joseph Dam and an occasional sockeye fishery in the Okanogan River.

This situation has been adversely compounded by later formulas for mitigation of mid-Columbia Public Utility District dams where the Federal Energy Regulatory Commission does not require mitigation for now, non-existing. Additional hatchery production under the proposed mitigation agreement with the PUDs is based on the run sizes of salmon and steelhead in a 10-year period during the 1970's and 1980's (Bugert 1998). Most of these post-dam runs were supported in large part by the initial hatchery mitigation programs funded by the PUDs and the Federal government. Since the Colville Tribes did not receive the initial mitigation from the construction of Federal and PUD dams, the basis for the new agreements discounts obligations to the Tribes.

Without the initial Federal salmon mitigation that other watersheds in the province obtained, the Okanogan Basin and Colville Tribes again were provided without mitigation. Additionally, the Federal government has never provided Okanogan anadromous fish mitigation for the Colville Tribes for the loss of adult and juvenile fish passing through the four Corps of Engineers' hydroelectric projects on the Lower Columbia River. Fish mortality at these projects have been generally estimated at about 10% per project, but were historically higher. Finally, Chinook mitigation by Douglas PUD for losses due to inundation and passage has been sited downriver, at Wells Hatchery and in the Methow River, away from the Colville Tribes' reservation fisheries.

The Tribes' harvest from 1980 through 2003 has averaged only 910 salmon and steelhead annually. Yet, in the 1800's prior to over harvest in lower river commercial fisheries and subsequent habitat destruction, these Tribes were estimated to have harvested in excess of 2 million pounds of salmon and steelhead annually (Koch 1976).

Integrated Recovery Programs – These programs will propagate local summer/fall Chinook to supplement natural-origin populations in the Okanogan, Similkameen, and Columbia rivers. The programs are needed to assist populations depressed by degraded habitat and passage through nine mainstem dams. The program will expand the distribution of the spawning populations in their historical habitat and propagate all components of the population to restore the complete genetic profile of the ESU. All Chinook will be adipose fin clipped and 40% coded wire tagged to distinguish them from natural-origin fish.

Integrated Harvest Program – This program will rear summer/fall Chinook using the same broodstock as its similar Integrated Recovery Program to ensure that naturally spawning fish are the same in both programs. All fish in this program will be adipose-fin clipped and 40% coded wire tagged to allow selective harvest of hatchery-origin Chinook by tribal fishermen and recreational anglers. Mortality of natural-origin fish will be

minimized. Fish will return to the terminal fishing area below Chief Joseph Dam where few non-target and ESA-listed fish are exposed to the fishery.

1.9) List of program "Performance Standards".

Standard: A quantifiable state or condition described in such a way that it is easy to determine whether or not it is being met (ISAB 2000)

The following performance standards and performance indicators are derived from the draft, "Performance Standards and Indicators for the Use of Artificial Production for Anadromous and Resident Fish Populations in the Pacific Northwest", NMFS, December 12, 2000.

Legal Standards:
Programs contribute to fulfilling tribal trust responsibilities and treaty rights. Annual C&S summer/fall Chinook fisheries are conducted with a minimum harvest of 10,000 fish.

Indicator: Total number of fish harvested in Colville summer/fall fisheries.
Indicator: Total number of days open to tribal fisheries.
Indicator: Unmet demand for ceremonial and subsistence fish for Colville members.
Indicator: Total number of fish harvested in Zone 6 treaty fisheries.

Programs contribute to mitigation agreements, if any. Measured performance of the hatchery programs meet or exceed performance requirements of any mitigation agreement.

Indicator: Performance requirements within each mitigation agreement (number of fish released, returning, or caught) are measured and reported to parties of the agreement.

Programs address ESA responsibilities as evidenced by NOAA Fisheries' concurrences.

Indicator: This HGMP is current and sufficient under ESA Section 4(d) or Section 7.

Harvest Standards:
Hatchery-origin fish are produced and released in a manner enabling effective harvest while avoiding over-harvest of non-target species. Tribal and recreational harvest is conducted within incidental mortality limitations of ESA permits or plans.

Indicator: Annual number of program's hatchery-origin summer/fall Chinook caught in all Columbia River fisheries (Zones 1-6 recreational, Zone 1-5 commercial, Zone 6 treaty, upper Columbia River

recreational, Okanogan recreational, CCT Chief Joseph Dam Tailrace, and CCT Okanogan River).

Indicator: Annual number of steelhead caught and released during summer/fall Chinook fisheries in the Columbia Cascade Province (CCT Chief Joseph Dam Tailrace, CCT Okanogan River, Okanogan recreational, upper Columbia River recreational)

Indicator: Annual escapement of Upper Columbia River Steelhead (hatchery-origin and natural-origin) in the ESU and in the Okanogan River.

Indicator: Annual escapement of Upper Columbia River Summer/Fall Chinook (hatchery-origin and natural-origin) in the ESU and in the Okanogan River.

Indicator: Catch per unit effort in each Columbia Cascade Province fishery (CCT Chief Joseph Dam Tailrace, CCT Okanogan River, Okanogan recreational, upper Columbia River recreational)

Indicator: Total effort in each Columbia Cascade Province fishery (CCT Chief Joseph Dam Tailrace, CCT Okanogan River, Okanogan recreational, upper Columbia River recreational)

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.

Indicator: Marking rate (100% ad-clipped, 40% tagged)) by mark type for each summer/fall Chinook release group (Similkameen Pond, Bonaparte Pond, Riverside Pond, Omak Pond, Chief Joseph Dam Hatchery).

Indicator: Sampling rate by mark type for each Columbia River fishery (Zones 1-6 recreational, Zone 1-5 commercial, Zone 6 treaty, upper Columbia River recreational, Okanogan recreational, CCT Chief Joseph Dam Tailrace, and CCT Okanogan River).

Indicator: Number of marks from these summer/fall Chinook programs observed in fishery samples and estimated total contribution of this population to Columbia River fisheries (Zones 1-6 recreational, Zone 1-5 commercial, Zone 6 treaty, upper Columbia River recreational, Okanogan recreational, CCT Chief Joseph Dam Tailrace, and CCT Okanogan River) and combined ocean fisheries.

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Conservation Standards:

The Integrated Recovery Program on the Okanogan and Similkameen rivers contribute to an increasing number and distribution of spawners returning to the Okanogan, Similkameen, and Columbia Rivers. Natural-origin spawners make up at least 80% of spawning population. Minimum escapement objectives of 3,500 early-arriving and 1,200 later-arriving summer/fall Chinook are met.

Indicator: Annual number of summer/fall Chinook spawners in each spawning area, by age (Similkameen River, Okanogan River,

Columbia River above Wells Dam).

Indicator: Spawner-recruit ratios.

Indicator: Annual number of redds in selected natural production index areas.

Indicator: Annual ratio of natural-origin and hatchery-origin summer/fall Chinook on spawning grounds.

Releases are sufficiently marked and tagged (100% adipose fin clipped and 40% coded-wire tagged) to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population.

Indicator: Annual marking rates by mark type for each summer/fall Chinook release group (see above).

Indicator: Annual number of marks and estimated total proportion of program's hatchery-origin fish in collections of juvenile summer/fall Chinook within the Okanogan basin and at any Columbia River dams.

Indicator: Annual proportion of hatchery-origin summer/fall Chinook on the spawning grounds.

Life-History Characteristics:

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 (once the later-arriving population component is rebuilt).

Indicator: Annual temporal distribution of summer/fall Chinook broodstock collection and of natural-origin Chinook at point of collection.

Indicator: Annual age composition of broodstock collected and of natural-origin fish at the point of collection.

Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas. Collection protocols in Tables 7 and 9 are achieved

Indicator: Annual number of natural-origin summer/fall Chinook removed for broodstock.

Indicator: Annual number of hatchery-origin and natural-origin summer/fall Chinook spawning in the Columbia basin above the Methow River (see above).

Indicator: Annual number of hatchery-origin juveniles released in natural rearing areas.

Indicator: Annual estimates of the number of natural-origin summer/fall Chinook migrating from the Okanogan basin.

Life history characteristics of the natural population do not change as a result of the artificial production program.

Indicator: Specific life history characteristics of the hatchery-origin

summer/fall Chinook are measured annually: juvenile dispersal timing from the Okanogan River; juvenile size and age composition at dispersal from the Okanogan River; adult return timing to Wells Dam; adult return age, size, and sex composition in catch, broodstock, and on spawning grounds; adult fecundity and eggs size.

Indicator: Specific life history characteristics of the natural-origin summer/fall Chinook are measured annually: juvenile rearing densities and distribution; juvenile dispersal timing from the Okanogan River; juvenile size and age composition at dispersal from the Okanogan River; adult return timing to Wells Dam; adult spawn timing including initiation, peak, and completion; spawning distribution; adult return age, size, and sex composition in catch, broodstock, and on spawning grounds; adult fecundity and eggs size.

Annual release numbers do not exceed estimated basin-wide and local habitat capacity, including spawning, freshwater rearing, migration corridor, and estuarine and near-shore rearing. Productivity rates of natural-origin spawners relative to rates of hatchery-origin fish does not decline.

Indicator: Juvenile carrying capacity of the Okanogan basin and Columbia River above Wells Dam, including method of calculation.

Indicator: Annual release of hatchery-origin summer/fall Chinook in the Okanogan basin, Columbia Cascade Province, and Columbia River basin by life-stage.

Indicator: Annual naturally spawning escapement of Upper Columbia River Summer/Fall Chinook.

Indicator: Location of annual releases of hatchery-origin fish relative to natural rearing areas.

Indicator: Timing of hatchery releases (volitional or forced) relative to emigration, densities, and estimated number of natural-origin summer/fall Chinook.

Indicator: Residualism rates of hatchery-origin juveniles in natural habitat of the Okanogan basin and Columbia River above Wells Dam.

Indicator: Annual per capita rate of production for naturally spawning and hatchery populations.

Genetic Characteristics:

Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.

Indicator: Genetic profile of Okanogan basin natural-origin summer/fall Chinook, as measured at program's outset (e.g. through DNA or allozyme procedures) is compared to genetic profiles developed in subsequent generations.

Collection of broodstock does not adversely impact the genetic diversity of the naturally spawning population.

Indicator:	Annual number of natural-origin summer/fall Chinook at point of broodstock collection.
Indicator:	Annual escapement to spawning grounds compared to the minimum effective population size (when established) required for each spawning population.
Indicator:	Timing of broodstock collection compared to overall run timing.

Hatchery-origin adults in natural production areas do not exceed appropriate proportion of the total natural spawning population per Table 5.

Indicator:	Ratio of hatchery-origin to natural-origin fish for each significant spawning area.
Indicator:	Observed and estimated numbers of hatchery-origin and natural-origin summer/fall Chinook passing Wells Dam.

Juveniles are released on-station or after sufficient acclimation to maximize homing ability to intended return locations. Recovery of hatchery-origin summer/fall Chinook does not exceed 5% of non-target spawning populations.

Indicator:	Location of annual juvenile releases.
Indicator:	Annual length of acclimation for each release group.
Indicator:	Annual release procedure for each group – volitional, forced, or direct stream release.
Indicator:	Annual number of adult summer/fall Chinook returning to intended return location compared to number returning to unintended dams, fisheries, hatcheries, and natural production areas.

Juveniles are released at fully smolted stage.

Indicator:	For each release group, the annual level of smoltification at release, compared to a regional smoltification index (to be developed).
Indicator:	For each release group, the annual type of release (volitional, forced, or direct stream release).

The number of adults returning to the hatchery that exceeds broodstock needs is declining

Indicator:	Annual number of adults available for broodstock (moving geometric mean, based on number of ages at return for this ESU).

<u>Research Activities:</u>
The artificial production program uses standard scientific procedures to evaluate various

aspects of artificial propagation.

Indicator: All program research employs scientifically based experimental design, with measurable objectives and hypotheses.

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.

Indicator: The program's annual Monitoring & Evaluation Plan addresses this HGMP's performance standards through measurement of the Plan's indicators.
Indicator: Annual M&E reports are submitted and made readily available for the public and scientific community.
Indicator: Findings pertaining to program benefits and risks are presented at AFS meetings, regional performance reviews, and when appropriate in peer-reviewed scientific journals.

Operation of Artificial Production Facilities:
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, and INAD.

Indicator: Compliance with guidelines, standards, and protocols are reported in annual reports.
Indicator: Periodic reviews and audits are conducted, particularly in the programs' early years.

Effluent from artificial production facilities will not detrimentally affect natural populations. Effluent criteria are met or exceeded.

Indicator: Discharge water quality at each propagation facility annually compared to applicable water quality standards and guidelines in IHOT, PNFHPC, and the Co-Managers of Washington Fish Health Policy.

Water withdrawals and in-stream water diversion structures for artificial production facility operations will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.

Indicator: Water withdrawals compared to WDFW adult passage criteria.
Indicator: Water withdrawals compared to NMFS juvenile screening criteria.
Indicator: Annual number of summer/fall Chinook aggregating or spawning immediately below water intake.
Indicator: Proportion of diversion of average monthly stream flow between intake and outlet for each hatchery facility.

Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens.

Indicator: Annual certification of juvenile fish health immediately prior to release, including pathogens present and their virulence, for each release site.
Indicator: Periodic samples of natural-origin fish for disease occurrence.

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.

Indicator: Annual number and locations of carcasses distributed for nutrient enrichment.
Indicator: Statement of compliance with applicable regulations and guidelines.

Adult brood stock collection does not significantly alter spatial and temporal distribution of any naturally produced population.

Indicator: Spatial and temporal spawning distribution above and below weir/trap compared to historical distribution.

Weir/trap operations do not result in significant stress, injury, or mortality in natural populations.

Indicator: Annual mortality rates in each broodstock collection facility.
Indicator: Annual prespawning mortality rates of trapped fish in the hatchery or after release.
Indicator: Annual mortalities of non-target Chinook, sockeye, and steelhead affected by operation of broodstock collection facilities.

Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.

Indicator: Size at, and time of, release of hatchery-origin fish compared to size and timing of natural-origin Chinook and steelhead present.
Indicator: Number of fish in stomachs of sampled hatchery-origin fish in the Okanogan River, with estimate of natural-origin fish composition, and estimate of total consumption of natural-origin fish.

Socio-Economic Effectiveness:
Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population or does not exceed other available options to provide fish to satisfy tribal trust responsibilities.

Indicator: Total cost of program operations.
Indicator: Sum of ex-vessel value of commercial catches and monetary value of recreational fisheries targeting these summer/fall Chinook (based on proportion of summer/fall Chinook in harvest).
Indicator: Total Colville harvest and harvest by other tribes.
Indicator: Cost of feasible and available alternatives to provide similar or better tribal harvest for Colville and other tribes.

Juvenile production costs are comparable to or less than other regional programs designed for similar objectives.

Indicator: Total costs of each summer/fall Chinook program release component.
Indicator: Average and representative costs for similar hatchery programs.

Non-monetary societal benefits for which the program is designed are achieved.

Indicator: Number of summer/fall Chinook available for CCT ceremonial and subsistence use.
Indicator: Annual number of recreational angler days and length of seasons in fisheries targeting the program's summer/fall Chinook.
Indicator: Length and geographic extent of tribal fishing seasons targeting program's summer/fall Chinook.
Indicator: Number of tribes participating in harvest of program's summer/fall Chinook.

Contingency Actions Based on Early Performance Measurement:

The collection and evaluation of performance information through an M&E program will likely result in some modifications to the summer/fall Chinook programs described in this HGMP to increase benefits or minimize risks. The following actions describe potential adaptations that could be implemented to optimize program performance based on evaluation of performance indicators. These actions do not include a multitude of changes that could be taken within the hatchery to improve fish culture:

1. Excessive escapement of hatchery-origin summer/fall Chinook in the Okanogan subbasin. Actions: increase selective fishing pressure; shift some of the juvenile releases from Okanogan River ponds to Chief Joseph Dam Hatchery or Colville Trout Hatchery; reduce production numbers; or change some summer/fall Chinook production to spring Chinook.
2. Significant adverse ecological interactions with natural populations. Actions: improve rearing and release protocols to reduce juvenile residency time; reduce production; shift some or all of the production from Okanogan River ponds to Chief Joseph Dam Hatchery;
3. Unsatisfied harvest demand of tribal or recreational fishermen. Actions: increase smolt quality or passage survival to increase adult

returns; increase production; increase selective fishing capability; or adjust harvest allocation between fishing sectors.

4. Underutilized supply of harvestable summer/fall Chinook. Actions: reduce production; develop new release sites to expand fishing opportunity; or open access to fishery for other tribes.
5. Excessive harvest mortality to non-target species or natural-origin summer/fall Chinook. Actions: Improve or restrict selective fishing gears; alter timing or location of fisheries; reduce production; or shift releases to other acclimation sites.
6. Inadequate broodstock collection using live-capture, selective fishing gears. Actions: Improve gear efficiency or effort; incorporate volunteers to Chief Joseph Dam Hatchery; or supplement with fish from Wells Dam trap.
7. Insufficient escapement to the Okanogan subbasin. Actions: improve smolt quality; reallocate production from the Integrated Harvest Program to the Integrated Recovery Program; reduce incidental harvest mortalities; or increase habitat improvements.

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

See Section 1.9

1.10.1) "Performance Indicators" addressing benefits.

See Section 1.9

1.10.2) "Performance Indicators" addressing risks.

See Section 1.9

1.11) Expected size of program.

The initial size of the Integrated Recovery and Integrated Harvest programs were based on several factors including:

a. need for an increased and stable supply of ceremonial and subsistence fish for the Colville Tribes.
b. need to bolster escapements and diversity of summer/fall Chinook in the mid and lower Okanogan River habitats.
c. underutilization of the estimated habitat carrying capacity of the Okanogan River.
d. substantially unmet mitigation responsibilities to the Colville Tribes.

Appendix B provides estimates of increases in runs from implementation of these programs and planned harvest and escapement management. Depending on the highly variable smolt-to-adult survival rates experienced by Chinook in the Columbia Cascade

Province, these programs would be expected to increase runs past Wells Dam by 3,000 to 15,000 early-arriving summer/fall Chinook and 3,000-14,000 later-arriving summer/fall Chinook. This increase in run size would then be managed in the low run years primarily to achieve escapement and broodstock needs and provide a minimal ceremonial and subsistence fishery for the Tribes. At higher run sizes, tribal and recreational selective fisheries would be expanded to capture surplus hatchery-origin fish. At the highest run sizes, harvest of natural-origin fish could also occur.

Once implemented, the size of the programs will be adjusted from knowledge gained from the comprehensive M&E program. Success in expanding the natural-origin Chinook population would lead to a shift in production from the recovery program to the harvest program or a reduction in release numbers. As the carrying capacity of the Okanogan River is achieved, releases of some fish could be shifted to direct releases at the hatchery to bolster the run size into the terminal location of the Colville's fishery below Chief Joseph Dam. The numbers of fish released in the Integrated Recovery Program will be directly based on the response of the natural-origin population.

This HGMP presumes a natural escapement requirement of 3,500 early-arriving and 1,200 later-arriving summer/fall Chinook past Wells Dam. The ultimate escapement needs will change as the mid and lower river's spawning habitat is used (and improved) to its full capacity. The programs were sized to ensure that escapements back to these areas would be sufficient, even in the lower survival years, to fully utilize these historical habitats and restore the abundance, distribution, and diversity of this Chinook population.

As explained in Section 1.8, the Colville Tribes have been seriously shorted of their rightful mitigation for development of the hydroelectric system on the Columbia River. The number of fish proposed in these programs would restore only a small portion of the runs and fisheries the Colville Tribes lost from construction of Grand Coulee and Chief Joseph dams and from the ongoing operations of the five PUD and four Corps dams downstream from their reservation.

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

Early-arriving summer/fall Chinook – 842 adult fish (inclusive of existing Similkameen Pond program, but exclusive of brood for Methow program)

Later-arriving summer/fall Chinook - 618 adult fish

Early- arriving summer/fall Chinook:

Yearling smolts: 1,276,000 smolts / 78% egg-smolt survival = 1,640,000 eggs
1,640,000 eggs / 5,000 eggs/female = 328 females
328 females x 2 = 656 males and females
656 fish / 90% pre-spawn survival = 730 adults

Sub-yearling smolts: 200,000 smolts / 81% egg-smolt survival = 247,000 eggs

247,000 eggs / 5,000 eggs/female = 50 females
50 females x 2 = 100 males and females
100 fish / 90% pre-spawn survival = 112 adults

Later-arriving summer/fall Chinook:

Yearling smolts: 600,000 smolts / 78% egg-smolt survival = 770,000 eggs
770,000 eggs / 5,000 eggs/female = 154 females
154 females x 2 = 308 males and females
308 fish / 90% pre-spawn survival = 342 adults

Sub-yearling smolts: 500,000 smolts / 81% egg-smolt survival = 618,000 eggs
618,000 eggs / 5,000 eggs/female = 124 females
124 females x 2 = 248 males and females
248 fish / 90% pre-spawn survival = 276 adults

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

The following releases are for early-arriving summer/fall Chinook. Production numbers may be phased in to test new hatchery facilities, new acclimation facilities, and broodstock collection capabilities prior to initiating full production. All hatchery-origin fish released would be adipose-fin clipped and 40% coded-wire tagged. The Similkameen Pond and Bonaparte Pond Chinook are 100% coded-wire tagged.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		0
Unfed Fry		0
Fry		0
Fingerling		0
Yearling	Similkameen Pond	376,000

Life Stage	Release Location	Annual Release Level
Eyed Eggs		0
Unfed Fry		0
Fry		0
Fingerling		0
Yearling	Bonaparte Pond	200,000

Life Stage	Release Location	Annual Release Level
Eyed Eggs		0
Unfed Fry		0
Fry		0
Fingerling		0
Yearling	Riverside Pond	400,000

Life Stage	Release Location	Annual Release Level
Eyed Eggs		0
Unfed Fry		0
Fry		0
Fingerling	Chief Joseph Dam Hatchery	200,000
Yearling	Chief Joseph Dam Hatchery	300,000

The following releases are for later-arriving summer/fall Chinook:

	Release Location	Annual Release Level
Eyed Eggs		0
Unfed Fry		0
Fry		0
Fingerling	Omak Pond	300,000
Yearling	Omak Pond	400,000

Life Stage	Release Location	Annual Release Level
Eyed Eggs		0
Unfed Fry		0
Fry		0
Fingerling	Chief Joseph Dam Hatchery	200,000
Yearling	Chief Joseph Dam Hatchery	200,000

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

After 1987, the later-arriving component of the summer/fall Chinook run has not been propagated in the upper Columbia River. Fall Chinook released as sub-yearling smolts at Priest Rapids Hatchery have a 5-year (1983-1987 brood years) average smolt-to-adult survival of 1.17%, with a range of 0.29% to 2.44% (Peck 1993).

Table 1 presents survival rates from WDFW's early-arriving summer/fall Chinook programs in the Columbia Cascade Province (from Bugert 1998).

Table 1. Survival Rates for Early-Arriving Summer/Fall Chinook

Hatchery	Age	Release Years	Release-Adult Survival Rate
Rocky Reach	yearling	1984-1989	1.4%
Wells	sub-yearling	1976-1989	0.1%
Wells	yearling	1976-1989	0.41%

Survival of yearling summer/fall Chinook from the Similkameen Pond was estimated at 0.7% and 0.4% for the 1994 and 1995 brood years (H. Bartlett, per. com. 2002). More recently, escapement levels of summer Chinook have increased dramatically, indicating much higher survivals of hatchery releases, perhaps near 2%.

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

The Similkameen Pond program started in 1989 and has been operating for 15 years. The potential start dates for the new portions of the Okanogan summer/fall Chinook program are as follows:
Bonaparte Pond – FY'2004; Riverside Pond – FY'2008; Omak Pond – FY'2008
Chief Joseph Dam Hatchery – FY'2008

1.14) Expected duration of program.

All components of the program are expected to continue into the foreseeable future unless M&E indicates certain components should be discontinued due to insufficient benefits or unacceptable and unalterable risks. Program components may be adjusted at any time based on M&E results. The Integrated Recovery portions of the program would be discontinued if the population growth rate of the naturally spawning population were to exceed 1.0 over time due to improvements in habitat and mainstem passage. Some of the Integrated Recovery program production could be shifted to the Integrated Harvest program if consistent with the health of the natural-origin population and to meet fisheries demand.

1.15) Watersheds targeted by program.

The summer/fall Chinook programs target the Okanogan and Similkameen rivers and the upper Columbia River below Chief Joseph Dam. The Colville Tribes also anticipate capturing summer/fall Chinook for experimental release into the Columbia River above Chief Joseph Dam to help determine the feasibility of adult and juvenile passage at the Dam.

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

Program alternatives were considered in an analysis of strategic options (Smith 2001).

The current summer/fall Chinook program at Similkameen Pond is not consistently returning sufficient fish to provide for adequate C&S harvest by the Colville Tribes in locations where such harvest can occur. Additional hatchery-origin fish are required to provide greater harvesting opportunities for the Colville Tribes who lost much of their historical fishing grounds with the construction of Grand Coulee and Chief Joseph dams. Remaining fisheries have been closed or severely limited by ESA constraints and ongoing passage mortalities associated with nine PUD and COE dams on the Columbia River. The Similkameen Pond program is insufficient mitigation for the fishery losses caused by the PUD and Federal dams.

The Colville Tribes are working to increase their harvesting capacity by testing and developing selective fishing gear. The Similkameen program alone will be insufficient to supply the salmon for the Tribes' intended C&S fisheries. Sufficient hatchery-origin fish must also be available to supply a selective, recreational fishery.

In spite of the most recent high returns of summer/fall Chinook into the Columbia Cascade Province, supplementation with hatchery-origin fish is required to maintain and increase the abundance and distribution of the population given the long-term, poor trend in this population. Considerable, historical Chinook spawning habitat is underutilized or

unused with the current Similkameen program. Natural re-colonization is unlikely to expand the population into historical habitats given the long-term population growth rates.

Artificial propagation can be used to rear and release fish at several life stages from unfed fry to yearling smolts. Experience has shown in the upper Columbia and Snake rivers that Chinook releases above eight or nine dams are most successful at the yearling smolt stage. Yearling smolts have survived at a rate 15 times that of subyearling releases (Bugert 1998). Therefore the primary focus of this program will be a yearling program. A sub-yearling component is proposed as part of this program to compare its cost-effectiveness and biological characteristics with the yearling program and to utilize the capacity of the Columbia River reservoirs to rear juvenile fish. Sub-yearling programs are not without controversy given their lower survival rates. However, maintaining and enhancing life history diversity is an important component of integrated recovery programs. The sub-yearling programs proposed in this plan will be initially based on information from new sub-yearling programs for fall Chinook in the Snake River, successful releases from the Priest Rapids Hatchery program, and sub-yearling programs at Wells and Turtle Rock hatcheries.

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

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

This HGMP will be submitted to NOAA Fisheries for its review and approval pursuant to Section 4(d) of the Endangered Species Act. This HGMP will be submitted to the U.S. Fish and Wildlife Service for ESA approval relative to listed Bull Trout (*Salvelinus confluentus.*

WDFW's existing Similkameen Pond program currently operates under ESA Permit # 1347

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

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

- Identify the ESA-listed population(s) that will be directly affected by the program.

This program involves the propagation of Upper Columbia River Summer/Fall Chinook,

which is not an ESA-listed species. No ESA-listed population is directly affected by the program.

- Identify the ESA-listed population(s) that may be <u>incidentally</u> affected by the program.

Two ESA-listed anadromous fish ESUs could be incidentally affected by the program: Upper Columbia River Spring-Run Chinook (UCR Spring Chinook) and Upper Columbia River Steelhead (UCR Steelhead). Juveniles of the UCR Spring Chinook population in the Methow River could be affected by rearing and migrating summer/fall Chinook arising from this program. Adult UCR Spring Chinook could be minimally exposed to the harvest directed on the adult summer/fall Chinook arising from this program. Incidental harvest effects are examined in "Biological Assessment for the 2002 – 2012 Chief Joseph Dam Tailrace Fishery for Colville Tribal Members and the Incidental Impacts on Salmon and Steelhead Species Listed Under the Endangered Species Act", May, 2002.

Low numbers of UCR steelhead may spawn and rear in the upper Okanogan River, the lower Similkameen River, and in lower tributaries of the Okanogan River. UCR Steelhead also inhabit the Methow River. Rearing and migrating steelhead may be affected by the summer/fall Chinook arising from this program.

Adult UCR steelhead will be affected by the broodstock collection for this program at various collection sites and, if necessary at the Wells Dam Trap.

Listed Bull Trout are not believed to exist in the Okanogan River downstream from Zosel Enloe dams. Therefore the programs described in this HGMP should not affect this listed species in the Okanogan subbasin. The change in numbers of migrating Chinook resulting from this program should also have inconsequential effects to any bull trout residing in the Columbia River.

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

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds

<u>UCR Steelhead:</u> This ESU is listed as endangered. In its hydrosystem biological opinion, NMFS (2000) estimated the median population growth rate for Upper Columbia River Steelhead ESU ranged from 0.94 to 0.66 depending on the effectiveness of hatchery-origin fish spawning in the wild. The ESU still has a high risk of extinction. Critical and viable population thresholds have not been established for this ESU. NOAA Fisheries has set an interim abundance target of 5,500 steelhead, but does not include fish from the Okanogan River.

The proportion of natural-origin UCR Steelhead passing Priest Rapids Dam has averaged 16 % (1991-2000 average). Steelhead passing Wells Dam have been predominately

hatchery-origin fish. From 1991-2000, natural-origin steelhead made up only 6.5% of the run.

WDFW manages for an UCR Steelhead escapement objective of 6,000 fish for the Wenatchee, Entiat, and Methow sub-basins, of which 2,200 fish is the objective for seeding the Methow. NMFS is also currently managing UCR Steelhead based on this escapement objective modified by the statement, "Current habitat conditions are not conducive to steelhead in the Okanogan River sub-basin" (NMFS, 2001c). Using potential smolt production information, the CCT has estimated a steelhead escapement goal of 600 fish for the Okanogan subbasin (Bugert, 1998)

For the purposes of managing fisheries and providing escapement to the Okanogan subbasin, the Colville Tribes assume an Okanogan escapement objective of 600 UCR Steelhead at this time. Steelhead management will therefore be based on an escapement objective of 2,800 at Wells Dam or approximately 6,600 at Priest Rapids Dam

Table 2. Fish Passage at Wells Dam – Cumulative Total (1991-2000 10-year average) *

	Chinook	Steelhead	Wild Steelhead	Sockeye
May 1	2	2	0	0
June 1	608	27	2	0
July 1	942	53	4	0
Aug 1	3,192	330	9	20,254
Sept 1	4,572	1,212	59	22,357
Oct 1	5,319	3,124	214	22,421
Nov 1	5,608	3,987	260	22,430

* from COE webpage

Table 3. 2002 Adult Salmon and Steelhead Runs *

	Total Steelhead	Wild Steelhead	Spring Chin. Adults	Summer Chin. Adults
Bonneville Dam	481,203	143,045	268,813	127,436
Priest Rapids Dam	15,895	N/A	34,083	96,326
Wells Dam	9,475	5,852**	7,585	62,595

* from FPC

** This number does not appear accurate

Okanogan steelhead population: Given the degraded condition of the habitat in the Okanogan subbasin, the population growth rate of steelhead in the subbasin is likely less than that for the entire ESU. Most of the tributary streams that likely supported steelhead have been severely degraded by withdrawal of flows and loss of riparian vegetation. The steelhead returning to the Okanogan subbasin are largely a result of stocking of Wells Hatchery fish; few natural-origin steelhead are observed. Passage into Omak Creek has been restored and significant steelhead spawning is being observed (39 redds in 2002 and 21 redds in 2003 in the lower 2 miles, C. Fisher pers comm. 2004). Steelhead passage into Salmon Creek is being pursued through improved water management in the watershed. In 2003 six redds were observed following a test flow program. Historically, steelhead also used habitat in Canada. This habitat is also degraded by agricultural and urban development.

UCR Spring Chinook: UCR Spring Chinook salmon enter the Columbia River in late February through the end of May. Their upstream migration past Wells Dam begins in early May, peaks during mid-June and ends in late June. UCR Spring Chinook are considered extirpated in the Okanogan River subbasin by the National Marine Fisheries Service and were listed as endangered in the Methow River on March 16, 1999. Spring Chinook are considered to be tributary spawners and consequently spawn in smaller systems than summer/fall Chinook salmon. Spring Chinook spawn from late-July through September, peaking in mid- to late August. Eggs hatch during the winter months. Chinook juveniles are thought to remain in the freshwater environment during their first year and emigrate to marine waters during their second spring. However, historically spring Chinook in the Okanogan River may have also exhibited an ocean-type life history, with juveniles migrating out of the subbasin as 0-age fish. Additionally, juveniles from spring Chinook spawning above Osoyoos Lake may have reared in the Lake prior to migrating to the ocean as yearlings. (For a more complete discussion of the likely diversity in historical life history of spring Chinook in the Okanogan, please refer to the draft HGMP, Okanogan Basin Spring Chinook)
The populations of UCR Spring Chinook are greatly depressed, although the 2000 to 2002 returns showed significant improvement (see Tables 2 and 3). The 2003 run of about 206,000 upriver spring Chinook passing Bonneville Dam also will improve escapement in the action area. From 1990-1999 the proportion of UCR spring Chinook passing Priest Rapids Dam averaged 13%.

- 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.

UCR Steelhead:
The Natural Return Ratios (NRR) or wild adult-to-adult survival rates for the Methow/Okanogan populations have been estimated as between 0.05 – 0.35 from 1975 to 1991. For the Wenatchee/Entiat populations, the NRR are estimated to have ranged from 0.1 – 0.9 during this same time (Ford et al., 2001). The Biological Requirements Committee concluded that the UCR steelhead populations are not able to sustain themselves naturally, but it is not clear if they would go extinct without ongoing

supplementation. The uncertainty surrounding the reproductive success of hatchery steelhead confounds these analyses. Even with planned increases in mainstem juvenile passage survival anticipated from the Habitat Conservation Plan, additional survival of 20 to 50% is necessary to achieve NRR greater than 1.0 (Cooney, 2000 Draft).

UCR Spring Chinook:
The NRR for the Wenatchee, Entiat, and Methow populations has ranged from 1.4 to 0.4 from 1958 to 1995 broodyears. The NRR has not been above 1.0 since the mid-1970's for the Wenatchee and Methow populations and the mid-1980's for the Entiat population (Ford et al., 2001). Even with planned increases in mainstem juvenile passage survival anticipated from the Habitat Conservation Plan, additional survival of 20 to 50% is necessary to achieve NRR greater than 1.0 (Cooney, 2000 Draft).

- 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.

The declining trends in UCR Spring Chinook and UCR Steelhead are well documented in Ford et al. (2001).

- 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.

UCR Spring Chinook are extinct in the Okanogan River basin. UCR Steelhead do spawn in the Okanogan basin although severely limited by habitat conditions and passage mortalities. Passage counts at Wells Dam indicate that from 1991-2000, natural-origin steelhead made up only 6.5% of the run. Spawning surveys in the Okanogan basin have not estimated the proportion of natural-origin and hatchery-origin fish.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.

See Section 11

- 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.

Take of UCR Spring Chinook is not anticipated in this program. UCR Spring Chinook should have all migrated past Wells Dam and into the Methow River before broodstock collection begins for summer/fall Chinook in and near the Okanogan River. Therefore any delay, handling, or use of UCR Spring Chinook in the later broodstock collection process should be insignificant at most. As UCR Spring Chinook are extinct in the Okanogan River, all research, monitoring, and evaluation activities should not take any

listed Chinook. No interactions between hatchery-origin summer/fall Chinook and UCR Spring Chinook should occur within the Okanogan basin or upper Columbia River above the confluence of the Methow River. Juvenile summer/fall Chinook can be expected to mix with UCR Spring Chinook during their migration down the Columbia River. However, interactions should be insignificant.

Take of UCR Steelhead can be expected during the collection of summer/fall Chinook broodstock at various fishing sites and, if necessary, at Wells Dam. Steelhead migration overlaps with that of the Chinook. Consequently, steelhead may be delayed and handled during the fishing or trapping operations. The take of steelhead during the trapping operation at Wells Dam is already covered by Section 10 permit # 1094.

The added broodstock collection required for this program can be expected to increase the take of steelhead described above. This take will occur as summer/fall Chinook collection will be extended beyond August 28th to November 30th to ensure propagation of fish from throughout the entire run. Collection will also occur at several sites using live-capture, selective fishing gears.

Take of listed steelhead will also occur in the Okanogan basin as hatchery-origin fish are released in waters likely to contain rearing steelhead. This effect should be inconsequential as steelhead are believed to rear in the tributary streams in at least their first year. By the following spring when some steelhead could be expected to reside in the Okanogan River, they will be of a size that will allow them to out compete the hatchery-origin Chinook and be of sufficient size to avoid being prey.

Finally take of steelhead can be expected during the monitoring and evaluation required for this summer/fall Chinook program. Steelhead will be collected in seines and traps used to collect critical information on hatchery-origin and natural–origin Chinook. These research efforts will all be part of an integrated M&E program designed to collected life history information on steelhead as well as Chinook. The take for this M&E program will be examined comprehensively in a separate consultation on BPA project #29033.

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

The only prior take would have been associated with the collection of broodstock for the Similkameen Pond program. That take has been described above.

- 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).

With the proposed program, take of listed species could occur at several locations and times. First, UCR Steelhead could be caught, released and possibly injured during

operation of live-capture fishing gears used to collect broodstock. If needed, steelhead could be delayed and possibly injured during any broodstock trapping operations in the east bank ladder at Wells Dam.

Secondly, take is possible upon the release of juvenile Chinook as they could compete with UCR steelhead during the downstream migration in the Okanogan and Columbia Rivers. Because the yearling Chinook smolts should be migrating promptly, there should not be other than insignificant competition for food and space in these rivers. Predation by Chinook on steelhead fry should not occur as yearling Chinook will have migrated from the Okanogan River prior to steelhead emergence and steelhead spawn mostly in tributary streams where summer/fall Chinook do not inhabit. Releases of subyearling Chinook should also provide only insignificant competition or predation on steelhead because they would be too small to be effective predators and they will rear in mainstem waters separate from the steelhead rearing in the tributaries. Should steelhead juveniles emigrate from the tributaries to rear in the Okanogan River, they should then be of a sufficient size that Chinook should not prey upon them. Subyearling Chinook are also expected to migrate to and rear in the Columbia River, away from steelhead rearing habitat. Also, in riverine environments, Chinook tend to rear in pool type habitats while steelhead prefer riffles. This natural segregation between the species has allowed them to evolve with minimal competition for food and space.

The harvest of returning adult Chinook raised in this program will take listed UCR Steelhead. This take is fully discussed in a Biological Assessment (CCT, 2002) and subsequent Biological Opinion (NMFS 2002). In general, the tribal ceremonial and subsistence fisheries and recreational fisheries for Chinook will be limited by the incidental take of steelhead. This take will be managed through selective fishing so as not to significantly impair steelhead recovery. Most incidental harvest of steelhead will be of hatchery-origin fish in excess of broodstock and escapement needs.

- 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.

The three circumstances where take could be exceeded are in broodstock collection, M&E activities and harvest.

Chinook broodstock collection and M&E activities will be terminated for the year, should the above take limitation of UCR Steelhead be exceeded. For harvest, fisheries will be terminated for the year should mortality of steelhead exceed the thresholds specified in the Biological Assessment.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan

A comprehensive ESU-wide plan for the propagation of UCR summer/fall Chinook does not exist. Fishery co-managers have prepared a draft "Biological Assessment and Management Plan, Mid-Columbia River Hatchery Program" (Bugert 1998). This conceptual artificial production plan (BAMP) was developed as a component of a Mid-Columbia Habitat Conservation Plan, but has not yet been formally agreed upon and adopted. According to the BAMP, artificial production of summer/fall Chinook in the mid-Columbia region (upstream from the Yakima River) is to increase during a Phase A to make progress toward an objective of "no net impact" from the operations of five public utility dams. Production increases are to be consistent with conservation of low-risk, natural populations and recovery of listed species. A phased approach is to be used to minimize deleterious effects of collecting broodstocks upon natural populations and to allow monitoring of program development.

The BAMP calls for continued production of 576,000 yearling, early-arriving summer/fall Chinook smolts for the Okanogan River and an additional 300,000 yearlings for the Columbia River near Chief Joseph Dam. Later, with the development of additional acclimation facilities, the 1,620,000 subyearlings released at Turtle Rock satellite facility (Rocky Reach Hatchery) could be converted to a 400,000 yearling program for release in the Okanogan River. BAMP has additional acclimation sites being developed to disperse hatchery production. The plan also calls for collection of broodstock from Wells Dam until means to gather broodstock in the Okanogan River are developed. BAMP identifies the Chief Joseph Dam Hatchery site as a good site for future production of mitigation fish.

Despite summer/fall Chinook having an "ocean-type" life history, BAMP contains a strategy for rearing early-arriving summer/fall Chinook to yearling smolts as experience has shown that they survive at a rate 15 times greater than subyearlings. Fishery co-managers concluded that while yearling smolts might create genetic risks, releasing substantially greater numbers of subyearlings could create greater ecological risks with the natural-origin populations. The substantially larger broodstock requirements for a subyearling program could also negate the benefits of artificial production.

For later-arriving summer/fall Chinook, BAMP recognizes that Chinook passing Wells Dam after August 28th should be propagated to ensure the entire run is equally enhanced. The plan calls for the acclimation of 300,000 yearling smolts for release in the Chief Joseph Dam tailrace.

This HGMP includes several deviations from the BAMP. For early-arriving summer/fall Chinook, deviations include 1) splitting production at Similkameen Pond to better distribute fish to historical spawning habitat and reduce superimposition of redds, and 2)

releasing an additional 200,000 subyearling smolts from Chief Joseph Dam Hatchery to continue comparisons of the life-history and genetic effects of yearling and subyearling rearing strategies. For later-arriving Chinook, alterations include 1) rearing 300,000 subyearling and 400,000 yearling smolts for release in the lower Okanogan River to seed historical habitats, and 2) rearing 200,000 yearling and 200,000 subyearling fish at Chief Joseph Dam Hatchery rather than the 300,000 yearlings proposed in BAMP.

The Okanogan River flows from Canada and Chinook salmon still migrate through Osoyoos Lake to spawn and rear in Canadian waters. The Okanogan Nation Alliance and the Colville Tribes have agreed to collaborate on recovery of fish and wildlife in the trans-boundary Okanogan subbasin, including the recovery of sockeye, Chinook, and steelhead. The Okanogan Nation Alliance is now working through Canada's Species At Risk Act (SARA), the equivalent of the Endangered Species Act, to seek a listing and recovery of Chinook salmon in the Canadian Okanogan River. The programs in this HGMP may need to be expanded or altered to incorporate recovery initiatives for Chinook in Canadian waters. This could include additions in production, changes in release sites of existing production, or further refinement of harvest management guidelines to protect fish arising from Canadian waters. This HGMP should be expanded, when appropriate, to include any artificial production plans that arise from Canadian recovery efforts if they involve summer/fall Chinook.

The Northwest Power and Conservation Council's "Artificial Production Review", outlines a process for reform of artificial production programs throughout the Columbia River basin. The Review included 10 policies to guide the use of artificial production and a requirement for adopting performance standards against which the benefits and risks of a production program should be monitored and evaluated. This HGMP includes a comprehensive set of performance standards and their associated performance indicators to which this program will be evaluated. This HGMP was also constructed consistent with the Review's policies, their guidance fully integrated into the program's design and proposed operations (see Appendix D).

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

Artificial production in the Columbia Cascade Province has been primarily driven by mitigation agreements with Douglas County, Chelan County, and Grant County Public Utility Districts, and the Grand Coulee Mitigation Agreement of the U.S. Bureau of Reclamation. The Columbia River Fish Management Plan arising from the US v. Oregon process includes hatchery programs, but this plan has expired and is no longer in force.

The Colville Confederated Tribes will be using this HGMP and others as a basis for renegotiating mitigation agreements with the PUDs, the Bureau of Reclamation, the Bonneville Power Administration, and the Northwest Power and Conservation Council to

recover and rebuild the Tribes' historical trust resources and fisheries. As indicated in Section 1.8, mitigation for the Tribes fisheries has been woefully inadequate.

3.3) Relationship to harvest objectives.

The summer/fall Chinook propagation programs described in this HGMP are designed, first and foremost, to restore the abundance, diversity, and distribution of historical populations. Additionally, these programs are designed to restore a base level of ceremonial and subsistence fisheries for the Tribes and recreational fisheries. These primary program objectives are designed to be consistent through the marking of hatchery-origin fish and the development of live-capture, selective fishing gear.

The Colville Tribes hold federally reserved fishing rights through the establishment of the Colville Reservation by Executive Order in 1872. The U.S. Court of Appeals for the 9th Circuit ruled that a primary purpose of the 1872 Executive Order was to preserve tribal fisheries and access to traditional tribal fishing areas. The Court also ruled that the Colville Tribes possess federally reserved water rights to stream flows sufficient to preserve or restore tribal fisheries. The Colville Tribes also reserved their rights to fish and fishing in the waters of ceded lands, including the Okanogan River up to the Canadian border.

Survival rates of the target Chinook and non-target, co-occurring steelhead will be highly variable primarily due to conditions affecting ocean survival, hydrologic conditions affecting passage of juveniles down the Columbia River, and power market conditions affecting fish passage operations at the dams. Successful fisheries management will depend on 1) determining the strength of each years' adult runs of Chinook and UCR steelhead, 2) determining the proportion of hatchery-origin and natural-origin Chinook and steelhead, and 3) harvesting the target populations selectively with minimal impact to non-target species and/or natural-origin fish. The populations targeted for harvest will be those fish species, Chinook races, or fish of different origin (hatchery v. natural) for which harvestable surpluses have been determined to exist. Non-target fish will be those deemed to not have harvestable surpluses or otherwise protected. These non-target fish will be released unharmed back to the rivers.

The Colville Tribes are seeking funding to develop, test, and deploy selective fishing gear that will allow the harvest of Chinook, surplus to escapement needs. With this gear, tribal fishermen will be able to harvest primarily hatchery-origin Chinook with the release of weak stocks and natural-origin Chinook. Similarly, recreational fisheries managed by WDFW will be able to continue, targeting on surplus hatchery-origin Chinook. When natural-origin Chinook are present in abundance (not expected to be a common occurrence) these gears will also allow their harvest. The deployment of selective fishing gears will provide significant flexibility to conduct fisheries in a manner compatible with rebuilding natural-origin populations and operation of propagation programs.

The Colville Tribes' fisheries are currently described and managed through a Biological Assessment (CCT, 2002). As selective gears are tested and deployed, a more comprehensive Assessment will be developed for adoption within ESA fisheries management and for integration in any future U.S. v Oregon management plans.

Future negotiations for harvest management in U.S. v Oregon will need to specifically account for Colville Tribes and recreational harvest in the Columbia Cascade Province.

The Colville Tribes intend to pursue development with the federal government of in-lieu fishing sites in waters adjoining the Reservation and ceded lands, including the Okanogan River upstream to Zosel Dam. These sites would provide tribal members access to fishing waters and include facilities related to the conduct of their ceremonial and subsistence fisheries in accord with the guidelines in this HGMP.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

The fisheries benefiting from this program will include:

1) Ocean recreational and commercial fisheries from the mouth of the Columbia River north to S.E. Alaska
2) Columbia River Zone 1-5 commercial fishery
3) Columbia River Zone 1-6 recreational fishery
4) Columbia River Zone 6 tribal C&S and commercial fisheries
5) Mid-Columbia River recreational fisheries
6) Upper Columbia and Okanogan rivers Colville Tribal C&S fisheries
7) Upper Columbia and Okanogan rivers recreational fisheries

The primary fisheries targeted for improvement by this program are the Upper Columbia and Okanogan rivers tribal and recreational fisheries (#6 and #7 above).
Early-arriving summer/fall Chinook from the mid-Columbia region have been heavily exploited in ocean fisheries, but only incidentally harvested in the lower Columbia River. The Colville Tribes have targeted summer/fall Chinook in their Chief Joseph Dam tailrace fishery, harvesting an average of 650 adults annually (1980-2003). The 1982-89 brood year average ocean fisheries exploitation rate was 39%, with the total exploitation rate of 68% estimated for the same years (Brown 2001).

Future in-river harvest rates for the summer/fall Chinook arising from this program are likely to be based on management guidelines developed through the U.S. v Oregon management process. For those summer/fall Chinook migrating through the lower river in the early to mid summer months, their harvest will be subject to the April 2001 agreement, "Interim Management Agreement for Upriver Spring Chinook, Summer Chinook and Sockeye" which provides that non-Indian Columbia River harvest is not to exceed 1% of the run as estimated at the mouth of the Columbia River. For the four treaty tribes, harvest impacts are not to exceed 5% of the run. For those summer/fall Chinook migrating through the lower river in late summer and fall, their harvest will be

subject to the August 2001 agreement, "2001 Management Agreement for Upper Columbia River Fall Chinook, Steelhead, and Coho" which provides that the harvest rate of upper Columbia River fall Chinook is not to exceed 31.29%, with 8.25% of the harvest rate allocated to state managed fisheries and 23.04% allocated to the 4 Columbia River Treaty Tribes. These fisheries are managed for a 43,500 escapement of both hatchery-origin and natural-origin fish at McNary Dam. Escapement into mid-Columbia River tributaries "…is not a management constraint for 2001 fisheries."

3.4) Relationship to habitat protection and recovery strategies.

The major factors affecting natural production of all species in the Okanogan basin are thoroughly discussed in the Okanogan Subbasin Summary. The key perturbations affecting UCR summer/fall Chinook include juvenile and adult passage mortalities through nine mainstem dams, agricultural water withdrawals from tributaries and the mainstem Okanogan River, high summer water temperatures, sedimentation, and loss of riparian vegetation.

The State of Washington and the Tribes have initiated a comprehensive habitat rehabilitation program in the Okanogan basin. Initial efforts have focused on improving passage, stream flows, reduction in sediment loads, and riparian rehabilitation in Omak and Salmon creeks. This program has been proposed for expansion via the Columbia Cascade Provincial Review to address other tributary streams, and mainstem flow quantity and quality problems.

Actions to improve juvenile and adult salmon passage through the hydroelectric system are critical to the long-term viability of the natural-origin summer/fall Chinook populations and the success of the propagation programs described in this HGMP. Significant improvements have been made in system survivals in recent years through increases in spring and summer flows, spill programs, improved juvenile bypass systems and transportation of juvenile fish at McNary Dam. Through the Council's Fish and Wildlife Program, FERC licensing requirements, and NOAA's ESA regulation, performance standards have been developed for adult and juvenile passage. M&E programs are being initiated to provide actual performance measures for comparison to the standards.

Substantial and sustained improvements in mainstem passage are critical to the viability of summer/fall Chinook in the Okanogan River. Increased survival of juvenile fish will be particularly important for both yearling migrants in the spring and sub-yearling migrants in the summer months. Progress in passage survival will not only affect the abundance and productivity of summer/fall Chinook, but also the life history diversity. The ability to transition from yearling programs to the natural, sub-yearling life history type should largely be governed by survival improvements made at the dams and associated reservoirs.

The Okanogan Nation Alliance and the Colville Tribes have agreed to collaborate on recovery of fish and wildlife in the trans-boundary Okanogan subbasin, including the recovery of sockeye, Chinook, and steelhead in Canadian waters. The Okanogan Nation Alliance is now working through Canada's Species At Risk Act (SARA to seek a listing and recovery of Chinook salmon in the Canadian Okanogan River. This HGMP should be expanded, when appropriate, to include any artificial production plans that arise from Canadian recovery efforts if they involve summer/fall Chinook.

The Colville Tribes have also been investigating the feasibility of restoring runs of summer/fall Chinook above Chief Joseph Dam. A spawning habitat survey has been completed of upper Rufus Woods Lake and a reconnaissance study completed of adult and juvenile fish passage at Chief Joseph Dam. With the increased runs of summer/fall Chinook returning to the dam area as anticipated in this HGMP, the Tribes may elect to collect and pass some of these fish above the Dam as part of an experiment to test the feasibility of adult spawning in the Lake and subsequent migration of juveniles down to the Dam. Should passage experiments evolve into a regular passage program, then this HGMP should be revised to account for the new recovery program. The live-capture gear and transportation capabilities developed for this HGMP's broodstock collection needs may provide a cost-effective means of passing fish over the Dam.

The Colville Tribes intend to restore spring Chinook runs to the base of Chief Joseph Dam for harvest purposes and into the Okanogan River subbasin to reintroduce extirpated runs. These programs are the subjects of another HGMP. However, the spring and summer/fall Chinook programs will have a number of potential interactions, including in the design and conduct of M&E, in harvest management, in broodstock collection, and in the ultimate design, construction, and operations of Chief Joseph Dam Hatchery.

3.5) Ecological interactions.

From the BAMP, these supplementation programs will implement the following strategies: (1) use local broodstock, (2) promote natural spawning of hatchery-origin Chinook, (3) acclimate smolts on surface waters in areas to be seeded, (4) reduce potential for adverse impacts to natural-origin populations, and (5) monitor natural-origin populations for indications of beneficial and deleterious effects from these supplementation programs.

Density Dependent Effects:

In addition to use of local broodstock, life-stage at release of hatchery-origin fish, and the abundance of listed and unlisted fish in the release location, a key consideration in how these propagation programs will affect natural-origin fish is a determination of the likely carrying capacity of the habitat to which the hatchery-origin fish are released. Understanding the potential for density-dependent effects is important to planning the need for, and size of, a hatchery program. The Hatchery Work Group of BAMP (Bugert 1998) provided estimates of carrying capacities of the Okanogan basin using various state-of-the-art methods. Table 4 summarizes this information:

Table 4. Estimated Carrying Capacity of Natural-Origin Anadromous Fish – Okanogan Subbasin*

Species	Smolt Capacity	Recent 10-yr Average	Percent Capacity
Sum/fall Chinook	1,440,000	475,000	33%
Sockeye	4,000,000	990,000	25%
Steelhead	17,600	15,700	89%
Spring Chinook	not reported	0	0%

* (Bugert, et al. 1998)

From this information the Hatchery Work Group concluded that properly conceived and implemented hatchery supplementation should increase production of Chinook in the Okanogan subbasin, providing a benefit to the natural-origin population. The factors limiting population growth have been largely external to the Okanogan basin (i.e. effects of the Columbia River passage mortalities and poor ocean productivity). However, recent improvements in ocean productivity have caused a substantial rebound in Chinook runs at least for the short term. Intra- and inter-species competition should also be minimized given the substantially underutilized habitat available for seeding.

The low carrying capacity for Okanogan steelhead results from the degraded state of habitat in tributary streams and similarly poor habitat and passage conditions in habitat in the Canadian portion of the subbasin. The tributary habitats critical to steelhead will not be utilized by hatchery-origin summer/fall Chinook.

The carrying capacity of the Columbia River and its estuary for migrating smolts and rearing subyearlings is not known. Research addressing these habitat issues is currently being proposed and considered in the provincial review process. The capacity of the Columbia River and its estuary to support additional hatchery-origin fish from this program will likely vary substantially due to the highly variable returns from natural-origin populations and existing hatchery programs, highly variable hydrologic conditions (spring and summer flows and temperatures), and the ongoing reduction of releases from other (mostly lower river) hatchery programs.

The carrying capacity of the Okanogan River and the effect of this summer/fall Chinook program will be monitored and evaluated pursuant to this HGMP and is reflected in a comprehensive monitoring and evaluation proposal of the Colville Tribes submitted to the Northwest Power and Conservation Council and BPA in the Columbia Cascade Provincial Review.

Disease Transmission:
Interactions between hatchery-origin and natural-origin fish can be a source of pathogen transmission. As most pathogens responsible for diseases are present in both hatchery-origin and natural-origin fish, there is uncertainty in the extent to which hatchery-origin fish transmit diseases. Because of the normally high densities that fish are reared in hatcheries and the associated stresses, these fish are, however, more susceptible to disease outbreaks (Bugert 1998). The rearing densities in the proposed acclimation ponds (Similkameen, Bonaparte, Tonasket, and Omak,) should be much lower than standard propagation limits thereby reducing the opportunity for disease outbreaks. The volitional release strategy for these ponds should also minimize crowding of hatchery-origin and natural-origin fish in the Okanogan and Columbia rivers, reducing the potential for disease transmission. As outlined in this HGMP, standard disease monitoring, treatment, and certification will all be occurring to minimize the opportunity for disease transmission.

Competition and Predation:
Direct competition for food and space can occur between hatchery-origin and natural-origin fish. The potential for competition and predation is highest in the nursery habitat in the vicinity of spawning grounds and in rearing habitat. Competition may occur as fish migrate downstream through the migration corridor, but at lower levels than in the tributary habitats.

Most of the Chinook juveniles arising from this program will be fully acclimated, volitionally released, yearling fish. As such, they will be actively migrating fish with minimal residence time, thereby providing only minimal competition for space and food supplies. As yearling Chinook at 10-20/pound, and being released in April, the only natural-origin steelhead they should encounter would be of sufficient size that the hatchery-origin fish would not prey upon. At this time of year, listed steelhead would be either residing in tributary streams as subyearlings or rearing and migrating in the Okanogan River as larger yearling fish. Predation could occur on newly emerged summer/fall Chinook from the Similkameen and upper Okanogan rivers. The incidence of predation should be minimized due to acclimation and release procedures for the hatchery-origin fish and the likelihood that recently emerged Chinook should be occupying shallow water, fringe habitat while smolted hatchery-origin fish should be actively migrating in the deeper, faster waters. Incidence of predation would be examined in the M&E program. A more thorough discussion of competition and predation risks can be viewed in the BAMP (Bugert 1998).

Natural Escapement Management:
Rebuilding the summer/fall Chinook population in its historical habitat along the entire Okanogan River will best be accomplished by eventually creating a spawning population consisting primarily of natural-origin fish in most years. Until better knowledge exists about the relative reproductive success of hatchery-origin and natural-origin salmon, the naturally spawning population should be managed to increase the proportion of natural-origin fish in the escapement. The HGMP includes the following goals for the desired proportion of hatchery-origin fish in the naturally spawning population (Table 5) to guide

harvest and propagation activities. Such goals will need to be flexible, however. With this population needing to migrate past nine dams on the Columbia River, many years of low escapements can be expected. In those years of lower escapements, the health of the population might best be served by allowing a greater proportion of hatchery-origin fish on the spawning grounds. Also, during the early years of the propagation program of the later-arriving summer/fall Chinook destined for the underutilized habitat in the lower Okanogan River, a high proportion of hatchery-origin spawners will be a necessity. These goals will need to be revised based on the results of the monitoring and evaluation program and with improved general knowledge of the effects of supplementation.

Table 5. Desired Proportion of Naturally-Spawning, Hatchery-Origin Summer/Fall Chinook; Okanogan and Similkameen Rivers

	Current % Hatchery	Long-Term % Hatchery
Wells Dam Escapement << 3,500		
Early-Arriving Summer/Fall Chinook	~ 47%	< 50%
Wells Dam Escapement >> 3,500		
Early-Arriving Summer/Fall Chinook	~ 64%	< 20%

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.

Similkameen Pond: 21 cfs of Similkameen River surface water. Small quantity of well water. The facility has a back-up aeration system for use when the water supply is shut off due to ice formation or from toxic spills.

Bonaparte Pond: Up to 25 cfs of Okanogan River surface water. Water temperature should be similar to Ellisforde Pond – mid to high 30's in December, low to mid 30's in January and February, mid 30's to mid 40's in March, mid 40's to mid 50's in April.

Riverside Pond: Up to 20 cfs of Okanogan River surface water. Water

temperature should be similar to Ellisforde Pond – mid to high 30's in December, low to mid 30's in January and February, mid 30's to mid 40's in March, mid 40's to mid 50's in April.

Tonasket Pond (contingency): Up to 25 cfs of Okanogan River surface water. Water temperature should be similar to Ellisforde Pond – mid to high 30's in December, low to mid 30's in January and February, mid 30's to mid 40's in March, mid 40's to mid 50's in April.

Omak Pond: undetermined quantity. Water temperature should be similar to Ellisforde Pond – mid to high 30's in December, low to mid 30's in January and February, mid 30's to mid 40's in March, mid 40's to mid 50's in April.

Chief Joseph Dam Hatchery: 20-22 cfs of water from Chief Joseph Dam's relief tunnel and 22 cfs (or as much as may be needed) of surface water from Rufus Woods Lake. Temperatures of the relief tunnel water range from 48°F in July to 55°F in December.

Other water quality parameters of the relief tunnel water are all within normal fish culture thresholds (Koch 1977). Lake waters range from about 38°F in winter to 66°F in late summer. Well water should be similar to that at Colville Trout Hatchery, 47°F in summer to 58°F in winter. A large aquifer exists 2.5 miles above the hatchery site that could be tapped for well water. Well water should be similar to that at Colville Trout Hatchery,47°F in summer to 58°F in winter.

Eastbank Hatchery: 53 cfs of water from 4 wells. Water temperatures range from 7.8°C in May to 13.9C in December. No rearing limitations within water supply.

Water rights have been or will be obtained for each of these propagation and acclimation facilities. For Chief Joseph Dam Hatchery, water rights will be obtained from the Colville Tribes as the planned water sources are on the reservation.

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.

Water intakes to all Similkameen and Okanogan acclimation ponds are screened to NMFS screening criteria. The Oroville-Tonasket Irrigation District has its Tonasket and Bonaparte ponds screened to NMFS criteria with 3/32" wedge wire (Tom Scott, OTID manager, pers. comm.). All hatcheries are also screened to NMFS criteria. The Chief Joseph Dam Hatchery will not be taking water from critical habitat so it will not affect ESA-listed species.

Effluent from all hatcheries and acclimation ponds will be monitored and kept within discharge thresholds. Ponds will be dewatered and cleaned of fish and fish food wastes

prior to each irrigation season. During fish rearing, the ponds will be vacuumed of propagation wastes as needed and solids properly disposed.

At Chief Joseph Dam Hatchery, facilities will include an aeration and settling facility to receive vacuum cleanings from the raceways. Solids will be removed as necessary from this facility. A detention pond capable of providing a one-hour detention of all waters passing through the hatchery's rearing facilities will be used.

SECTION 5. FACILITIES

Artificial propagation programs will change as information is gained on the benefits and risks of the programs, as program goals are revised through time, or as new management goals are established to which the facility might be applied. Programs are adapted through time as monitoring information is evaluated. Consequently the facilities must be capable of adjustment. This can be done at least expense if the facilities are designed initially with flexibility as an objective. The design of this hatchery should ensure capability to adjust operations to:

1. impose disease management restrictions during incubation and rearing (particularly BKD).
2. allow for fish marking (fin-clipping, cwt tagging, or PIT tagging) of all or parts of production groups.
3. incubate eggs in family units.
4. isolate the juvenile rearing of more numerous distinct populations.

5.1) Broodstock collection facilities (or methods).

Broodstock will be collected using live-capture, selective fishing gear. This gear will be developed, tested and deployed prior to operation of the hatchery. It is anticipated that this gear could include temporary weirs, beach seines, floating net traps, and powered fish wheels. The gear will operated in and near the mouth of the Okanogan River to capture Chinook returning specifically to the River. Anticipated research on the live-capture gear will also investigate the best procedures to hold and transfer the broodstock from the fishing sites to the holding ponds at the hatchery. Collection in this manner will allow development of a broodstock of Chinook that are adapted to the unique attributes of the Okanogan habitat.

Once the collection efficiencies for the live-capture gear are known, then protocol details can be developed. In addition to the number of fish collected throughout the run, the new collection protocol will specify the days of the week, hours/day, female:male ratio, and safe handling and transportation procedures.

In most years, temperature barriers form in the Okanogan River causing summer/fall Chinook to hold in Wells Pool prior to migrating upstream to spawning areas. This

phenomenon could complicate the planned capture of recently arriving Chinook through the summer and fall months that would ensure proportionate broodstock collection from throughout the run. Testing and deployment of live-capture gear below the adult holding areas off the mouth of the Okanogan River may be necessary to ensure proper broodstock collection protocols.

As a contingency should the live-capture gear perform inadequately, broodstock would be collected at Wells Dam's east ladder trap, as is the current practice. The fish ladder is closed above a large holding area from which fish ascend a denil fishway and false weir. Fish are then diverted via a chute directly into a truck-mounted anesthetic tank. There is no handling of trapped fish prior to being anesthetized. Fish can then be tagged, recovered, and placed in transport trucks. The trap is actively manned (Brown, 2001). The opportunity to use the collection facilities at Wells Dam beyond August will need to be negotiated with Douglas PUD as it would affect operations and fish passage at the Dam.

Chief Joseph Dam Hatchery will also be constructed with adult collection and holding capabilities. Hatchery effluent water, attraction waters from Rufus Woods Lake, and pumped attraction flows from the Columbia River will be released into a fishway. The ladder will lead from the Columbia River to 5 separate adult holding raceways. Summer/fall Chinook will be allowed to voluntarily enter the facility.

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

Adults are transported from Wells Dam to Eastbank Hatchery and placed in the adult holding pond.

Broodstock for Chief Joseph Dam Hatchery will be collected at various sites using live-capture, selective fishing gear. Fish will be held and transferred to fish transport trucks for delivery to the hatchery's adult holding ponds. One pond will be used for acclimation as broodstock could be coming from river water in the mid-60's F, but then held in water closer to 50 F.

5.3) Broodstock holding and spawning facilities.

Eastbank Hatchery includes an adult holding pond for early-arriving summer/fall Chinook collected at Wells Dam.

Chief Joseph Hatchery will include 5 adult holding raceways; two for early-arriving summer/fall Chinook and two for later-arriving summer/fall Chinook. A fifth raceway will be used for handling excess fish to acclimate fish arriving from offsite collection points. Total holding capacity will be about 23,000 cubic feet with a minimum water

supply of 1 gpm/fish and 1 pond turnover per hour. The ponds will include fish crowding and sorting facilities in association with a spawning building.

Spawning and egg-taking facilities will be housed in a 1,200 square-foot enclosed structure that will overlap three of the adult holding raceways. These facilities will be located near the river away from the main hatchery facilities to avoid disease transfers.

5.4) Incubation facilities.

Eastbank Hatchery has 70 half-stacks of vertical incubators equipped with a chilled water supply.

Incubation facilities at Chief Joseph Dam Hatchery will have a capacity of about 2.5 million summer/fall Chinook eggs, requiring 570 trays (@ 5,000 eggs/tray). Incubation will use 7.0 gpm for each half stack (8) of trays. Incubation flows will be disease–free relief tunnel water that will be slightly chilled to achieve optimum incubation temperature of 48 F. Initial incubation will occur in jars to reduce fungal infections prior to eggs being transferred to the Heath incubator trays.

Power for the hatchery and incubation chillers will be supplied by the Nespelem Valley Electric Cooperative.

5.5) Rearing facilities.

Eastbank Hatchery has eight 3,750 cubic foot raceways and five 22,200 cubic foot raceways supplied by four wells providing 53 cfs of water.

Rearing facilities at Chief Joseph Dam Hatchery will include 40 start tank units (3’ x 40’ x 2.5’). Loading criteria for the fry will be 1.0 lbs/inch/gpm, at least 1 tank turnover per hour, and a density not to exceed 0.30 lbs./cu. ft. Button-up fry will be transferred to the start tanks at about 0.45 grams.

At about 0.50 grams/fish, the fry will be transferred via gravity flow to outdoor raceways. 48 total raceways (8’ x 100’ x 3.25’) will be required for the summer/fall Chinook program. Flows will be a combination of relief tunnel water and lake water mixed to achieve optimum rearing temperatures to meet smolt size objectives. Loading densities will not exceed 1.0 lbs/inch/gpm, 1.0 raceway turnover per hour, and 0.75 lbs./cu. ft. Rearing will be accomplished with a single pass of water, with effluent delivered to a detention pond.

5.6) Acclimation/release facilities.

Similkameen Pond is a single, trapezoid pond with concrete end structures, sloped sides, and hypalon floors. Useable pond volume is 77,000 cubic feet. The pond is supplied

with 21 cfs of water from the Similkameen River and a small amount of well water. The pond is located on the right bank of the Similkameen River at river kilometer 5, near the town of Oroville.

Bonaparte Pond is an open-air pond, is 128'x102'x12', and has 65,300 cubic feet of useable rearing volume at an operating depth of 5 feet. The pond's water is supplied by five pumps, each delivering five cfs from the Okanogan River. The pond will therefore have a turnover rate of about 1.4/hour. The pond is located on the left bank of the Okanogan River, immediately downstream from the town of Tonasket.

Riverside Pond will be constructed to a volume of 53,000 cubic feet with dimensions of about 47' x 188' x 6'. The pond will be supplied with 20 cfs of Okanogan River water.

Tonasket Pond (contingency) is an open-air pond, is 295'x42'x6', and has 74,300 cubic feet of useable rearing volume. The pond is located on the right bank of the Okanogan River, immediately upstream from the town of Tonasket. The pond has a supply of 25 cfs of Okanogan River water.

Omak Pond will be constructed to a volume of 53,000 cubic feet with dimensions of about 47' x 188' x 6'. The pond will be supplied with 20 cfs of Okanogan River water.

The design or modification of all acclimation ponds will need to consider icing issues. Experience from WDFW operations at Similkameen Pond and Tribal operations at Ellisforde and Bonaparte Ponds will be taken into account. Design considerations will be given to pond intakes, outlets, and winter operational requirements.

Each of the acclimation ponds, when designed or modified, will have its outlets downstream of the water supply intakes to avoid subjecting released fish to the intake screens. The Bonaparte and Tonasket ponds have telephone links to the offices and cell phones of Irrigation District employees to warn of flow or surface level problems. Similar links should be installed for all acclimation ponds used in these programs to warn of potential flow, temperature, dissolved oxygen, and security problems.

All outdoor acclimation facilities will be fitted with netting to prevent avian predation and electrical wiring to prevent entry of land-based predators.

Integration of NATURES rearing techniques will be considered for testing and installation at the acclimation facilities. Consideration will be given to adding structure and subsurface feeders to emulate natural conditions. The research on NATURES will be reviewed prior to final design to determine if survival advantages justify the additions.

Acclimation and release of juvenile fish at Chief Joseph Dam Hatchery will be from the raceways described in Section 5.5.

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

Similkameen Pond program has had difficulties meeting its goals due to a variety of disease and water quality problems. The program has faced losses from cold-water disease, BKD, and Ich. Water quality problems have included high water temperatures, pollution, and heavy loads of fine sediments (S. Bickford pers comm. 2003)

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.

Eastbank Hatchery: UCR summer/fall Chinook are not ESA-listed. Take of UCR steelhead and UCR spring Chinook associated with rearing summer Chinook occurs associated with the broodstock collection at Wells Dam, Dryden Dam and Tumwater Dam. These activities are cover by Section 10 direct take permits #1094 and #1196.

Chief Joseph Hatchery: The hatchery will not have listed fish on station, nor will its water be supplied from habitat of listed fish. The hatchery will also be located well above the flood zone. The hatchery is located about 11 miles upstream of the confluence of the Okanogan River and the nearest spawning and rearing habitat for UCR steelhead is in Omak Creek which is 32 miles up the river. The hatchery should therefore not directly affect this listed species. Hatchery effluent will be monitored for disease organisms and appropriate action taken should transmittable diseases by detected. The minimal amount of hatchery effluent will be substantially diluted and mixed prior to reaching the confluence of the Okanogan River. Therefore, operations of the hatchery should not affect listed species.

Similkameen Pond: The pond does not rear ESA-listed fish. Water supplied to the pond is screened to NMFS flow and screen standards to avoid entrainment of UCR steelhead. The pond is located above the flood zone. Disease prevention methods are employed for health of program fish and to minimize the transmission of diseased fish or disease agents to the Okanogan River. The pond receives regular vacuuming and personnel routinely remove mortalities. Fish inspections by certified fish pathologists are undertaken on a regular basis.

Bonaparte Pond: The pond will not rear ESA-listed fish. Water supplied to the pond is screened to NMFS standards with 3/32" wedge wire to avoid entrainment of UCR steelhead. The pond is located above the flood zone. Disease prevention methods will be employed for health of program fish and to minimize the transmission of diseased fish or disease agents to the Okanogan

River. The pond will receive regular vacuuming and personnel will routinely remove mortalities. Fish inspections by certified fish pathologists will be undertaken on a regular basis.

Riverside Pond: The pond will not rear ESA-listed fish. Water supplied to the pond will be screened to NMFS flow and screening standards to avoid entrainment of UCR steelhead. The pond will be located above the flood zone. Disease prevention methods will be employed for health of program fish and to minimize the transmission of diseased fish or disease agents to the Okanogan River. The pond will receive regular vacuuming and personnel will routinely remove mortalities. Fish inspections by certified fish pathologists will be undertaken on a regular basis.

Tonasket Pond (contingency): The pond will not rear ESA-listed fish. Water supplied to the pond is screened to NMFS standards with 3/32" wedge wire to avoid entrainment of UCR steelhead. The pond is located above the flood zone. Disease prevention methods will be employed for health of program fish and to minimize the transmission of diseased fish or disease agents to the Okanogan River. The pond will receive regular vacuuming and personnel will routinely remove mortalities. Fish inspections by certified fish pathologists will be undertaken on a regular basis.

Omak Pond: The pond will not rear ESA-listed fish. Water supplied to the pond will be screened to NMFS flow and screening standards to avoid entrainment of UCR steelhead. The pond will be located above the flood zone. Disease prevention methods will be employed for health of program fish and to minimize the transmission of diseased fish or disease agents to the Okanogan River. The pond will receive regular vacuuming and personnel will routinely remove mortalities. Fish inspections by certified fish pathologists will be undertaken on a regular basis.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1) Source.

"The summer Chinook used in the Similkameen Pond program are descendants of stock manipulations during the Grand Coulee Fish Mitigation Program and through mainstem dam mitigation programs (Meyers et al. 1998). These mitigation programs tended to homogenize summer-run and fall-run fish. The current broodstock originate from

natural-origin and hatchery-origin fish collected at Wells Dam and Wells Hatchery traps. These brood sources are representative of the summer-run populations indigenous to the Okanogan basin" (NMFS 2000).

The Tribes intend to shift broodstock collection from Wells Dam to collection points in the Okanogan River and in the Columbia River near the confluence of the Okanogan River. Collection can also be undertaken at Chief Joseph Dam Hatchery. Under this plan, collection at Wells Dam will be a contingency option should primary collection sites be inadequate.

6.2) Supporting information.

6.2.1) History.

Propagation of summer/fall Chinook in the Columbia Cascade Province started with operation of the Wells spawning channel in 1967. Initially, the entire run was propagated. Then in 1987, broodstock collection was terminated after August 28th to avoid including stray fall Chinook from downriver programs. All broodstock came from local Columbia River summer/fall Chinook stock with few exceptions. Broodstock was diverted from ladders at Wells Dam or from volunteers that entered the trap at the hatchery discharge. Only low numbers, about 3%, of non-indigenous stocks have been incorporated into the broodstock over the years. Methow and Okanogan subbasins were the major populations intercepted at Wells Dam and supplied the broodstock for the programs (Brown 1999).

Since 1987, early-arriving summer/fall Chinook broodstock for the Rocky Reach/Turtle Rock program and the Similkameen program have also been obtained from the trap at Wells Dam and consequently have a similar history (Brown 1999). Prior to 1987, summer/fall Chinook were trapped from the west fish ladder at Wells Dam and were diverted into Wells Hatchery. Trapping took place from mid-July through early November (S. Bickford, pers comm. 2003).

6.2.2) Annual size.

<u>Historical Chinook Broodstock Protocols for Early-Arriving Summer/Fall Chinook:</u>

Early-arriving summer/fall Chinook broodstock for the Okanogan and Methow subbasins is collected each year from the run at large reaching Wells Dam. Trapping in the Wells Dam east ladder begins on July 10th and ends on August 28th. Trapping occurs 3 days/week. Trapping occurs 16 hours per day with fish removed from the traps daily. The program collects 556 fish; achieves a 1 to 1 female to male ratio; assumes a 90% pre-spawn survival rate; assumes 5,000 eggs/female; assumes an egg to release survival rate of 78%; and achieves a program objective of 976,000 yearling smolts (Peterson and Truscott 2001).

No more than 20% of the early-arriving adult run is collected based on counts at Rocky Reach Dam. If cumulative adult counts at Rocky Reach Dam are less than 40% of the 10-year average, then broodstock collection ceases until the 40% escapement level has been reached. All collection occurs in the east ladder trap with the west ladder only used if difficulties are encounter in the east ladder. All Chinook collected at Wells Dam are differentially marked to distinguish them from those collected at the Wells Hatchery's volunteer channel (Brown, 2001).

Equal numbers of males and females are collected. Jack Chinook are collected in proportion to the run-at-large. The broodstock collection protocols are reviewed annually (Brown, 2001).

A primary consideration in broodstock collection is achieving a minimum natural escapement of 2,000 adults and jacks past Wells Dam, with an emphasis on meeting a 3,500 fish escapement level. In low run years, hatchery programs are reduced or deferred to increase escapement. In low run years, the order of elimination in hatchery programs is 1) Wells sub-yearlings, 2) Wells yearlings, 3) the Carlton (Methow) and Similkameen (Okanogan) programs. In low run years, escapement to Wells Hatchery can be used in the Okanogan program (Brown, 2001).

There is currently no broodstock collection of later-arriving summer/fall Chinook.

Future Broodstock Protocols for Summer/Fall Chinook:

WDFW and the Colville Tribes have agreed that the Upper Columbia River Summer/Fall Chinook in the Okanogan River should be managed as a single population and broodstock, but recognizing the full continuum in run timing and spawn timing from the upper to lower Okanogan River. Progeny will be acclimated at sites from the upper basin to lower river based on parental spawn timing. The following protocol is based on broodstock collection continuing at Wells Dam (the contingency plan) as it best highlights the differences with current procedures. A similar protocol will be developed and included in this HGMP based on using the live-capture, selective fishing gear once more is known about its success and attributes at various fishing sites. For example, dates of fish collection for each program component will need to be adjusted based on the migration timing and fishing success at various collection sites.

Under the contingency protocol:

1) Broodstock for the current 576,000 yearling program of early-arriving summer/fall Chinook for the Okanogan subbasin would be collected at Wells Dam, as is the current practice, from July 10th until August 28th. These fish would be held, spawned, and progeny reared at Eastbank Hatchery. These fish would be acclimated and released from the uppermost acclimation ponds on the Similkameen and Okanogan rivers. These same procedures would be used to collect the broodstock needed for the 400,000 yearling program in the Methow subbasin.

2) Broodstock for the new 500,000 yearling and sub-yearling program of early-arriving summer/fall Chinook for release at Chief Joseph Dam Hatchery would also be collected at Wells Dam from July 10th until August 28th. These fish would be held, spawned, and progeny reared at Chief Joseph Dam Hatchery.
3) For the new 400,000 yearling program acclimated at Riverside Pond, broodstock would be collected at Wells Dam from mid-August through mid-September. These fish would be held, spawned, incubated and reared at Chief Joseph Dam Hatchery.
4) Broodstock for the new 1.1 million yearling and sub-yearling program of later-arriving summer/fall Chinook would be collected at Wells Dam from August 29th through mid-November. These fish would be held and spawned at Chief Joseph Dam Hatchery. Progeny rearing would occur at the hatchery and later acclimated and released onsite and at Omak Pond.
5) Once all of the broodstock are transported to Chief Joseph Dam Hatchery, then spawning will occur as they ripen. The earliest ripening fish will be used to supply the hatchery release of 500,000 (per # 2), irregardless of when the broodstock were collected. The next ripening fish will be used to supply the eggs for the Riverside Pond release of 400,000 (per # 3), irregardless of when they were collected. And finally, the last ripening fish will supply the 1.1 million fish (per # 4) for Omak Pond and hatchery releases.

Until capabilities are developed for broodstock collection in the Okanogan River, early-arriving summer/fall Chinook broodstock for the Okanogan and Methow subbasins will be collected jointly each year as generally specified in the above contingency protocol. Dates and times of collection will remain as currently specified. The new broodstock objective will increase to 1,070 fish to achieve a total program of 1,876,000 yearlings and subyearlings.

The collection of early-arriving summer/fall Chinook broodstock must be based on the run size at Wells Dam. The run at Rocky Reach Dam is also critical as it provides an estimate of the anticipated run at Wells Dam.

Escapement goal for early-arriving summer/fall Chinook past Wells Dam:	3,500
Broodstock objective at Wells Dam:	1,070
Total	4,570

In the event of insufficient early-arriving summer/fall Chinook broodstock, the program priority will be: 1) Similkameen Pond – 376,000 yearlings; Methow Program – 200,000 yearlings, 2) Bonaparte Pond – 200,000 yearlings; Methow Program – 200,000 yearlings, 3) Riverside Pond – 200,000 yearlings, 4) Chief Joseph Dam Hatchery – 200,000 yearlings, 5) Riverside Pond 200,000 yearlings, 6) Chief Joseph Dam Hatchery – 100,000 yearlings 7) Chief Joseph Dam Hatchery 200,000 subyearlings.

The number of broodstock that should be collected must be based on the anticipated escapement past Wells Dam. The management objective is to fully seed the available

habitat in the Okanogan and Methow rivers (currently 3,500 adults) while spreading the risk of low population productivity and survival of this ESU between natural and hatchery production. These Chinook populations are located above nine dams and face substantial, cumulative passage mortalities. Additionally, the Okanogan population faces the threat of catastrophic mortality due to excessive water temperatures. Therefore, the higher productivity of hatchery populations as a means to minimize risks of population failure is factored into the broodstock collection protocol provided in Table 6.

Table 6. Priority of Broodstock Collection for Early-Arriving Summer/Fall Chinook at Wells Dam.

Anticipated Count of Early-Arriving Summer/Fall Chinook at Wells Dam	Maximum Broodstock Collection	Programs * Implemented
<2,000	328	#1
2,000 – 2,500	556	#1 and #2
2,501 – 3,500	670	#1 - #3
3,501 – 4,000	898	#1 - #5
4,001 – 5,000	955	#1 - #6
> 5,000	1,070	#1 - #7

* see Okanogan/Methow program priority listing above

Collection of broodstock at Wells Dam must initially be based on counts of early-arriving summer/fall Chinook at Rocky Reach Dam. However since 1990, the Wells Dam count has varied significantly, from 44% to 80%, of the Rocky Reach Dam count. Fishery managers collecting broodstock at Wells Dam will need to be cognizant of the cumulative counts at Rocky Reach Dam to follow collection protocols.

All hatchery-origin summer/fall Chinook escaping to and above Wells Dam will be adipose fin clipped, whereas natural-origin fish will be unmarked. Natural-origin Chinook must be integrated into the hatchery broodstock to ensure that the hatchery fish are not allowed to genetically diverge from the naturally spawning fish. Integration of natural-origin fish is also important to prevent long-term domestication of the broodstock.

From 1998-2002 the proportion of hatchery-origin fish spawning in the Similkameen River has averaged 57% (range 41-70%), while in the Okanogan River, hatchery-origin fish have averaged 51% of the natural spawners (range 33-61%). In both rivers, the proportion of hatchery-origin spawners increases with increasing escapement. This information is important is establishing protocols for broodstock collection.

In collecting broodstock, up to 100% of broodstock should be unmarked, natural-origin fish. However, not more than 20% of the natural-origin run should be collected for broodstock (Table 7).

Table 7. Proportion of Natural-Origin, Early-Arriving Summer/Fall Chinook in Hatchery Broodstocks.

Anticipated Count of Early-Arriving Summer/Fall Chinook at Wells Dam	Max. % of Broodstock Natural-Origin	Max. % of Natural Origin Fish in Broodstock
< 2 ,000	50%	20%
2,000 - 5,000	75%	20%
> 5,000	100%	20%

Jack Chinook are collected in proportion to the run-at-large. The broodstock collection protocols will be reviewed annually.

Additional broodstock for the new, later-arriving summer/fall Chinook program will be collected using live-capture, selective fishing gear or, if necessary, at Wells Dam's eastbank ladder trap from August 29th through November 30th. Fish will be taken equally from throughout the run, with an equal collection of males and females. The broodstock collection objective will be 616 adults to achieve a total program goal of 600,000 yearlings and 500,000 subyearlings.

The collection of broodstock must be based on the runs size at Wells Dam. The run at Rocky Reach Dam is also critical as it provides an estimate of the anticipated run at Wells Dam.

Interim escapement goal for later-arriving summer/fall Chinook past Wells Dam:	1,200
Broodstock objective at Wells Dam:	616
Total	1,816

In the event of insufficient later-arriving summer/fall Chinook broodstock, the program priority will be: 1) Omak Pond – 200,000 yearlings, 2) Chief Joseph Dam Hatchery – 200,000 yearlings, 3) Omak Pond – 200,000 more yearlings, 4) Omak Pond – 300,000 subyearlings, 5) Chief Joseph Dam Hatchery – 200,000 subyearlings.

The number of broodstock that should be collected must be based on the anticipated escapement past Wells Dam. The management objective is to fully seed the available habitat in the Okanogan, Methow and Columbia rivers while spreading the risk of low population productivity and survival of this ESU between natural and hatchery production. However, the habitat capacity and corresponding escapement needs are unknown and will be the subject of a monitoring and evaluation program. At this time, an escapement objective for later-arriving summer/fall Chinook above Wells Dam is assumed to be 1,200. These Chinook populations are located above nine dams and face substantial, cumulative passage mortalities. Therefore, the higher productivity of hatchery populations as a means to minimize risks of population failure is factored into the broodstock collection protocol indicated in Table 8.

Table 8. Priority of Broodstock Collection for Later-Arriving Summer/Fall Chinook at Wells Dam.

Anticipated Count of Later-Arriving Summer/Fall Chinook at Wells Dam	Maximum Broodstock Collection	Programs * Implemented
<1,000	228	#1 and #2
1,000 – 1,500	342	#1 - #3
1,501 – 2,000	506	#1 - #4
> 2,000	616	#1 - #5

* see Okanogan/Columbia program priority listing above

Collection of broodstock using live-capture gears or at Wells Dam must initially be based on counts of later-arriving summer/fall Chinook at Rocky Reach Dam. However since 1990, the Wells Dam count has varied significantly, from 20% to 76%, of the Rocky Reach Dam count. If collection of broodstock occurs at Wells Dam, fishery managers will need to be cognizant of the cumulative counts at Rocky Reach Dam to follow collection protocols. If collection occurs as anticipated with live-capture fishing gear, then managers will have the more accurate counts from Wells Dam to guide collection procedures.

As with the early-arriving fish, the broodstock for the later-arriving summer/fall Chinook must also be managed for natural-origin fish as indicated in Table 9. All hatchery-origin summer/fall Chinook escaping to Wells Dam and above will be adipose fin clipped, whereas natural-origin fish will be unmarked. Natural-origin Chinook must be integrated into the hatchery broodstock to ensure that the hatchery fish are not allowed to genetically diverge from the naturally spawning fish. Integration of natural-origin fish is also important to prevent long-term domestication of the broodstock. In collecting broodstock, up to 100% of broodstock should be unmarked, natural-origin fish. However, not more than 20% of the natural-origin run should be collected for broodstock.

Table 9. Proportion of Natural-Origin, Later-Arriving Summer/Fall Chinook in Hatchery Broodstock.

Anticipated Count of Later-Arriving Summer/Fall Chinook at Wells Dam	Max. % of Broodstock Natural-Origin	Max. % of Natural Origin Fish in Broodstock
< 2,000	50%	20%
2,000 - 3,000	75%	20%
>3,000	100%	20%

Jack Chinook are collected in proportion to the run-at-large. The broodstock collection protocols will be reviewed annually.

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

See Section 6.2.2 above.

6.2.4) Genetic or ecological differences.

For early-arriving summer Chinook, there are no known genotypic, phenotypic, or behavior differences between the hatchery stocks and natural stocks in the target area (Brown 1999). This observation is likely due to the protocols for past broodstock collection that collect fish from the early-arriving summer/fall Chinook run and integrate natural-origin fish into the hatchery program. Also, hatchery-origin fish make up a large proportion of the naturally spawning population as evidenced by the data in Table 10 (Bartlett, pers. com. June 2002). These relatively high proportions of hatchery-origin fish over time have likely accomplished a homogenized, single population of early-arriving summer/fall Chinook.

Table 10. Proportion of Hatchery-Origin Summer/Fall Chinook Recovered on the Spawning Grounds

Year	Similkameen River	Okanogan River
1998	53%	33%
1999	60%	58%
2000	74%	49%

Since 1987, later-arriving summer/fall Chinook have purposefully not been included in the summer/fall Chinook hatchery broodstock. Given the high mortality rates for Chinook above nine dams, the natural-origin, later-arriving Chinook have declined to lower levels than the earlier-arriving Chinook. The overall Chinook population of the Okanogan and upper Columbia rivers, therefore is likely not representative genotypically, phenotypically, or behaviorally with the historical, indigenous population. By initiating a propagation program for the later-arriving Chinook, the Tribes intend to restore the natural variability of the province's Chinook and more fully utilize the historical Chinook habitat of the lower Okanogan River and Columbia River.

Upon development of broodstock collection capabilities for the Okanogan River, broodstock will not be collected at Wells Dam. Over time, this will allow the population of the Okanogan River to specifically adapt to the habitat conditions of the Okanogan River and mainstem Columbia River without any potentially confounding effects of Chinook originating from the Methow subbasin.

6.2.5) Reasons for choosing.

The summer/fall Chinook migrating past Wells Dam represent a mixture of the indigenous Methow and Okanogan populations. Given the unique habitat characteristics of the Okanogan River, propagation of Chinook released into the Okanogan River should arise from fish of that subbasin. If the live-capture gear proves successful, then the

Okanogan River summer/fall Chinook population would be managed as a separate population. Propagation of the later-arriving Chinook is intended to ensure this part of the Okanogan population survives the cumulative mortalities from the hydroelectric system and annual harvest rates of nearly 50%.

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

The Chinook programs described in this plan are not listed and will therefore not cause any genetic or ecological effects to other listed stocks via broodstock selection.

SECTION 7. BROODSTOCK COLLECTION

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

Adult summer/fall Chinook will be collected.

7.2) Collection or sampling design.

Summer/fall Chinook broodstock for the Okanogan subbasin have been collected each year from the run at large reaching Wells Dam. Trapping begins after July 10th and ends on or before August 28th. Trapping occurs Monday through Wednesday of each week. Trapping occurs 16 hours per day with fish removed from the traps as they enter. The trapping facility is attended the entire 16-hour period. No more than 20% of the adult run is collected based on counts at Rocky Reach Dam. If cumulative adult counts at Rocky Reach Dam are less than 40% of the 10-year average, then broodstock collection ceases unit the 40% escapement level has been reached. All collection occurs in the eastbank ladder trap with the west ladder only used if difficulties are encounter in the eastbank ladder. All Chinook collected at Wells Dam are differentially marked to distinguish them from those collected at Wells Hatchery (Brown, 2001).

Equal numbers of males and females are collected. Jack Chinook are collected in proportion to the run-at-large. The broodstock collection protocols are reviewed annually (Brown, 2001).

A primary consideration in collection of early-arriving summer/fall Chinook is achieving a minimum natural escapement of 2,000 adults and jacks past Wells Dam, with an emphasis on meeting a 3,500 fish escapement level. In low run years, hatchery programs are reduced or deferred to increase escapement. The order of elimination in hatchery programs is 1) Wells sub-yearlings, 2) Wells yearlings, 3) the Carlton (Methow) and

Similkameen (Okanogan) programs. In low run years, escapement to Wells Hatchery can be used in the Okanogan program (Brown, 2001).

The broodstock for the new, later-arriving summer/fall Chinook program will be collected using live-capture gear in September through mid-November. The dates and locations of this trapping will depend on results from gear research. As a contingency, collection will occur at Wells Dam's east ladder trap from August 29th through mid-November. Fish will be taken equally from throughout the run, with an equal collection of males and females. No more than 20% of the adult run will be collected based on counts at Rocky Reach Dam. If cumulative adult counts at Rocky Reach Dam are less than 40% of the 10-year average, then broodstock collection will cease unit the 40% escapement level has been reached. All collection will occur in the east ladder trap with the west ladder only used if difficulties are encounter in the east ladder. Any trapping at the west ladder would need to be consistent with trapping for endangered steelhead programs.

Jack Chinook are collected in proportion to the run-at-large. The broodstock collection protocols will be reviewed annually.

7.3) Identity.

All hatchery-origin summer/fall Chinook released from Wells Dam, in the Methow subbasin, and in the Okanogan subbasin are adipose-fin clipped to differentiate them from natural-origin fish. This marking scheme will be continued for all summer/fall Chinook production in the Okanogan subbasin and for releases in the Columbia River below Chief Joseph Dam.

During the July and August broodstock collection period at Wells Dam, no other Chinook populations are present in the project area (Brown 2001). Methow spring Chinook will have already migrated into that subbasin. Spring Chinook returning to the Okanogan River and Chief Joseph Dam Hatchery in the future will have migrated past Wells Dam and into the Okanogan River, the hatchery, or harvest gear. Also, no other Chinook should be present at Wells Dam during the September through November broodstock collection period for later-arriving summer/fall Chinook. With collection at Wells Dam, there is no differentiation between the Okanogan and Methow populations. Collection of summer/fall Chinook destined for the Okanogan subbasin is intended to be undertaken in that subbasin to develop a unique broodstock adapted to the Okanogan's specific habitat.

7.4) Proposed number to be collected:

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

Early-arriving summer/fall Chinook:	1,070 adults; 1:1 sex ratio	
Similkameen/Bonaparte yearlings:	328	(existing)
Methow:	230	(existing)
Riverside Pond yearlings:	228	(new)
CJD Hatchery yearlings:	172	(new)
CJD Hatchery subyearlings:	112	(new)
Total:	1,070	

Later-arriving summer/fall Chinook:	618 adults; 1:1 sex ratio	
Omak Pond yearlings:	228	(new)
Omak Pond subyearlings:	166	(new)
CJD Hatchery yearlings:	114	(new)
CJD Hatchery subyearlings:	110	(new)
Total:	618	

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

The Okanogan/Methow early-arriving summer/fall Chinook program takes its broodstock from the east ladder at Wells Dam. The trapping goal has been 560 fish. The Rocky Reach/Turtle Rock summer/fall Chinook program takes its broodstock from volunteers to Wells Hatchery. The trapping goal for this program and that at Wells Hatchery is about 1,050 adults. For more details, please refer to Brown (1999).

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

Collection of summer/fall Chinook broodstock using live-capture fishing gear or from the Wells Dam trap will be limited to the requirements of the programs as described in this plan. All hatchery-origin fish trapped in excess of program needs will be released and allowed to continue their upriver migration. The Tribes are, however, also planning to develop live-capture, selective fishing gear to harvest hatchery-origin Chinook upstream of Wells Dam in excess of escapement needs. The harvest and broodstock collection activities could be merged to increase efficiencies.

In the future, the Tribes could collect some portion of the programs' broodstock at Chief Joseph Dam Hatchery. Once broodstock objectives are achieved, the entrance to the hatchery's collection and holding facility could be closed to force remaining hatchery-origin fish to spawn in the river or remain available for harvest. Should fish counts at Wells Dam and harvest levels be insufficient in any year to reduce numbers of hatchery-origin fish to management objectives for natural spawning escapement, then excess

hatchery fish could be allowed to voluntarily enter into the hatchery. The excess fish would be distributed to tribal members for subsistence.

7.6) Fish transportation and holding methods.

Early-arriving summer/fall Chinook for the Similkameen program are trapped at Wells Dam and held to maturity in an adult holding pond at Eastbank Hatchery. For other early-arriving summer/fall Chinook programs and the new, later-arriving summer/fall Chinook programs, the collected fish will be transported to adult holding facilities at Chief Joseph Dam Hatchery. Transport time from live-capture fishing sites and the Wells Dam trap to Chief Joseph Dam Hatchery should be no greater than 1 hour. Care of fish during transport will follow standard procedures. Transported Chinook will be placed in one of five holding ponds at the hatchery. One adult holding pond may be used as an acclimation facility to transition broodstock from warmer river waters to cooler holding waters.

7.7) Describe fish health maintenance and sanitation procedures applied.

Fish health protocols will be developed if Chief Joseph Dam Hatchery is approved for construction. Fish disease control procedures will be developed based on current fishery co-managers' fish disease control policies

7.8) Disposition of carcasses.

Carcasses of summer/fall Chinook spawned for the Similkameen/Methow program were buried on-site at the hatchery or returned to the Methow River or Columbia River near the tailrace of Wells Dam for nutrient enrichment purposes (Brown 2001). Similar procedures will be applied for fish spawned at Chief Joseph Dam Hatchery. Carcasses will be distributed in the Okanogan River or placed in the Columbia River below Chief Joseph Dam. Carcasses will only be placed in the Similkameen and Okanogan rivers in years of low escapement or in river reaches that achieve inadequate escapement to provide natural, nutrient enrichment. Attention will be given to ensure carcasses do not cause disease outbreaks due to high fish concentrations or high water temperatures. Carcasses not safe for nutrient enrichment will be buried at an acceptable site. The Salmon and Steelhead Carcass Distribution Protocols of the PNFHPC will be followed (see http://pnfhpc.fws.gov/carcass.html).

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.

Collection of Chinook broodstock at Wells Dam is covered in Section 10 Permit # 1094 and Section 10 Permit # 1196. These permits describe the effects on listed UCR steelhead and UCR Spring Chinook.

SECTION 8. MATING

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

8.1) Selection method.

Summer/fall Chinook broodstock will be collected randomly from the run at large arriving at or above Wells Dam from July 10th through November. Fish will be spawned from ripe fish on a given day. Depending on the run size, natural-origin fish will make up to 100% of the broodstock, unless limited by unexpected low numbers of natural-origin recruits in the run (see tables 7 and 9). When hatchery-origin brood is mated they will be spawned to achieve a random mix of HxH, WxW, HxW, and WxH crosses.

8.2) Males.

A 1:1 mating scheme is used for summer/fall chinook. Males may be live-spawned on the first spawning day as necessary to make up for a low male to female ratio. Inclusion of jacks in the run-at-large broodstock collection helps to alleviate occasional low adult male occurrence (Brown 2001).

8.3) Fertilization.

Summer/fall Chinook collected at Wells Dam are held and spawned at either Eastbank Hatchery or Chief Joseph Dam Hatchery (see Section 6.2.2) separately from other Chinook broodstock. Fish will be spawned at a 1 male to 1 female ratio. Gametes of the least numerous sex are split into subsets and these are crossed with gametes from a different individual of the more numerous sex.

Fish health procedures used for disease prevention include biological sampling of spawners. Generally sixty ovarian fluid and kidney/spleen samples are collected from female spawners to test for the presence of viral pathogens (Brown 2001). The enzyme-linked immunosorbent assay (ELISA) is now conducted on kidney samples from all female adults whose progeny are expected to go into the yearling program (Foster, J

2003). This assay detects the antigen for *Renibacterium salmonarium*, the causative agent of bacterial kidney disease (BKD)). These procedures will be continued at Eastbank Hatchery and applied at Chief Joseph Dam Hatchery.

8.4) Cryopreserved gametes.

No cryopreserved gametes have been or are expected to be used in the summer/fall Chinook program.

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

No listed fish are used in these summer/fall Chinook programs.

SECTION 9. INCUBATION AND REARING

9.1) Incubation:

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

Early-Arriving Summer/Fall Chinook

Similkameen/Bonaparte Ponds: The current production goal for the Similkameen Pond program is 576,000 yearling smolts. The program assumes a 78% egg-to-smolt survival standard, thereby requiring 738,000 eggs (Peterson and Truscott 2001). In the future, these fish will be split between the Similkameen and Bonaparte ponds.

Riverside Pond: A summer/fall Chinook program of 400,000 yearling smolts will require a take of an additional 513,000 eggs.

Chief Joseph Dam Hatchery: The release of 300,000 yearling summer/fall Chinook will require the take of 385,000 eggs. The 200,000 sub-yearling release will require 245,000 eggs assuming an egg to fingerling release survival objective of 81% (Peterson and Truscott 2001).

Later-Arriving Summer/Fall Chinook

Chief Joseph Dam Hatchery: The program at the hatchery will release 200,000 yearlings and 200,000 sub-yearlings requiring 503,000 eggs based on an egg-to-smolt survival of 78% for yearlings and 81% for subyearlings.

Omak Pond: For this Chinook program, 300,000 sub-yearlings and 400,000 yearlings will be released from Omak Pond. Assuming similar survival standards as the early-arriving summer/fall Chinook program, these Chinook releases will require 890,000 eggs.

In total, the programs (existing and proposed) will require 1.88 million early-arriving summer/fall Chinook eggs and 1.39 million later-arriving summer/fall Chinook eggs. In the event of a shortage of eggs, the sub-yearling programs will be deferred in favor of the yearling programs that should provide higher survival rates to adults.

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

The summer/fall Chinook programs may take up to 10% surplus eggs to ensure program release goals are met. The number of surplus eggs will be based on program performance and the greater need of ensuring adequate escapement to the spawning grounds. WDFW is not authorized to destroy excess gametes or fish. This rule applies to the early-arriving summer/fall Chinook reared at Eastbank Hatchery. The Colville Tribes will consider destroying excess gametes or fry at Chief Joseph Dam Hatchery to be responsive to any Federal restrictions on fish releases, in consideration of funding, or to avoid adverse ecological and genetic effects with releasing excess fish. Surplus fry may be destroyed and buried on-site, released, or fully reared if sufficient funds are available for propagation and marking. Under no circumstances, will smolts in excess of 110% of program objectives be released.

The take of surplus eggs will be minimized when program survival levels are determined and stabilized.

9.1.3) Loading densities applied during incubation.

Heath stack incubators are used to incubate summer/fall Chinook eggs at Eastbank Hatchery. Incubation conditions at the hatchery are designed on loading densities recommended by Piper et al. (1982) (Brown 2001)

Incubation of summer/fall Chinook at Chief Joseph Hatchery will follow similar guidelines using Heath incubators. Facilities have been conceptualized based on incubating 5,000 eggs/tray, and using 7 gpm/half-stack. Incubation water will be chilled as necessary to meet a 48°F optimum incubation temperature. Prior to placement in Heath trays, eggs of single families will be kept isolated in jar incubators until disease tests can be performed

9.1.4) Incubation conditions.

For Eastbank Hatchery, influent and effluent gas concentrations, including dissolved oxygen concentrations, are measured and within parameters optimal for salmonid egg and juvenile fish survival (Brown 2001).

At Chief Joseph Dam Hatchery, incubation waters will be silt free relief tunnel water, with dissolved oxygen levels above 7 ppm. Temperatures will be controlled to within the optimal range of 41 - 53°F, with a target temperature of 48°F.

9.1.5) Ponding.

Eastbank Hatchery: Summer/fall Chinook fry are transferred from Heath trays for ponding upon button-up and swim-up. Ponding generally occurs after the accumulation of 1,650-1,750 temperature units. Unfed fry are transferred to the ponds from early May through early June. The normal weight for fry initially ponded for brood years 1989-95 was 0.45 grams (1,000 fish per pound). Fry fork length was 36-40 mm (Brown 2001).
Chief Joseph Dam Hatchery: Transfer of Chinook fry from incubators to start tanks should occur similarly to Eastbank Hatchery. Transfer to troughs will be forced. Fry will be transferred at 0.45 grams at about 1,700 ftu. Loading criteria will not exceed 1.0 lbs/inch/gpm, 1.0 turnovers/hour, and 0.30 lbs/cu.ft.

9.1.6) Fish health maintenance and monitoring.

Eastbank Hatchery: No fish disease outbreaks have been experienced during the incubation to ponding period in the summer/fall Chinook program in recent years. Mortality levels have remained within program standards. Fish health is continuously monitored in compliance with co-manager Fish Health Policy Standards (Brown 2001)
Chief Joseph Dam Hatchery: As at Priest Rapids Hatchery, eggs may be water-hardened in iodophor for disinfection. Formalin may be periodically used in incubator water to control fungus growth on eggs. All fish disease control procedures will be conducted consistent with the fishery managers' fish disease control policies.

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.

Eastbank Hatchery: No listed fish are reared at this facility.
Chief Joseph Dam Hatchery: No listed fish are reared at this facility.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

Eastbank Hatchery: For the Okanogan/Methow summer/fall Chinook program, 84.6% of the fertilized eggs survive to the fry stage for ponding (1989-92 brood year data). The performance standard of egg to fry survival is 90%. The survival objective from fertilization to release is 65% (Brown 1999).
Chief Joseph Dam Hatchery: New program; no survival rate data exist.

Similkameen Pond: Significant mortalities have occurred at Similkameen Pond in 2001 and 2003.
Bonaparte Pond: New program; no survival rate data exist.
Riverside Pond: New program; no survival rate data exist.
Omak Pond: New program; no survival rate data exist.

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

Eastbank Hatchery: Rearing conditions are designed on loading densities recommended by Piper et al. (1982) of 6 lbs/gpm and 0.75 lb/cubic foot (Brown 1999).
Chief Joseph Dam Hatchery: The hatchery has been conceptualized based on the criteria 1 lbs/inch/gpm, 0.75 lbs/ cubic foot, and 1 turnover/hour.
Similkameen Pond: The Pond was designed based on rearing densities of Piper (1982). However, the summer Chinook program of 576,000 fish will be split, with 200,000 going to Bonaparte Pond. This will result in reduced rearing densities at Similkameen Pond, down to 4 lbs/gpm and 0.49 lbs/ cubic foot at time of release (assuming 10 fpp).
Bonaparte Pond: With 200,000 summer Chinook at a release size of 10 fpp, rearing densities could be as low as 1.8 lbs/gpm and 0.26 lbs/cubic foot. Flow rates and water depth in the pond could be reduced to save on pumping costs, in which case loading rates would be closer to Piper's criteria.
Riverside Pond: As with the other acclimation ponds in this program, Riverside will be designed for loading densities substantially lower than Piper's criteria to create a more natural rearing environment.
Tonasket Pond (contingency): With 400,000 summer Chinook at a release size of 10 fpp, rearing densities could be as low as 3.6 lbs/gpm and 0.54 lbs/cubic foot. Flow rates in the pond could be reduced to save on pumping costs, in which case loading rates would be closer to Piper's criteria.
Omak Pond: As with the other acclimation ponds in this program, Omak will be designed for loading densities substantially lower than Piper's criteria to create a more natural rearing environment.

9.2.3) Fish rearing conditions

Eastbank Hatchery: Influent and effluent gas concentrations at the hatchery, including dissolved oxygen concentrations, are within parameters optimal for juvenile salmonid production (Brown 1999).
Chief Joseph Dam Hatchery: Influent and effluent gas concentrations and temperatures will be constantly monitored following best hatchery management practices. Temperatures of the water supplies are such that optimal rearing conditions will be available. Testing of the Relief Tunnel waters have indicated they meet criteria for salmonid propagation (Koch, 1977)
Similkameen Pond: Influent and effluent gas concentrations at the acclimation pond, including dissolved oxygen concentrations, are within parameters optimal for juvenile salmonid production (Brown 1999).

Bonaparte Pond: Influent and effluent gas concentrations and temperatures will be constantly monitored following best hatchery management practices.
Riverside Pond: Influent and effluent gas concentrations and temperatures will be constantly monitored following best hatchery management practices.
Omak Pond: Influent and effluent gas concentrations and temperatures will be constantly monitored following best hatchery management practices.

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.

Eastbank Hatchery: Fish health and condition are monitored by fish health professionals throughout the fingerling to smolt rearing period with 10 – 15 site visits. Growth samples are taken monthly. For detailed information on growth information please refer to the Eastbank Hatchery HGMP by Brown (1999).
Chief Joseph Dam Hatchery: This will be a new program. No data are available. The hatchery has been designed based on an expected growth rate of 0.04 mm/ctu/day.
Similkameen Pond: Fish health and condition are monitored by fish health professionals throughout the fingerling to smolt rearing period with 10 – 15 site visits. Growth samples are taken monthly. For detailed information on growth information please refer to the Eastbank Hatchery HGMP by Brown (1999).
Bonaparte Pond: This will be a new program. No data are available.
Riverside Pond: This will be a new program. No data are available.
Omak Pond: This will be a new program. No data are available.

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

See Section 9.2.5.

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*).

Eastbank Hatchery: Commercial-grade moist and semi-moist fish feed is used and applied at rates appropriate for the size of fish. Feed is applied at a daily rate ranging from 3.0% of the total population weight per day for fry and small fingerlings and to 1.5% of the total population weight per day for larger fingerlings. The expected feed conversion efficiency rate is 1.2 (Brown, 1999).
Chief Joseph Dam Hatchery: This will be a new program. No data are available.
Similkameen Pond: Commercial-grade moist and semi-moist fish feed is used and applied at rates appropriate for the size of fish. Feed is applied at a daily rate ranging from 3.0% of the total population weight per day for fry and small fingerlings and to 1.5% of the total population weight per day for larger fingerlings. The expected feed conversion efficiency rate is 1.2 (Brown, 1999).
Bonaparte Pond: This will be a new program. No data are available.

Riverside Pond: This will be a new program. No data are available.
Omak Pond: This will be a new program. No data are available.

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

Eastbank Hatchery: Fish health and disease conditions are continuously monitored in compliance with Co-manager Fish Health Policy standards. Fish health is monitored by fish health professionals 10 – 15 times during the rearing period. In particular, summer Chinook are screened prior to transfer and again at release for the incidence of bacterial kidney disease (Brown, 1999).
Chief Joseph Dam Hatchery: This will be a new program. Fish health monitoring procedures will be established following standard policies and procedures of fishery co-managers.
Similkameen Pond: Fish health and disease conditions are continuously monitored in compliance with Co-manager Fish Health Policy standards. Fish health is monitored by fish health professionals 10 – 15 times during the rearing period. In particular, summer Chinook are screened prior to release for the incidence of bacterial kidney disease (Brown, 1999).
Bonaparte Pond: This will be a new program. Fish health monitoring procedures will be established following standard policies and procedures of fishery co-managers.
Riverside Pond: This will be a new program. Fish health monitoring procedures will be established following standard policies and procedures of fishery co-managers.
Omak Pond: This will be a new program. Fish health monitoring procedures will be established following standard policies and procedures of fishery co-managers.

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

Eastbank Hatchery: Degree of smoltification is monitored through monthly collection of data indicating average condition factor (Kfl). Gill ATPase levels have been monitored in the past, however this index has not been found to be useful for determining when to begin fish releases due to delays in obtaining results and the finding that ATPase levels do not actually increase until the smolts are actively migrating in the Columbia River. For more information see Brown (1999).
Chief Joseph Dam Hatchery: This will be a new program. No data are available.
Similkameen Pond: Degree of smoltification is monitored through monthly collection of data indicating average condition factor (Kfl). Gill ATPase levels have been monitored in the past, however this index has not been found to be useful for determining when to begin fish releases due to delays in obtaining results and the finding that ATPase levels do not actually increase until the smolts are actively migrating in the Columbia River. For more information see Brown (1999).
Bonaparte Pond: This will be a new program. No data are available.
Riverside Pond: This will be a new program. No data are available.
Omak Pond: This will be a new program. No data are available.

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

Integration of NATURES rearing techniques will be considered for testing and installation at the acclimation facilities. Consideration will be given to adding structure and subsurface feeders to emulate natural conditions. The research on NATURES will be reviewed prior to final design to determine if survival advantages justify the additions. At this time, natural rearing techniques are not anticipated to be applied at the hatchery facilities.

Eastbank Hatchery: No natural rearing methods are employed at the hatchery.
Chief Joseph Dam Hatchery: Natural rearing methods are not anticipated for application at the hatchery, pending results of natural rearing experiments being conducted elsewhere that will clarify any advantages and cost-effectiveness of such methods. The hatchery may serve as a control for testing of NATURES techniques at other facilities.
Similkameen Pond: Summer Chinook are reared in lower densities than at the hatchery and a more natural setting than concrete raceways. Fish are also reared on their "home" waters (Brown, 1999). This facility may serve as a control for testing of NATURES techniques at other facilities.
Bonaparte Pond: Fish will be reared at very low densities and at high flow rates on home waters, see Section 9.2.2. NATURES techniques may be tested here.
Riverside Pond: Fish will be reared at very low densities and at high flow rates on home waters, see Section 9.2.2. NATURES techniques may be tested here.
Omak Pond: Fish will be reared at very low densities and at high flow rates on home waters, see Section 9.2.2. NATURES techniques may be tested here.

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.

Eastbank Hatchery: No listed fish are reared at this facility.
Chief Joseph Dam Hatchery: No listed fish are reared at this facility.
Similkameen Pond: No listed fish are reared at this facility.
Bonaparte Pond: No listed fish are reared at this facility.
Riverside Pond: No listed fish are reared at this facility.
Omak Pond: No listed fish are reared at this facility.

SECTION 10. RELEASE

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

Fish will be provided a volitional release from acclimation sites prior to forcing the remainder in mid April for yearlings and mid June of subyearlings. Releases of yearlings will be coordinated with initiation of the mid-Columbia flow and spill programs to increase survival of fish passing the dams. These operations normally start about April 12th. All releases will be adipose-fin clipped and 40% coded-wire tagged.

10.1) Proposed fish release levels.

For early-arriving summer/fall Chinook:

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Yearling	376,000	10 fpp	Early - mid April	Similkameen Pond

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	200,000	10 fpp	Early - mid April	Bonaparte Pond

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	400,000	10 fpp	Early - mid April	Riverside Pond

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling	200,000	40 fpp	June	Chief Joseph Dam Hatchery
Yearling	300,000	10 fpp	Early - mid April	Chief Joseph Dam Hatchery

For later-arriving summer/fall Chinook:

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling	300,000	50 fpp	June	Omak Pond
Yearling	400,000	10 fpp	Early - mid April	Omak Pond

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling	200,000	50 fpp	June	Chief Joseph Dam Hatchery
Yearling	200,000	10 ffp	Early - mid April	Chief Joseph Dam Hatchery

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

Stream, river, or watercourse: Similkameen River
Release point: Similkameen Pond, rm 3.1 (rkm 5)
Major watershed: Okanogan River
Basin or Region: Columbia River

Stream, river, or watercourse: Okanogan River
Release point: Bonaparte Pond, rm 56 (rkm 90.2)
Major watershed: Okanogan River
Basin or Region: Columbia River

Stream, river, or watercourse: Okanogan River
Release point: Riverside Pond, rm 49 (rkm 79)
Major watershed: Okanogan River
Basin or Region: Columbia River

Stream, river, or watercourse: Okanogan River
Release point: Tonasket Pond (contingency), rm 59 (rkm 95)
Major watershed: Okanogan River
Basin or Region: Columbia River

Stream, river, or watercourse: Okanogan River
Release point: Omak Pond, rm 32 (rkm 51.5)
Major watershed: Okanogan River
Basin or Region: Columbia River

Stream, river, or watercourse: Columbia River
Release point: Chief Joseph Dam Hatchery, rm 544.6 (rkm 877)
Major watershed: Columbia River
Basin or Region: Columbia River

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

The following information is for the Similkameen Pond Chinook program (from StreamNet):

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1991							353,000	11.0 fpp
1992							540,000	12.0 fpp
1993							676,000	20.0 fpp
1994							548,000	18.0 fpp
1995							586,000	13.0 fpp
1996							536,000	13.0 fpp
1997							587,000	13.8 fpp
1998							508,000	17.7fpp
1999							590,000	11.0 fpp
2000							293,000	9.0 fpp
2001							630,000	12.8 fpp
2002							532,000	22.3 fpp
Average							532,000	14.5 ffp

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

For Similkameen Pond summer/fall Chinook program:
2002: 4/08/02 – 4/08/02 forced release due to Dermostidium infection*
2001: 4/11/01 – 4/25/01 volitional then forced
2000: 4/13/00 – 4/26/00 volitional then forced
1999: 4/12/99 – 4/26/99 volitional then forced
1998: 3/13/98 – 3/18/98 released early due to Bacterial Gill Disease*

* from Foster (2003)

10.5) Fish transportation procedures, if applicable.

None of the summer/fall Chinook in these programs will be transported just prior to release. All fish are either released at a hatchery or transported months earlier to their final rearing and acclimation ponds.

Similkameen Pond: Chinook are transported from Eastbank Hatchery in October.

Chief Joseph Dam Hatchery: Chinook will be released on station or transported to acclimation ponds, see below.

Bonaparte Pond: Chinook will be transported from Eastbank Hatchery in October.

Riverside Pond: Chinook will be transported from Chief Joseph Dam Hatchery in October

Omak Pond: Chinook will be transported from Chief Joseph Dam Hatchery in October and again in April.

10.6) Acclimation procedures

Chief Joseph Dam Hatchery: Summer/fall Chinook not transported to acclimation ponds (see below) will be reared and acclimated from hatching through release. Fish will be reared on water from the Chief Joseph Dam relief tunnel and subsurface waters from Rufus Woods Lake.

Similkameen Pond: Early-arriving summer/fall Chinook are reared and acclimated for 6 months. Fish are reared primarily on river water.

Bonaparte Pond: Early-arriving summer/fall Chinook will be reared and acclimated for 6 months. Fish will be reared on river water.

Riverside Pond: Early-arriving summer/fall Chinook will be reared and acclimated for 6 months. Fish will be reared on river water.

Omak Pond: Later-arriving, yearling summer/fall Chinook will be reared and acclimated for 6 months. Following release of yearlings, sub-yearling Chinook will be transferred to the pond for acclimation of up to 2 months. Fish will be reared on river water.

Transfer of Chinook to acclimation ponds will occur only after river temperatures in October have declined to safe levels. Transfer to acclimation ponds could be further delayed to prevent disease infections if substantial numbers of naturally-spawned carcasses are present immediately above the a pond's water intake.

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

An appropriate tagging program depends on a number of variables, including:

1. smolt-to-adult survival rate
2. tag recovery rate
3. statistical design of the hatchery M&E program
4. whether marked fish are used to calculate fishery contribution and exploitation rates.

Much of the above is, at this time, unknown for the Chief Joseph Dam Hatchery Program for summer/fall Chinook. The extensive, selective fisheries planned for these hatchery programs should lead to relatively high tag recovery rates in the terminal fisheries (above Wells Dam). Also the broad, shallow Okanogan River should allow a relatively high recovery rate of tags from spawning ground surveys. A final coded wire tagging protocol will need to be developed if the hatchery is approved for construction and the conceptual M&E program, now under development, is refined into a final program.

At this conceptual stage of planning the following tagging protocol is proposed. This protocol requires a relatively high rate of tagging, but if implemented would be modified based on actual fish survival rates and tag recovery rates from fisheries and spawning ground surveys.

Yearling smolts: 30% tagging, but not less than 100,000 tags per release group
Sub-yearling smolts: 50% tagging, but not less than 100,000 tags per release group

Early-Arriving Summer/Fall Chinook:		
200,000 sub-yearlings at CJDH -	100,000 tagged	
300,000 yearlings at CJDH -	100,000 tagged	
400,000 yearlings at Riverside Pond -	120,000 tagged	
Later-Arriving Summer/Fall Chinook:		
300,000 sub-yearlings at Omak Pond -	150,000 tagged	
200,000 sub-yearlings at CJDH -	100,000 tagged	
400,000 yearlings at Omak Pond -	120,000 tagged	
200,000 yearlings at CJDH -	100,000 tagged	
2,000,000 smolts	790,000 tagged	40% tag rate

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

At time of release, all fish up to 110% of approved program levels will be released. Fish will not be transported to acclimation sites in excess of 110% of approved programmed levels.

10.9) Fish health certification procedures applied pre-release.

See Section 9.2.7

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

Chief Joseph Dam Hatchery: The hatchery will have two primary water sources: relief tunnel and subsurface lake water. The hatchery will be supplied with emergency generators to maintain water supply in the event of a power outage. Should there occur a failure in the primary relief tunnel water, the hatchery can be switched over to gravity feed water from Rufus Woods Lake.

Similkameen Pond: In the event of an irresolvable water supply emergency that threatens the health of the Chinook, the fish will be immediately forced from the rearing pond.

Bonaparte Pond: In the event of an irresolvable water supply emergency that threatens the health of the Chinook, the fish will be immediately forced from the rearing pond.

Riverside Pond: In the event of an irresolvable water supply emergency that threatens the health of the Chinook, the fish will be immediately forced from the rearing pond.

Omak Pond: In the event of an irresolvable water supply emergency that threatens the health of the Chinook, the fish will be immediately forced from the rearing pond.

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.

Genetic Effects:

The Upper Columbia Summer/fall Chinook ESU is not listed. There are no ESA-listed Upper Columbia River Spring Chinook spawning in the Okanogan or Columbia rivers. The summer/fall Chinook released into the Okanogan subbasin are expected to migrate back to their natal river. Fish released from Chief Joseph Dam Hatchery will be harvested, return to the hatchery, or spawn in the Columbia River. Therefore, no genetic interactions between these two Chinook ESUs are expected. Monitoring of spring Chinook in the Methow River will determine if any Okanogan summer/fall Chinook are present in the spawning spring Chinook population in sufficient numbers to cause concern. Coded-wire tags recovered from salmon carcasses will indicate any presence of hatchery-origin fish from the Okanogan subbasin.

Ecological Effects:
The key ecological effects of concern with the release of hatchery-origin summer/fall Chinook are predation of ESA-listed steelhead and competition for food resources.

All early-arriving summer/fall Chinook released in the Okanogan and Similkameen rivers in early April will be yearling smolts that are expected to actively migrate down to and through the Columbia River. These fish will be about 130-140 mm in length. Early-arriving summer/fall Chinook released from Chief Joseph Dam Hatchery will be yearlings of a similar size and at a similar time. Sub-yearlings about 45 - 55 mm in length will also be released from the hatchery in June. Later-arriving summer/fall Chinook released in the lower Okanogan River and at Chief Joseph Dam Hatchery will be yearlings of about 130-140 mm in length. These fish will be released in April. Sub-yearling Chinook of about 45-55 mm in length will be released in June.

ESA-listed UCR Steelhead spawn in tributaries of the Okanogan River. Young of the year steelhead are thought to rear in the tributaries until their smolt migration the following spring. Some juvenile steelhead may drop out of the tributaries in May and June of their first year and rear through the summer in limited microhabitats in the Okanogan River where water temperatures from subsurface flow are suitable. Yearling summer and fall Chinook should have migrated from the Okanogan River prior to any juvenile steelhead inhabiting these waters. Any steelhead fry that would be in the Okanogan River would also be occupying shallow habitats, whereas the larger Chinook should be in deeper, faster waters. Therefore predation and competition by Chinook on young of the year steelhead for food and space should be minimal and insignificant.

Yearling Chinook can be expected to co-habit waters of the Okanogan River with yearling steelhead (arising from tributary streams) prior to and during their migration. Predation should not occur as the steelhead will be too large for Chinook consumption. Competition for food and space will occur to a limited extent, but should have only minor adverse effects as the Chinook will be actively migrating to the larger waters of the Columbia River. Also steelhead and Chinook tend to occupy different habitat types when rearing, with steelhead occupying riffle habitat and Chinook occupying deeper pools.

The June release of sub-yearling summer/fall Chinook in the lower Okanogan River should not co-habit waters used by steelhead fry as these fish should be primarily residing in the tributary streams. Should some steelhead fry occur in the lower Okanogan, some competition for food could occur until the Chinook migrate out to the Columbia River. However this competition should be short-lived and insignificant as steelhead and Chinook tend to occupy different habitat types when rearing, with steelhead occupying riffle habitat and Chinook occupying deeper pools.

The increased numbers of hatchery-origin summer/fall Chinook spawning in the Okanogan River should provide a beneficial effect for the steelhead populations. Carcasses of spawned out Chinook will provide nutrients and a direct food source for any rearing steelhead. Chinook will also be spawning in riffle areas recently unutilized or underutilized. This spawning action will clean the gravels of silt, a perennial problem in

the Okanogan River, providing better rearing habitat for steelhead. Emerging Chinook fry will also provide a food supply for yearling steelhead.

Should trapping of broodstock at Wells Dam be necessary, delay of adult steelhead could occur. Trapping protocols will need to be created to minimize any delays that would affect steelhead survival and spawning success.

The comprehensive monitoring and evaluation program that is associated with this Chinook program will assess all aspects of steelhead and Chinook interactions. The rearing behavior of Chinook and steelhead and the potential for competition will be documented. Researchers will also examine stomachs of hatchery-origin Chinook for the presence of steelhead fry. Information from the M&E work will be used to adjust the Chinook program as necessary to minimize or eliminate any significant problems with listed species.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

A key issue to be fully evaluated is the appropriate number and location of hatchery-origin fish releases. Achieving the goals of joint Integrated Recovery and Integrated Harvest programs will require collecting and evaluating a wide variety of information on fish interactions, productivity rates of hatchery-origin and natural-origin populations, and harvest effects. The Colville Tribes realize that initial production numbers will likely change and the programs adapt as M&E occurs. Of particular note is the need for information that could guide adjusting fish release numbers between sites on the Okanogan River and the hatchery, directly below Chief Joseph Dam, to balance the two programs.

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

The Colville Tribes have submitted the Okanogan Basin Monitoring and Evaluation Plan, under the Columbia Cascade Provincial Review that provides a comprehensive baseline assessment of the performance indicators for this summer/fall Chinook program as well as spring Chinook and steelhead. As part of the Master Planning process, the Colville Tribes have prepared a conceptual M&E Plan that further describes efforts to collect information on the performance indicators described in Section 1.9.

To facilitate program evaluations, all hatchery-origin summer/fall Chinook will be adipose fin clipped and 40% coded wire tagged.

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

The Colville Tribes have recently been notified that the baseline Okanogan Basin Monitoring and Evaluation Plan has been accepted for annual funding starting in FY 2004. This baseline M&E program will be supplemented a hatchery M&E program. Together, these two integrated programs will provide the information necessary to fully evaluate benefits and risks of the propagation programs described in this HGMP.

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.

For risk aversion measures associated with the M&E activities, please refer to the Okanogan Basin Monitoring and Evaluation Plan. The key summer/fall Chinook program activities that will affect listed fish are:

Wells Dam Trap: Summer/fall Chinook broodstock collection and adult monitoring will delay and handle listed UCR Steelhead. For more information on these activities, please refer to WDFW section 10 permits # 1094 and #1196.
Okanogan River Screw Traps: A number of screw traps will be operated in the upper, mid, and lower Okanogan River to collect juvenile summer/fall Chinook. These traps will be continuously monitored and checked at least every eight hours to minimize the delay and risk of harm to UCR Steelhead.
Zosel Dam Trap: A trap at Zosel Dam has been proposed for construction and operation. M&E at this site will include temporarily trapping and examining summer/fall Chinook destined for the Okanogan River above Osoyoos Lake. This trap may on occasion delay the migration of a few UCR Steelhead as they have recently been observed spawning in Nine Mile Creek above Osoyoos Lake (Foster 2003). The extent of movement and spawning of steelhead above Zosel Dam is unknown. The Zosel trap, when in operation will be continuously monitored and checked at least every eight hours to minimize the delay and risk of harm to UCR Steelhead.

SECTION 12. RESEARCH

Other than a comprehensive M&E plan to measure the benefits and risks of this summer/fall Chinook program, there is no research planned at this time to be conducted in direct association with this HGMP.

12.1) Objective or purpose.
NA
12.2) Cooperating and funding agencies.
NA
12.3) Principle investigator or project supervisor and staff.
NA
12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.
NA
12.5) Techniques: include capture methods, drugs, samples collected, tags applied.
NA
12.6) Dates or time period in which research activity occurs.
NA
12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.
NA
12.8) Expected type and effects of take and potential for injury or mortality.
NA
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).
NA
12.10) Alternative methods to achieve project objectives.
NA
12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.
NA
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.
NA

SECTION 13. ATTACHMENTS AND CITATIONS

Brown, L. 1999. Hatchery & Genetic Management Plan for Upper Columbia Summer Chinook Salmon Mitigation and Supplementation Program – Eastbank Fish Hatchery and Wells Fish Hatchery Complexes, WDFW.

Brown, L. 2001. Hatchery & Genetic Management Plan (HGMP) for Upper Columbia – Washington Department of Fish and Wildlife", Appendix G in Okanogan/Similkameen Subbasin Summary.

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Bugert, B. (Facilitator), National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Confederated Tirbes of the Yakama Indian Reservation, Confederated Tribes of the Colville Indian Reservation, Confederated Tribes of the Umatilla Indian Reservation. 1998. Biological Assessment and Management Plan: Mid-Columbia River Hatchery Program.

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Cooney, T. 2000 Draft. Upper Columbia River Steelhead and Spring Chinook Salmon Quantitative Analysis Report, Part I: Run Reconstruction and Preliminary Assessment of Extinction Risks – Technical Review Draft.

Ford M. et al. 2001. Upper Columbia River Steelhead and Spring Chinook Salmon Population Structure and Biological Requirements, Final Report. NMFS

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Koch, D., “Estimate of the Size of the Salmon and Steelhead Trout Populations of the Upper Columbia River, 1872-1939”, September 1, 1976

Koch, D. and Cochran, G., “Feasibility Report of a Fish Hatchery on the Colville Indian Reservation at Chief Joseph Dam – Bridgeport, Washington”, March 1, 1977

NMFS. 2000. Biological Opinion – Reinitiation of Consultation on Operations of the Federal Columbia River Power System, Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin.

NMFS. 2001. Biological Opinion – Modification of Permit 1094-Washington Department of Fish and Wildlife’s Section 10(a)(1)(A) Research and Enhancement Permit for the Hatchery Steelhead Supplementation Program in the Upper Columbia River Steelhead ESU
NWPPC, “Artificial Production Review”, November 1999

NMFS. 2002. Biological Opinion on the Effects of the Chief Joseph Dam Tailrace Fishery from 2002 Through 2012, as Described in the Colville Confederated Tribes’ Fishery Management Plan on Salmon and Steelhead Listed under the Endangered Species Act.

Peterson, K. and Truscott, K. 2001. Second Draft Year 2001 Upper Columbia River Salmon and Steelhead Broodstock Objectives and Site-Based Broodstock Collection Protocols; memo to Mid-Columbia Coordinating Committee

Peck, L., “Integrated Hatchery Operations Team – Operation Plans for Anadromous Fish Production Facilities in the Columbia River Basin, Volume IV, Priest Rapids Salmon Hatchery” April 1993; DOE/BP-60629-3

Smith, S. 2001. Draft Strategic Options for Okanogan Summer/Fall Chinook, attachment to Memo of June 8, 2001 from Joe Peone to Columbia Basin Fish Managers.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by:  Date: May 12, 2004

[SumFallHGMP404]

APPENDICIES

APPENDIX A: OKANOGAN SUMMER/FALL CHINOOK BROODSTOCK COLLECTION PROTOCOL

EXISTING PROTOCOL:

Early-arriving, summer/fall Chinook broodstock for the Okanogan and Methow subbasins is collected each year from the run at large reaching Wells Dam. Trapping in the Wells Dam east ladder begins on July 10th and ends on August 28th. Trapping occurs 3 days/week. Trapping occurs 16 hours per day with fish removed from the traps upon entry. The program collects 556 fish; achieves a 1 to 1 female to male ratio; assumes a 90% pre-spawn survival rate; assumes 5,000 eggs/female; assumes an egg to release survival rate of 78%; and achieves a program objective of 976,000 yearling smolts (Peterson and Truscott 2001).

No more than 20% of the adult run is collected based on counts at Rocky Reach Dam. If cumulative adult counts at Rocky Reach Dam are less than 40% of the 10-year average, then broodstock collection ceases unit the 40% escapement level has been reached. All collection occurs in the eastbank ladder trap with the west ladder only used if difficulties are encounter in the eastbank ladder. All Chinook collected at Wells Dam are differentially marked to distinguish them from those collected at Wells Hatchery (Brown, 2001).

Equal numbers of males and females are collected. Jack Chinook are collected in proportion to the run-at-large. The broodstock collection protocols are reviewed annually (Brown, 2001).

A primary consideration in broodstock collection is achieving a minimum natural escapement of 2,000 adults and jacks past Wells Dam, with an emphasis on meeting a 3,500 fish escapement level. In low run years, hatchery programs are reduced or deferred to increase escapement. The order of elimination in hatchery programs is 1) Wells sub-yearlings, 2) Wells yearlings, 3) the Carlton (Methow) and Similkameen (Okanogan) programs. In low run years, escapement to Wells Hatchery can be used in the Okanogan program (Brown, 2001).

There is currently no broodstock collection of later-arriving summer/fall Chinook.

Future Broodstock Protocols for Summer/Fall Chinook:

WDFW and the Colville Tribes have agreed that the Upper Columbia River Summer/Fall Chinook in the Okanogan River should be managed as a single population and broodstock, but recognizing the full continuum in run timing and spawn timing from the upper to lower Okanogan River. Progeny will be acclimated at sites from the upper basin to lower river based on parental spawn timing. The following protocol is based on broodstock collection continuing at Wells Dam (the contingency plan) as it best highlights the differences with current procedures. A similar protocol will be developed and included in this HGMP based on using the live-capture fishing gear once more is known about its success and attributes at various fishing sites. For example, dates of fish collection for each program component will need to be adjusted based on the migration timing and fishing success at various collection sites.

Under the contingency protocol:

1) Broodstock for the current 576,000 yearling program of early-arriving summer/fall Chinook for the Okanogan subbasin would be collected at Wells Dam as is the current practice, from July 10th until August 28th. These fish would be held, spawned, and progeny reared at Eastbank Hatchery. These fish would be acclimated and released from the uppermost acclimation ponds on the Similkameen and Okanogan rivers. These same procedures would be used to collect the broodstock needed for the 400,000 yearling program in the Methow subbasin.
2) Broodstock for the new 500,000 yearling and sub-yearling program of early-arriving summer/fall Chinook for release at Chief Joseph Dam Hatchery would also be collected at Wells Dam from July 10th until August 28th. These fish would be held, spawned, and progeny reared at Chief Joseph Dam Hatchery.
3) For the new 400,000 yearling program acclimated at Riverside Pond, broodstock would be collected at Wells Dam from mid-August through mid-September. These fish would be held, spawned, incubated, and reared at Chief Joseph Dam Hatchery.
4) Broodstock for the new 1.1 million yearling and sub-yearling program of later-arriving summer/fall Chinook would be collected at Wells Dam from August 29th through mid-November. These fish would be held and spawned at Chief Joseph Dam Hatchery. Progeny rearing would occur at the hatchery and later acclimated and released onsite and at Omak Pond.
5) Once all of the broodstock are transported to Chief Joseph Dam Hatchery, spawning will occur as they ripen. The earliest ripening fish will be used to supply the hatchery release of 500,000 (per # 2), irregardless of when the broodstock were collected. The next ripening fish will be used to supply the eggs for the Riverside Pond release of 400,000 (per # 3), irregardless of when they were collected. And finally, the last ripening fish will supply the 1.1 million fish (per # 4) for Omak Pond and hatchery releases.

Until capabilities are developed for broodstock collection in the Okanogan River and in the Columbia River near the confluence of the Okanogan River, summer/fall Chinook

broodstock for the Okanogan subbasin will be collected each year as generally specified in the contingency protocol. Dates and times of collection will remain as currently specified. The new broodstock objective will increase to 1,070 fish to achieve a total program of 1,876,000 yearlings and subyearlings for both the Okanogan and Methow Rivers.

In many years, temperature barriers form in the Okanogan River causing summer/fall Chinook to hold in Wells Pool prior to migrating upstream to spawning areas. This phenomenon could complicate the planned capture of recently arriving Chinook through the summer and fall months that would ensure proportionate broodstock collection from throughout the run. Testing and deployment of live-capture gear below the adult holding areas off the mouth of the Okanogan River will be necessary to ensure proper broodstock collection protocols.

Once the collection efficiency for the live-capture fishing gear is known, then protocol details can be developed. In addition to the number of fish collected throughout the run, the new collection protocol will specify the days of the week, hours/day, female:male ratio, and safe handling and transportation procedures.

The collection of early-arriving summer/fall Chinook broodstock must be based on the run size at Wells Dam. The run at Rocky Reach Dam (Table A.1) is also critical as it provides an estimate of the anticipated run at Wells Dam (Table A.2).

Table A.1. Counts of Early-Arriving Summer/Fall Chinook at Rocky Reach Dam 1980-2001

Year	Summer Chinook - Adult	Summer Chinook – Jack	Total
2001	45,085	9,298	54,383
2000	14,633	4,198	18,831
1999	10,536	1,140	11,676
1998	6,706	326	7,032
1997	5,614	694	6,308
1996	5,006	224	5,230
1995	4,452	252	4,704
1994	5,789	387	6,176
1993	4,618	225	4,843
1992	2,059	951	3,010
1991	2,985	289	3,274
1990	4,089	272	4,361
1989	4,720	218	4,938
1988	3,245	447	3,692
1987	3,570	489	4,059
1986	4,833	579	5,412
1985	5,320	592	5,912
1984	5,463	838	6,301
1983	2,407	756	3,163
1982	2,474	1,037	3,511
1981	4,112	624	4,736
1980	4,959	1,109	6,068
22-yr average	6,940	1,134	8074
22-yr median	4,776	586	5,321
22-yr range	2,059 - 45,085	218 – 9,298	3,010 – 54,383

Table A.2 Counts of Early-Arriving Summer/Fall Chinook at Wells Dam 1980-2001

Year	Summer Chinook Adult	% Rocky Reach Count	Summer Chinook Jack	Total Run
2001	33,244	74	4,882	38,126
2000	6,447	44	3,709	10,156
1999	7,335	70	541	7,876
1998	3,237	48	733	3,970
1997	2,570	46	153	2,723
1996	2,225	44	165	2,390
1995	2,767	62	289	3,056
1994	4,613	80	378	4,991
1993	3,404	74	170	3,574
1992	1,343	65	631	1,974
1991	1,774	59	270	2,044
1990	3,207	78	217	3,424
1989	3,115	66	223	3,338
1988	2,411	74	360	2,771
1987	2,790	78	347	3,137
1986	3,787	78	515	4,302
1985	4,018	76	499	4,517
1984	4,768	87	1,173	5,941
1983	2,002	83	819	2,821
1982	2,223	90	1,126	3,349
1981	3,141	76	1,135	4,276
1980	3,910	79	982	4,892
22-yr average	4,742	70	878	5,620
22-yr median	3,272	74	507	3,499
22-yr range	1,343 – 33,244	44 – 90	153 – 4,882	1,974 – 38,126

Escapement goal for early-arriving summer/fall Chinook past Wells Dam:	3,500
Broodstock objective at and above Wells Dam:	1,070
Total	4,570

In the event of insufficient early-arriving summer/fall Chinook broodstock, the program priority will be: 1) Similkameen Pond – 376,000 yearlings; Methow Program – 200,000 yearlings, 2) Bonaparte Pond – 200,000 yearlings; Methow Program – 200,000 yearlings, 3) Riverside Pond – 200,000 yearlings, 4) Chief Joseph Dam Hatchery – 200,000 yearlings, 5) Riverside Pond 200,000 yearlings, 6) Chief Joseph Dam Hatchery – 100,000 yearlings 7) Chief Joseph Dam Hatchery 200,000 subyearlings.

The number of broodstock that should be collected must be based on the anticipated escapement past Wells Dam. The management objective is to fully seed the available habitat in the Okanogan and Methow rivers (currently 3,500 adults) while spreading the risk of low population productivity and survival of this ESU between natural and hatchery production. These Chinook populations are located above nine dams and face substantial, cumulative passage mortalities. Additionally, the Okanogan population faces the threat of catastrophic mortality due to excessive water temperatures. Therefore, the higher productivity of hatchery populations as a means to minimize risks of population failure is factored into the broodstock collection protocol provided in Table A.3.

Table A.3. Priority of Broodstock Collection for Early-Arriving Summer/Fall Chinook at Wells Dam.

Anticipated Count of Early-Arriving Summer/Fall Chinook at Wells Dam	Maximum Broodstock Collection	Programs * Implemented
<2,000	328	#1
2,000 – 2,500	556	#1 and #2
2,501 – 3,500	670	#1 - #3
3,501 – 4,000	898	#1 - #5
4,001 – 5,000	955	#1 - #6
> 5,000	1,070	#1 - #7

* see Okanogan/Methow program priority listing above

Collection of broodstock at Wells Dam must initially be based on counts of early-arriving summer/fall Chinook at Rocky Reach Dam. However since 1990, the Wells Dam count has varied significantly, from 44% to 80%, of the Rocky Reach Dam count. Fishery managers collecting broodstock at Wells Dam will need to be cognizant of the cumulative counts at Rocky Reach Dam to follow collection protocols. Collection of broodstock above Wells Dam using live-capture fishing gear will have the benefit of the more pertinent Wells Dam counts.

All hatchery-origin summer/fall Chinook escaping to Wells Dam will be adipose fin clipped, whereas natural-origin fish will be unmarked. Natural-origin Chinook must be integrated into the hatchery broodstock to ensure that the hatchery fish are not allowed to genetically diverge from the naturally spawning fish. Integration of natural-origin fish is also important to prevent long-term domestication of the broodstock.

From 1998-2002 the proportion of hatchery-origin fish spawning in the Similkameen River has averaged 57% (range 41-70%), while in the Okanogan River, hatchery-origin fish have averaged 51% of the natural spawners (range 33-61%). In both rivers, the proportion of hatchery-origin spawners increases with increasing escapement. This information is important is establishing protocols for broodstock collection.

In collecting broodstock, up to 100% of broodstock should be unmarked, natural-origin fish. However, not more than 20% of the natural-origin run should be collected for broodstock (Table A.4).

Table A.4. Proportion of Natural-Origin, Early-Arriving Summer/Fall Chinook in Hatchery Broodstocks.

Anticipated Count of Early-Arriving Summer/Fall Chinook at Wells Dam	Max. % of Broodstock Natural-Origin	Max. % of Natural Origin Fish in Broodstock
< 2 ,000	50%	20%
2,000 - 5,000	75%	20%
> 5,000	100%	20%

Jack Chinook are collected in proportion to the run-at-large. The broodstock collection protocols will be reviewed annually.

The additional broodstock for the new, later-arriving summer/fall Chinook program will be collected using live-capture fishing gear or collected at Wells Dam's eastbank ladder trap from August 29th through mid-November. Fish will be taken equally from throughout the run, with an equal collection of males and females. The broodstock collection objective will be 616 adults to achieve a total program goal of 600,000 yearlings and 500,000 subyearlings.

The collection of later-arriving Chinook broodstock must be based on the runs size at Wells Dam (Table A.5). The run at Rocky Reach Dam (Table A.6) is also critical as it provides an estimate of the anticipated run at Wells Dam.

Table A.5. Counts of Later-Arriving Summer/Fall Chinook at Wells Dam 1990-2001

Year	Chinook Adult	% Rocky Reach Count	Chinook Jack	Total Run
2001	6,928	76	2,672	9,600
2000	2,211	38	1,206	3,417
1999	1,925	35	631	2,556
1998	1,047	37	158	1,205
1997	611	25	156	767
1996	707	20	210	917
1995	1,007	27	175	1,182
1994	2,462	55	555	3,017
1993	1,061	52	160	1,221
1992	770	52	747	1,517
1991	577	43	272	849
1990	592	30	149	741
12-yr average	1,658	41	591	2,249
12-yr median	1,054	38	241	1,213
12-yr range	577 – 6,928	20 – 76	149 – 2,672	741 – 9,600

Table A.6. Counts of Later-Arriving Summer/Fall Chinook at Rocky Reach Dam 1990-2001

Year	Chinook – Adult	Chinook – Jack	Total
2001	9,072	3,956	13,028
2000	5,770	1,364	7,134
1999	5,492	4,090	9,582
1998	2,824	412	3,236
1997	2,412	766	3,178
1996	3,453	545	3,998
1995	3,722	940	4,662
1994	4,485	1,043	5,528
1993	2,051	272	2,323
1992	1,489	1,170	2,659
1991	1,341	739	2,080
1990	1,942	839	2,781
12-yr average	3,671	1,345	5,016
12-yr median	3,138	890	3,617
12-yr range	1,341 – 9,072	272 – 3,956	2,080 – 13,028

Interim escapement goal for later-arriving summer/fall Chinook past Wells Dam:	1,200
Broodstock objective at Wells Dam:	616
Total	1,816

In the event of insufficient later-arriving summer/fall Chinook broodstock, the program priority will be: 1) Omak Pond – 200,000 yearlings, 2) Chief Joseph Dam Hatchery – 200,000 yearlings, 3) Omak Pond – 200,000 more yearlings, 4) Omak Pond – 300,000 subyearlings, 5) Chief Joseph Dam Hatchery – 200,000 subyearlings.

The number of broodstock that should be collected must be based on the anticipated escapement past Wells Dam. The management objective is to fully seed the available habitat in the Okanogan, Methow and Columbia rivers while spreading the risk of low population productivity and survival of this ESU between natural and hatchery production. However, the habitat capacity and corresponding escapement needs are unknown and will be the subject of upcoming monitoring and evaluation program. At this time, an escapement objective for later-arriving summer/fall Chinook above Wells Dam is assumed to be 1,200. These Chinook populations are located above nine dams and face substantial, cumulative passage mortalities. Therefore, the higher productivity of hatchery populations as a means to minimize risks of population failure is factored into the broodstock collection protocol indicated in Table A.7.

Table A.7. Priority of Broodstock Collection for Later-Arriving Summer/Fall Chinook at Wells Dam.

Anticipated Count of Later-Arriving Summer/Fall Chinook at Wells Dam	Maximum Broodstock Collection	Programs * Implemented
<1,000	228	#1 and #2
1,000 – 1,500	342	#1 - #3
1,501 – 2,000	506	#1 - #4
> 2,000	616	#1 - #5

* see Okanogan/Columbia program priority listing above

Collection of broodstock at Wells Dam must initially be based on counts of later-arriving summer/fall Chinook at Rocky Reach Dam. However since 1990, the Wells Dam count has varied significantly, from 20% to 76%, of the Rocky Reach Dam count. Fishery managers collecting broodstock at Wells Dam will need to be cognizant of the cumulative counts at Rocky Reach Dam to follow collection protocols. Use of live-capture fishing gear above Wells Dam can be guided by that dam's Chinook counts.

As with the early-arriving fish, the broodstock for the later-arriving summer/fall Chinook must also be managed for natural-origin fish as indicated in Table A.8. All hatchery-origin summer/fall Chinook escaping to Wells Dam will be adipose fin clipped, whereas natural-origin fish will be unmarked. Natural-origin Chinook must be integrated into the hatchery broodstock to ensure that the hatchery fish are not allowed to genetically diverge from the naturally spawning fish. Integration of natural-origin fish is also important to prevent long-term domestication of the broodstock.

Table A.8. Proportion of Natural-Origin, Later-Arriving Summer/Fall Chinook in Hatchery Broodstock .

Anticipated Count of Later-Arriving Summer/Fall Chinook at Wells Dam	Max. % of Broodstock Natural-Origin	Max. % of Natural Origin Fish in Broodstock
< 2,000	50%	20%
2,000 - 3,000	75%	20%
>3,000	100%	20%

Jack Chinook are collected in proportion to the run-at-large. The broodstock collection protocols will be reviewed annually.

APPENDIX B: OKANOGAN & COLUMBIA RIVERS SUMMER/FALL CHINOOK HARVEST PLAN

EXISTING HARVEST MANAGEMENT

Harvest of summer/fall Chinook is premised on an escapement objective of 3,500 fish. Based on Chinook passing Wells Dam from 1990 – 2001, the later-arriving component of this run has averaged 24.5% of the total summer/fall Chinook run (median of 24%).

Tribal Ceremonial & Subsistence Fishery

The Colville Confederated Tribes manage a C&S fishery in the tailrace immediately below Chief Joseph Dam. The fishery uses hook-and-line gear to snag UCR Summer/Fall Chinook. UCR steelhead are caught incidentally. Historically the fishery commenced on July 1 and ended no later than September 30. The fishery is designed to harvest summer/fall Chinook in excess of the current escapement objective, 3,500 fish. Incidental harvest of steelhead is restricted under regulation of the Endangered Species Act. In 2001, steelhead mortality was limited to 200 fish.

Starting in 2002, the fishery can be extended in time, to October 31, and in location, downriver 12 miles to the confluence of the Okanogan River. Mortality of hatchery-origin and natural-origin steelhead is each specified as a percentage of the run over Wells Dam (CCT 2002).

Because the tailrace fishery is located in a terminal site and uses hook-and-line gear, it has very limited capacity to harvest large numbers of Chinook surplus to escapement needs. From 1980 – 2000, the fishery harvested 200 – 1,100 summer/fall Chinook and 12 – 819 steelhead. Even with the extraordinary, record run of summer/fall Chinook past Wells Dam of 47, 700 in 2001, the Tribes' harvest was estimated at only 3,400 Chinook.

Recreational Fishery

Recreational fisheries for summer/fall Chinook in the Okanogan and upper Columbia rivers are opened when forecasted runs of summer Chinook indicate a significant surplus to broodstock and escapement needs. A surplus is calculated as the anticipated run at Priest Rapids Dam less 5,750 fish required for broodstock at hatchery programs upstream of the Dam, less 2.5% of the Priest Rapids count for lower-river recreational fisheries, less 5% harvest by the Wanapum Tribe, less an allocation for natural escapement in the Wenatchee, Methow, Similkameen, Okanogan, Entiat, and Chelan rivers. As escapement goals for each of these rivers has not yet been established, WDFW has conservatively used the sum of the maximum annual escapements to each river for 1996-2000, about

11,000 fish at Priest Rapids Dam as the limitation on recreational fisheries.

The recreational fishery in and about the Okanogan River has been very infrequent due to the consistently poor runs of summer Chinook until recent years. Anglers are allowed to harvest hatchery-origin and natural-origin Chinook.

FUTURE HARVEST MANAGEMENT

Future harvest management of UCR summer/fall Chinook will be based on the principles of 1) ensuring adequate natural escapement of UCR summer/fall Chinook, 2) ensuring recovery and adequate natural escapement of UCR steelhead, 3) ensuring broodstock collection for summer/fall Chinook propagation programs, 4) ensuring broodstock collection for UCR steelhead propagation programs, 5) ensuring only minimal, incidental take of UCR spring Chinook, 6) providing at least a minimal C&S fishing opportunity for tribal members, 7) sharing of surplus hatchery-origin Chinook between tribal and recreational fisheries, and 8) developing fishery capacity in strong run years to harvest significant surpluses of hatchery-origin Chinook and even natural-origin fish when appropriate. Harvest of surplus, hatchery-origin UCR steelhead would be expected to increase substantially in strong run years with recovery of the natural-origin population and elimination of restrictions from its ESA-listing.

The tribes and WDFW anticipate implementing a substantial M&E program associated with these propagation programs and fisheries. Information derived from this M&E will undoubtedly improve the knowledge of spawning and rearing habitat capacity, leading to revised escapement objectives. New management guidelines for these fisheries will then be necessary.

Early-Arriving Summer/Fall Chinook:

With implementation of the additional Integrated Recovery and Integrated Harvest Programs, returns of hatchery-origin, early-arriving summer/fall Chinook above Wells Dam would be expected to increase by approximately 3,000 – 15,000 depending on brood-year survival. Later, natural-origin runs of summer Chinook should increase significantly with increased abundance and distribution of natural spawning fish.

A 2001 sample of the tribes' tailrace summer/fall Chinook harvest showed 71% adipose fin clipped, hatchery-origin Chinook in the catch. The 2001 WDFW spawning ground counts in the Okanogan and Similkameen rivers showed 978/1598 = 61% were adipose fin clipped, indicating hatchery-origin fish. For this conceptual harvest plan the early-arriving summer/fall Chinook run is assumed to be 60:40 hatchery:natural origin.

Table B.1. Counts of Early-Arriving Summer/Fall Chinook at Wells Dam 1980-2002

Year	Chinook Adult	% Rocky Reach Count	Chinook Jack	Total Run
2002	62,595	86	412	63,007
2001	33,244	74	4,882	38,126
2000	6,447	44	3,709	10,156
1999	7,335	70	541	7,876
1998	3,237	48	733	3,970
1997	2,570	46	153	2,723
1996	2,225	44	165	2,390
1995	2,767	62	289	3,056
1994	4,613	80	378	4,991
1993	3,404	74	170	3,574
1992	1,343	65	631	1,974
1991	1,774	59	270	2,044
1990	3,207	78	217	3,424
1989	3,115	66	223	3,338
1988	2,411	74	360	2,771
1987	2,790	78	347	3,137
1986	3,787	78	515	4,302
1985	4,018	76	499	4,517
1984	4,768	87	1,173	5,941
1983	2,002	83	819	2,821
1982	2,223	90	1,126	3,349
1981	3,141	76	1,135	4,276
1980	3,910	79	982	4,892
23-yr average	7,257	70	857	8,115
23-yr median	3,207	74	499	3,574
23-yr range	1,343 – 62,595	44 – 90	153 – 4,882	1,974 – 63,007

Table B.2 Broodstock Needs for Early-Arriving Summer/Fall Chinook

Wells Dam Count Early-Arriving Chinook	Maximum Broodstock Collection
<2,000	328
2,000 – 2,500	556
2,501 – 3,500	670
3,501 – 4,000	898
4,001 – 5,000	955
> 5,000	1070

Later-Arriving Summer/Fall Chinook:

With implementation of the additional Integrated Recovery and Integrated Harvest Programs, returns of hatchery-origin, later-arriving summer/fall Chinook above Wells Dam would be expected to increase by approximately 3,000 – 14,000 depending on brood-year survival. Later, natural-origin runs of later-arriving Chinook should increase significantly with increased abundance and distribution of natural spawning fish.

Table B.3 Counts of Later-Arriving Summer/Fall Chinook at Wells Dam 1990-2002

Year	Fall Chinook Adult	% Rocky Reach Count	Fall Chinook Jack	Total Run
2002	6,241	55	231	6,472
2001	6,928	76	2,672	9,600
2000	2,211	38	1,206	3,417
1999	1,925	35	631	2,556
1998	1,047	37	158	1,205
1997	611	25	156	767
1996	707	20	210	917
1995	1,007	27	175	1,182
1994	2,462	55	555	3,017
1993	1,061	52	160	1,221
1992	770	52	747	1,517
1991	577	43	272	849
1990	592	30	149	741
13-yr average	2,010	42	563	2,574
13-yr median	1,047	38	231	1,221
13-yr range	577 – 6,928	20 – 76	149 – 2,672	741 – 9,600

Table B.4. Broodstock Needs for Later-Arriving Summer/Fall Chinook

Wells Dam Count Fall Chinook	Maximum Broodstock Collection
<1,000	228
1,000 – 1,500	342
1,501 – 2,000	506
> 2,000	616

Tribal Ceremonial & Subsistence Fishery

The Tribe has proposed testing and deploying live-capture, selective fishing gear in the Okanogan River and in the Columbia River from the Okanogan River upstream to Chief Joseph Dam to supplement the tailrace fishery. The intent of these new, selective fisheries is to harvest a greater portion of the surplus hatchery-origin summer/fall Chinook to rebuild the ceremonial and subsistence fishing. This fishery would complement the Integrated Recovery and Integrated Harvest programs contained in this HGMP by minimizing harvest of natural-origin fish at low to medium run sizes and targeting harvest on marked, hatchery-origin fish surplus to escapement and broodstock requirements.

With the summer/fall Chinook propagation programs in operation, the tribes intend on 1) continuing their hook-and-line tailrace fishery immediately below Chief Joseph Dam from July 1 to October 31, 2) initiating a live-capture, selective fishery from Chief Joseph Dam downstream to the area of the Okanogan River confluence from July 1 to October 31, and 3) initiating a live-capture, selective fishery in the upper Okanogan River from July 1 to September 30 and in the lower Okanogan River from July 1 to October 15. These C&S fisheries will be regulated in cooperation with recreational fisheries, also targeting selectively on hatchery-origin Chinook.

The Colville Tribes intend to pursue development with the federal government of in-lieu fishing sites in waters adjoining the Reservation and ceded lands, including the Okanogan River upstream to Zosel Dam. These sites would provide tribal members access to fishing waters and include facilities related to the conduct of their ceremonial and subsistence fisheries in accord with the guidelines in this HGMP.

The three tribal C&S fisheries will be managed based on the following guidance:

Table B.5 Tribal Incidental Take Thresholds for ESA-Listed Upper Columbia River Steelhead*

Steelhead Count Wells Dam	Maximum CCT Take Hatchery-origin	Maximum CCT Take Natural-origin
< 1,000	3%	1%
1001 – 2,000	5%	1%
2,001 – 3,000	7%	2%
3,001 – 5,000	15%	3%
5,001 – 10,000	30%	5%
10,001 -	50%	10%

* see CCT 2001

Table B.6. Tribal Harvest Thresholds for Upper Columbia River Summer/Fall Chinook (Early-Arriving Run)

Wells Dam Chinook Count July 1 – Aug 28**	Max. CCT Harvest Hatchery-Origin Chinook	Max. CCT Harvest Natural-Origin Chinook
< 2,000 *	100	20
2,000 – 3,000 *	300	40
3,001 – 4,000	500	40
4,001 – 5,000	600	40
5,001 – 6,000	800	100
6,001 – 8,000	2,500	300
8,000 – 10,000	3,000	500
10,001 – 20,000	4,500	2,400
20,001 – 30,000	9,500	4,400
30,001 – 40,000	13,500	8,400

* Tailrace fishery only
** Assumes 40% of run is natural-origin fish

Table B.7. Tribal Harvest Thresholds for Upper Columbia River Summer/Fall Chinook (Later-Arriving Run)

Wells Dam Chinook Count Aug 29 – Nov 30**	Max. CCT Harvest Hatchery-Origin Chinook	Max. CCT Harvest Natural-Origin Chinook
< 1,000 *	0	0
1,000 – 2,000 *	100	10
2,001 – 3,000	700	200
3,001 – 5,000	1,600	400
5,001 – 7,000	2,000	1,000
7,001 – 10,000	3,000	1,700

* Tailrace fishery only
** Assumes 40% of run is natural-origin

Recreational Fishery

The recreational fishery would be closed in years of lower runs of summer/fall Chinook (< 8,000), deferring to natural escapement, broodstock needs, and to a minimal tribal C&S fishery. In medium run years, the tribal C&S and recreational fisheries would share in the harvestable surplus of hatchery-origin fish. In higher run years both tribal and recreational fisheries will be managed to also allow harvest of natural-origin fish that are

in excess of broodstock needs, are in excess of natural spawning escapement goals, and are not needed to ensure the proportion of hatchery-origin fish is too high in the naturally spawning population.

Table B.8 Harvest Thresholds for Upper Columbia River Summer/Fall Chinook (Early-Arriving Run)

Wells Dam Chinook Count July 1 – Aug 28*	Max. Recreational Harvest Hatchery-Origin Chinook	Max. Recreational Harvest Natural-Origin Chinook
< 8,000	0	0
8,000 – 10,000	1,000	0
10,001 – 20,000	3,000	0
20,001 – 30,000	4,000	1,000
30,001 – 40,000	6,000	1,000

* Assumes 40% of run is natural-origin fish

Table B.9 Harvest Thresholds for Upper Columbia River Summer/Fall Chinook (Later-Arriving Run)

Wells Dam Chinook Count Aug 29 – Nov 30*	Max. Recreational Harvest Hatchery-Origin Chinook	Max. Recreational Harvest Natural-Origin Chinook
< 5,000	0	0
5,001 – 7,000	800	200
7,001 – 10,000	1,300	200

* Assumes 40% of run is natural-origin

Selective, recreational fisheries for UCR Steelhead are currently managed by WDFW through an ESA Section 10 hatchery permit to control the excessive escapement of hatchery-origin fish. The selective fishery is designed to assist the hatchery enhancement program in improving the abundance and viability of the naturally spawning steelhead population.

APPENDIX C: CONSISTENCY WITH THE NORTHWEST POWER & CONSERVATION COUNCIL'S 10 POLICIES TO GUIDE USE OF ARTIFICIAL PRODUCTION

INTRODUCTION:

In October 1999, the Northwest Power and Conservation Council issued its report, Artificial Production Review, in response to a Congressional directive to review artificial production programs in the Columbia River Basin and recommend policies for future operations. In its report, the Council recommended 10 policies to guide use of artificial production. In this appendix, the production programs described in this HGMP are compared against the Council's recommended policies. This comparison is provided to assist the Council in it review of this HGMP and the Chief Joseph Dam Hatchery Master Plan.

PROGRAM AND POLICY COMPARISION:

COUNCIL POLICY #1: The purpose and use of artificial production must be considered in the context of the environment in which it is used.

To achieve healthy populations of naturally spawning summer/fall Chinook, tribal ceremonial and subsistence fisheries, and recreational fisheries in the Okanogan and upper Columbia rivers, the alterations to the riverine environment must be fully considered. The habitat and fisheries addressed by this HGMP occur above nine mainstem, hydroelectric dams through which both juvenile and adult Chinook must pass. The cumulative losses during these migrations are the predominate factor affecting the viability of these Columbia Cascade Province resources and fisheries. Additionally the construction of Grand Coulee and Chief Joseph Dams have inundated and blocked much of the historical summer/fall Chinook habitat and tribal fishing sites. In the recent past, ocean and lower river fisheries have also exacted a heavy mortality on the Okanogan Chinook.

In the past two decades, fish passage losses and fishing mortalities have been significantly reduced. However, passage through the hydroelectric system still takes over 50% of the out-migrating juvenile Chinook and over 10% of the returning adults. Recent conditions have shown that under optimal freshwater and especially ocean conditions, the Okanogan summer/fall Chinook population can be productive. But, with poor freshwater conditions and in poor ocean productivity conditions, the population is not sustainable and cannot support even minimal C&S fisheries.

Given the substantial range in survival rates caused by natural variations in the freshwater and marine environments, the ongoing cumulative hydrosystem losses, and the permanent

loss of habitat above Chief Joseph Dam, this summer/fall Chinook management plan is designed to provide stability to the tribes' C&S fisheries and support the natural spawning population when environmental conditions are less than optimal.

COUNCIL POLICY #2: Artificial production remains experimental. Adaptive management practices that evaluate benefits and address scientific uncertainties are critical.

This HGMP includes a comprehensive set of performance standards and performance measures to which a full monitoring and evaluation program is being designed and implemented. This M&E program will provide the information necessary to evaluate plan benefits and risks, and allow alterations as needed based on regular reviews of M&E data. This plan also allows the added flexibility to shift production (both short-term and long-term) between release sites on the Okanogan River and below Chief Joseph Dam to optimize conservation and harvest benefits, and minimize risks.

COUNCIL POLICY #3: Artificial production programs must recognize the regional and global environmental factors that constrain fish survival.

Chinook survival into the Columbia Cascade Province is highly variable due to freshwater and marine conditions. But, survival is also significantly depressed annually due to effects of adult and juvenile passage through nine dams. The numbers of artificially produced Chinook, flexibility in release sites, and the selective harvest scheme proposed in this HGMP allow adjustments in response to changing survival rates to cost-effectively achieve harvest and conservation benefits while minimizing risks.

COUNCIL POLICY #4: Species diversity must be maintained to sustain populations in the face of environmental variation.

This HGMP proposes several actions to improve species diversity. First, a local broodstock, derived from the Okanogan River Chinook, will be used rather than an aggregate broodstock collected at Wells Dam. Second, broodstock will be collected from throughout the run, mid-July through mid-November rather than just through the end of August. Third, a significant portion of the juveniles released, will be 0-aged to mimic natural life-history characteristics. Finally, the HGMP's selective harvest scheme will limit the number of hatchery-origin adults on the spawning grounds, allowing the natural population to be perpetuated by mostly natural-origin fish compared to current levels, up to 74%, of hatchery-origin fish in the spawning population.

COUNCIL POLICY #5: Naturally spawning populations should be the model for artificially reared populations.

The HGMP implements several actions to support the integrity of, and mimic the natural-origin population. First, the production program includes significant production and release of 0-age Chinook (the natural life-history characteristic) to evaluate their success and attributes against the release of yearling smolts that have historically survived better

through the hydroelectric system. Second, acclimation and release sites are planned to restore spawning distribution to historical habitats. Third, the hatchery broodstock will consist of fish from throughout the adult run with an initial emphasis on the later-arriving Chinook to restore their depleted numbers in historical habitats. Finally, the proportion of hatchery-origin Chinook allowed to spawn in the wild will be managed through selective harvest to help ensure the integrity of the natural population and allow it to adapt to its habitat.

COUNCIL POLICY #6: Fish managers must specify the purpose of each artificial production program in the basin.

The purpose of each release group of artificially produced Chinook in this HGMP is clearly described. Releases in the Okanogan River are to support an Integrated Recovery Program while those fish released below Chief Joseph Dam are to support an Integrated Harvest Program.

COUNCIL POLICY #7: Decisions about artificial production must be based on fish and wildlife goals, objectives, and strategies at the subbasin and basin levels.

The HGMP describes the purposes, goals, objectives, and strategies for complementary and integrated artificial production, natural production, and harvest programs. This HGMP is being integrated in subbasin planning and has been submitted to the Phase II/III HGMP production planning being led by NOAA Fisheries to coordinate integration of *U.S. v Oregon* production planning and ESA planning.

COUNCIL POLICY #8: Because artificial production poses risks, risk management strategies must be implemented.

Several risk management strategies are described in this HGMP. First, the HGMP describes actions to reduce the risks of the current hatchery program for Upper Columbia River Summer/Fall Chinook. The HGMP includes a comprehensive set of performance standards and measures to guide an M&E program to assess ongoing risks. The baseline M&E program is under development and has been approved for funding by BPA. A complementary hatchery evaluation program has been developed for implementation with the proposed Chief Joseph Dam Hatchery. The HGMP includes development of a live-capture fishing program to allow a highly adaptable, selective harvest of target species and hatchery-origin fish based on annual run composition. The Plan includes the ability to adjust production numbers, release sites, and terminal harvest rates to maximize conservation and harvest benefits and minimize risks to the natural population.

COUNCIL POLICY #9: Production for harvest is a legitimate management objective for artificial production. But harvest rates and practices must be dictated by the need to sustain naturally spawning populations.

The HGMP includes a unique harvest program that will rely largely on live-capture, selective fishing gear. Explicit protocols are included that base harvest on annual run

size, composition of hatchery-origin and natural-origin Chinook, and abundance of non-target species. Selective harvest will also be used to improve the viability of the naturally spawning population by controlling the proportion of hatchery-origin adults in the population.

COUNCIL POLICY #10: Federal and other legal mandates and obligations for fish protection, mitigation, and enhancement must be fully addressed.

The HGMP has been prepared in large part to restore the Colville Tribes' trust C&S fisheries. The HGMP has been crafted to be consistent with protection requirements of the Endangered Species Act – minimizing the direct and indirect take of listed species. Downstream harvest rates of *U.S. v Oregon* parties have been accounted for in sizing the production program and in estimating adult returns. The HGMP also links the need for increased Chinook production to achieve unfulfilled mitigation obligations arising from the construction and operation of the Federal Columbia River Power System.

APPENDIX D: CONSISTENCY WITH THE INDEPENDENT SCIENTIFIC ADVISORY BOARD'S 8 RECOMMENDATIONS ON SALMON AND STEELHEAD SUPPLEMENTATION

ISAB RECOMMENDATION #1: Only natural-origin adults should be used as broodstock.

The HGMP includes a broodstock protocol that specifies the proportion of natural-origin fish to be included for spawning. Up to 100% of the broodstock will be natural-origin fish depending on the size and composition of the run. At smaller run sizes, the Plan's overriding objective, however, will be to ensure sufficient natural-origin fish on the spawning grounds. See Tables 7 and 9 in Section 6.2.2.

ISAB RECOMMENDATION #2: Performance standards for natural-origin and hatchery origin adult abundance and per capita production rates should be established.

The performance standards and measurement indicators include per capita production rates (see section 1.9, Life-History Characteristics). The M&E program to be implemented with this program will include collection, analysis, and reporting of these data. Performance standards for the natural-origin population and each major production group (yearling and sub-yearling; early-arriving and later-arriving, Okanogan River releases and Columbia River releases) will be established.

ISAB RECOMMENDATION #3: All supplementation programs should be conducted within an explicit experimental design.

A comprehensive baseline M&E program addressing natural-origin and hatchery-origin summer/fall Chinook and other species in the Okanogan River has been approved for funding by BPA in FY 2004. An additional hatchery M&E program specific to the proposed new propagation programs has also been developed for implementation concurrent with the operation of the Chief Joseph Dam Hatchery.

a. Limits to the proportion of the adult natural population that can be collected as broodstock.

The HGMP includes specific protocols for limiting the number of natural-origin and hatchery-origin fish that can be collected for broodstock based on run size and composition. Production programs are prioritized for when broodstock collection must be restricted to protect the natural spawning population. See Tables 6 – 9 in Section 6.2.2.

b. Allowance for the numerical abundance of hatchery smolt releases to vary with environmental changes.

The fish production numbers can be flexed based upon several factors. First, the proportion of sub-yearling and yearling smolts released will be varied based on their relative survival, adult attributes, and effects on the naturally spawning population. The proportion of smolts released in the Okanogan River versus the Columbia River below Chief Joseph Dam will be altered based on M&E results to maximize program benefits and keep risks minimized. Also, as longer-term M&E results are obtained on survival rates and management objectives, the numbers of fish produced will be altered to ensure meeting the Plan's conservation and harvest goals. Finally, in the longer term, information being collected about physical and biological conditions in the ocean may be useful in predicting smolt-to-adult survival. If so, this information may be used to establish annual production numbers.

c. Operational guidelines and performance standards that respond to changes in the ratio of natural-origin and hatchery-origin adult abundance.

The HGMP includes protocols for managing production and selective harvest to ensure optimal levels of hatchery-origin fish on the spawning grounds. See Table 5 in Section 3.5.

d. Commitment to a specified monitoring and evaluation program that includes an unsupplemented reference population.

The programs in this HGMP affect a currently supplemented population. No unsupplemented, reference population of summer/fall Chinook exists in the immediate area. The Entiat River may be designated as a reference stream for the Columbia Cascade Province.

e. A schedule for annual reporting.

A schedule for annual reporting will be included in the M&E Program now being prepared. The Northwest Power and Conservation Council should also consider convening a regular hatchery performance review (3 or 5 year) for all propagation programs in the Columbia Basin.

ISAB RECOMMENDATION #4: Reference populations should be established as experimental controls.

The programs in this HGMP affect a currently supplemented population. No unsupplemented, reference population of summer/fall Chinook exists in the immediate area. The Entiat River may be designated as a reference stream for the Columbia Cascade Province. Unsupplemented populations have not been viable when located

above nine dams. Options for reference populations were also lost when so many were destroyed with the construction of Grand Coulee Dam.

ISAB RECOMMENDATION #5: Program plans should contain an objective means to assess when supplementation should be terminated.

The Colville Tribes anticipate many years of supplementation to restore the summer/fall Chinook throughout their historical habitats. During this time, information will be gathered to determine Chinook carrying capacity in the Okanogan and Columbia rivers. New escapement objectives, based on restored populations and habitats, will need to be calculated. At that time, supplementation to achieve the goals of the Integrated Recovery Program will be adjusted or terminated based on program evaluation. The HGMP also provides the option for the Tribes to switch production releases from the Okanogan River (the Integrated Recovery Program) to the terminal area below Chief Joseph Dam (Integrated Harvest Program).

ISAB RECOMMENDATION #6: Multiple supplementation projects across the Columbia River Basin should be coordinated so that in the aggregate they constitute a basinwide adaptive management experiment.

The Colville Tribes agree that supplementation needs to be thoroughly evaluated in a number of settings and for a number of species. The Tribes look to a comprehensive, basinwide M&E Plan to organize such an endeavor. The Tribes have supported use of the new DNA micro-satellite techniques to perform pedigree analyses to determine the relative reproductive success of hatchery-origin versus natural-origin fish. An opportunity to conduct this type of research on Upper Columbia River Steelhead has been created on the Colville Reservation in Omak Creek. BPA recently funded this research to evaluate the relative reproductive success of hatchery-origin, natural-origin, and reconditioned kelt steelhead. This summer/fall Chinook program does not offer the opportunity for conducting pedigree analysis research. Should the Tribes be successful in passing Chinook above Chief Joseph Dam via trap and haul, then an opportunity might exist to test relative reproductive success of summer/fall Chinook.

ISAB RECOMMENDATION #7: Supplementation projects should collect the data necessary to test their effectiveness.

The planned baseline and hatchery M&E programs will collect the information necessary to test the effectiveness of both the Integrated Recovery Program and the Integrated Harvest Program.

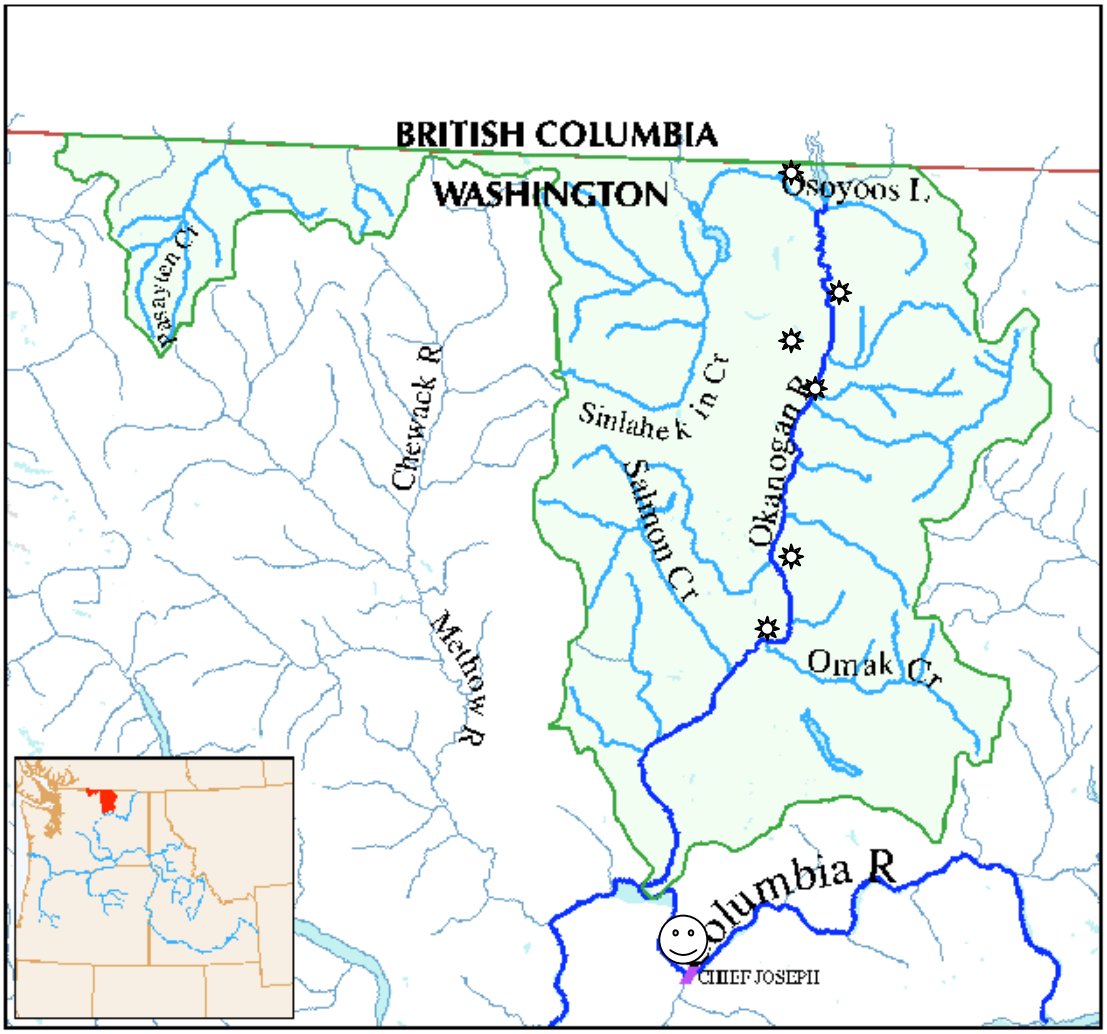
ISAB RECOMMENDATION #8: Supplementation should be used sparingly, focusing in areas where natural spawning populations are not replacing themselves, where habitat capacity is available to accommodate the additional production and where landscape conditions are suited to the experimental design.

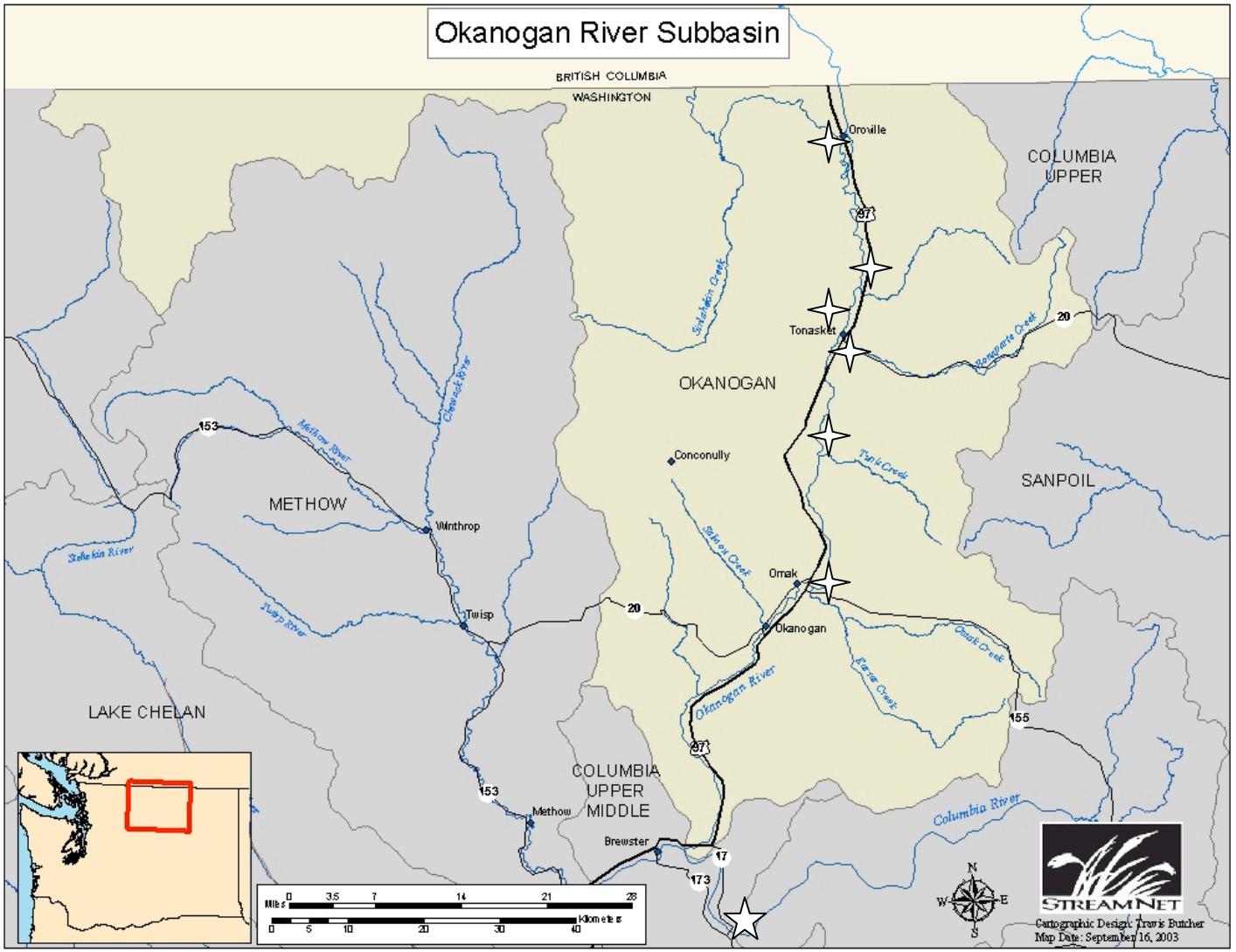
Until the last few years with improved ocean conditions, the Okanogan summer/fall Chinook population was depressed and not replacing itself. The natural population may still not be self-sustaining. Spawning fish are almost entirely distributed near the single acclimation pond in the upper subbasin and utilize other, historical habitat at very low densities. The spawning population is also at least half hatchery-origin fish. Because the Okanogan River is located above nine dams, has unused and underutilized historical spawning habitat and must support tribal C&S fisheries, it is an ideal location to apply supplementation.

Figure 1 Okanogan River Subbasin

☼ Location of existing and proposed acclimation sites

☺ Location of proposed Chief Joseph Dam Hatchery




Okanogan River Subbasin
BRITISH COLUMBIA
WASHINGTON
Oroville
COLUMBIA
UPPER
97
Tonasket
20
OKANOGAN
Conconully
SANPOIL
153
METHOW
Winthrop
Twisp
Omak
Okanogan
20
LAKE CHELAN
155
97
COLUMBIA
UPPER
MIDDLE
153
Methow
Brewster
17
173
Columbia River
Miles 0 3.5 7 14 21 28
Kilometers 0 5 10 20 30 40
N
W
E
S
STREAMNET
Cartographic Design: Travis Butcher
Map Date: September 16, 2003

APPENDIX E: ACRONYMS AND ABBREVIATIONS

ATP:	Adenosine Triphosphate
BAMP:	Biological Assessment and Management Plan – Mid-Columbia River Hatchery Program (April 1998)
BIOP:	Biological Opinion
BKD:	Bacterial Kidney Disease
BPA:	Bonneville Power Administration
BOR:	Bureau of Reclamation
C&S:	Ceremonial and Subsistence
CCT:	Colville Confederated Tribes
CFS:	Cubic Feet per Second
COE:	United States Army Corps of Engineers
Cu. Ft.:	Cubic Feet
ELISA:	Enzyme-Linked Immunosorbent Assay
ESA:	Endangered Species Act
ESU:	Evolutionarily Significant Unit
FPC:	Fish Passage Center
FPP:	Fish per Pound
FTE:	Full-Time Equivalents
Gpm:	Gallons per Minute
HGMP:	Hatchery and Genetic Management Plan
HxH:	Hatchery-Origin Fish Breeding with a Hatchery-Origin Fish
HxW:	Hatchery-Origin Fish Breeding with a Natural-Origin Fish
IHOT:	Integrated Hatchery Operations Team
INAD:	Investigational New Animal Drugs
ISAB:	Independent Scientific Advisory Board
M&E:	Monitoring and Evaluation
NMFS:	National Marine Fisheries Service; now designated National Oceanic and Atmospheric Administration – Fisheries
NRR:	Natural Return Rate
O&M:	Operation and Maintenance
OTID:	Oroville/Tonasket Irrigation District
PNFHPC:	Pacific Northwest Fish Health Protection Committee
PUD:	Public Utility District
Rkm:	River kilometer
Rm:	River Mile
RM&E:	Research Monitoring and Evaluation
UCR:	Upper Columbia River
USFWS:	United States Fish and Wildlife Service
WDFW:	Washington Department of Fish and Wildlife
WRIA:	Water Resource Inventory Area
WxW:	Natural-Origin Fish Breeding with a Natural-Origin Fish
ylng:	Yearling