HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	OKANOGAN BASIN SPRING CHINOOK
Species or Hatchery Stock:	SPRING CHINOOK
Agency/Operator:	COLVILLE CONFEDERATED TRIBES
Watershed and Region:	OKANOGAN
Date Submitted:	2004
Date Last Updated:	April 30, 2004

NOTE: This HGMP is currently under review by fishery co-managers.

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SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Phase I - Okanogan Basin Spring Chinook

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

Spring Chinook Salmon - *Oncorhynchus tshawytscha*
Phase I - Carson stock (ESA-unlisted)
Phase II - Methow Composite stock, (ESA-endangered species)

1.3) Responsible organization and individuals

Name (and title):	Joe Peone, Director F&W Department
Agency or Tribe:	Confederated Tribes of the Colville Reservation
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

U.S. Fish & Wildlife Service – operates fish production facilities supplying Chinook; cooperates in monitoring and evaluation, tribal trust responsibilities

Washington Department of Fish and Wildlife - cooperates in monitoring and evaluation; co-manages spring Chinook fishery

Grant County Public Utility District – potential funding partner
Chelan County Public Utility District – potential funding partner
Douglas County Public Utility District – potential funding partner

Bonneville Power Administration – provides funding, tribal trust responsibilities

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

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

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

Funding:

Grant PUD:	$ uncertain at this time
Douglas PUD:	$ uncertain at this time
Chelan PUD:	$ uncertain at this time
BPA:	$ uncertain at this time
USBOR:	$ uncertain at this time

Anticipated Staffing:

Propagation:	
Willard/Little White Salmon Hatchery:	FTE, USFWS
Leavenworth Hatchery:	FTE, USFWS
Chief Joseph Dam Hatchery:	FTE, CCT
Acclimation:	
St. Mary's Mission Pond:	FTE, CCT
Salmon Creek Ladder:	FTE, CCT
Ellisforde Pond:	FTE, CCT
Adult Collection:	
Leavenworth Hatchery:	FTE, USFWS
Future Okanogan Trapping:	FTE, CCT
M&E:	
BPA # 29033:	FTE, WDFW
	FTE, CCT
	FTE, USFWS

Anticipated Capital Costs:

The estimated capital costs of the separable spring Chinook facilities at Chief Joseph Dam Hatchery and for modification of two acclimation ponds are $5.6 million.

Anticipated Operational Costs:

Propagation:	
Willard/Little White Salmon Hatchery, Step A:	$325,000
Leavenworth Hatchery, Step A:	$ uncertain at this time
Chief Joseph Dam Hatchery, Step B:	$198,000
Acclimation:	
St. Mary's Mission Pond:	$4,700
Salmon Creek Ladder:	$3,000
Ellisforde Pond:	$18,600
Adult Collection:	
Leavenworth Hatchery:	$ uncertain at this time
Future Okanogan Trapping:	$

Monitoring & Evaluation:
BPA Project #29033: $162,000

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

Hatcheries:

Willard National Fish Hatchery – USFWS facility located on the Little White Salmon River at river mile 5.3 (rkm 8.5), near Stevenson, Washington.

Little White Salmon Hatchery - USFWS facility located on the Little White Salmon River at river mile 1.2 (rkm 2), near Stevenson, Washington.

Leavenworth National Fish Hatchery – USFWS facility located at on Icicle Creek at river mile 2.8 (rkm 4.5), near Leavenworth, Washington, (WRIA 45).

Chief Joseph Dam Hatchery - Proposed for construction on the right bank of the Columbia River below Chief Joseph Dam at river mile 543 (rkm 875).

Juvenile Acclimation Facilities:

St. Mary's Mission Pond – Colville Tribes' acclimation pond on Omak Creek at river mile 5.0 (rkm 8), below Mission Falls near Omak, Washington.

Salmon Creek Diversion – acclimation waters located on Salmon Creek at river mile 3.8 (rkm 6.1), at the Okanogan Irrigation District's diversion dam and channel near Okanogan, Washington.

Ellisforde Pond – acclimation pond located on the left bank of the Okanogan river at mile 61.7 (rkm 99.3) on the Okanogan River near Tonasket, Washington.

Colville Trout Hatchery – acclimation pond to be located on the right bank of the Columbia River at the existing hatchery at river mile 542 (rkm 873).

Osoyoos Lake Experimental Net Pens - floating net pens located in Lake Osoyoos immediately above Zosel Dam, at river mile 77.4 (rkm 124.6) on the Okanogan River near Oroville, Washington.

Adult Collection Facilities:

Leavenworth National Fish Hatchery – USFWS facility located at on

Icicle Creek at river mile 2.8 (rkm 4.5), near Leavenworth, Washington, (WRIA 45).

Omak Creek Weir: A future facility to be constructed on Omak Creek about 0.5 miles above its confluence with the Okanogan River.

Zosel Dam - Watershed Code: 17020006, at river mile 77.4 (rkm 124.6) on the Okanogan River near Oroville, Washington. This is a potential future collection site.

Chief Joseph Dam Hatchery – a future facility to be located on the right bank of the Columbia River at river mile 543 (rkm 875), immediately below Chief Joseph Dam.

Contingency Collection – live-capture, selective gear to be fished in the Okanogan River and in the Columbia River from Chief Joseph Dam (river mile 544.6) down to near the confluence of the Okanogan River (river mile 533.5)

1.6) Type of program.

This Hatchery and Genetic Management Plan (HGMP) addresses a comprehensive, two-phase plan for spring Chinook in the Okanogan subbasin and in the Columbia River from Chief Joseph Dam downstream to the confluence of the Okanogan River. Phase I programs within this plan use Carson stock spring Chinook commonly propagated in the Columbia Cascade Province. Phase II programs within this plan use the Upper Columbia River Spring Chinook ESU, currently listed as endangered. Spring Chinook are extirpated in the Okanogan subbasin. This HGMP primarily addresses the Phase I programs.

Two spring Chinook programs would be operated simultaneously in the Okanogan subbasin:

Integrated Recovery Program – re-establish natural spawning (self-sustaining or supplemented), populations in suitable habitat using Carson stock initially (Phase I), then transitioning to the Upper Columbia River Spring Chinook ESU in Phase II. Methow Composite stock from the adjacent Methow subbasin would be used in Phase II. The Phase I goal of this program is to demonstrate the viability of spring Chinook in historical habitat and guide rehabilitation of that habitat. The Phase II goal of this program is to increase the abundance, productivity, distribution, and diversity of the ESA-listed Upper Columbia River Spring Chinook to aid in its recovery.

This program will use Carson stock initially (Phase I) from excess broodstock collected at Leavenworth NFH. Upon the regular availability of Methow Composite stock, surplus to the recovery programs in the Methow subbasin, the Phase II program will be initiated. The Carson stock will be used to test the suitability of historical spawning, rearing, and

migration habitats in the Okanogan subbasin to again produce and support natural-origin populations of spring Chinook. Considerable effort is underway to restore tributary and main stem habitat quality in the Okanogan subbasin. Upon its availability, Methow Composite stock will replace the Carson stock. The program will then operate to re-establish, and if necessary, supplement natural spawning populations of spring Chinook. In Phase II, the program will be operated to assist in the de-listing and recovery of the Upper Columbia River Spring Chinook ESU. Methow Composite stock will be introduced into the Okanogan only as an "experimental population", with lesser take prohibitions, to avoid significant limitations to tribal and recreational selective fishing, and other economic activities.

Isolated Harvest Program – create a hatchery-origin run to support tribal and recreational selective fisheries, using Carson stock (Phase I) then transitioning to Methow Composite stock (Phase II). The Phase I goal of this program is to provide spring Chinook ceremonial and subsistence harvest again to the Colville Confederated Tribes and opportunity for recreational anglers in the Columbia Cascade Province in a manner compatible with recovery of Upper Columbia River Spring Chinook.

This program will use Carson stock initially (Phase I) until Methow Composite stock is available on a frequent basis (Phase II). The Carson stock will be used to create a hatchery-origin run of spring Chinook to replace lost harvest opportunity for tribal and recreational fishers. This program will be located and operated to minimize interaction with spring Chinook from the integrated recovery program and with the summer/fall Chinook indigenous to the province. All returning adults will be targeted for selective harvest or collected for broodstock. Upon its availability, Methow Composite stock will replace the Carson stock.

In Phase II, Methow Composite stock will be introduced into the Okanogan only as an "experimental population", with lesser take prohibitions, to avoid significant limitations to tribal and recreational selective fishing, and other economic activities. At that time, the Isolated Harvest Program will be transitioned to the following Integrated Harvest Program.

Integrated Harvest Program – create a hatchery-origin run to support tribal and recreational selective fisheries, and provide a genetic reserve for the Integrated Recovery Program using Methow Composite stock. The Phase II goals of this program are to continue spring Chinook harvest opportunity for the Tribes and recreational anglers targeting on hatchery-origin fish while providing a genetic reserve for the de-listing and recovery of Upper Columbia River Spring Chinook. Those Chinook destined for harvest would be differentially marked to distinguish them from hatchery-origin fish used in the recovery program.

Depending on how the above programs perform, there may be a future option to continue an Isolated Harvest Program for Carson stock spring Chinook in the Columbia River below Chief Joseph Dam while the Phase II Integrated Harvest Program is implemented in the Okanogan River using Methow Composite stock.

1.7) Purposes (Goal) of program.

Restoration – The goal of this program is to restore natural spawning populations of spring Chinook salmon in historical habitats that contributed to the fisheries of the Confederated Tribes of the Colville Reservation. This purpose would also assist in recovery of the Upper Columbia River Spring Chinook ESU, contributing to the goals of the Endangered Species Act.

Mitigation – The goal of this program is to replace spring Chinook runs in the Okanogan River and the upper Columbia River lost due to the construction and operation of Grand Coulee, Chief Joseph, Wells, Rocky Reach, Rock Island, Wanapum, Priest Rapids, McNary, John Day, The Dalles, and Bonneville dams. The management of these runs will focus on 1) restoring tribal ceremonial and subsistence fisheries and recreational fisheries, and 2) providing a contingency source of broodstock for the restoration program.

1.8) Justification for the program.

The Upper Columbia River Spring Chinook were listed as an endangered species on March 24, 1999. The listed ESU includes all naturally spawned populations of spring Chinook in accessible reaches of Columbia River tributaries between Rock Island and Chief Joseph dams, excluding the Okanogan River. Several hatchery populations from the Methow and Wenatchee subbasins where included in the listed ESU. Critical habitat for the listed ESU was designated on February 16, 2000, and included all river reaches accessible to listed spring Chinook in Columbia River tributaries between Rock Island and Chief Joseph dams, excluding the Okanogan River (Talayco, 2001).

The Upper Columbia River Spring Chinook ESU includes stream-type Chinook salmon spawning above Rock Island Dam in the Wenatchee, Entiat, and Methow rivers. All Chinook salmon in the Okanogan River are now believed to be ocean-type and are considered part of the Upper Columbia River Summer/Fall Chinook ESU (Meyers 1998). However, historically, spring Chinook salmon were numerous in the Okanogan sub-basin as they were harvested by the Colville Confederated Tribes in the Okanogan River during their May thru October salmon fisheries (Post 1938 as quoted in NWPPC 1986).

Fulton reported that while spring and summer Chinook were limited to the Okanogan and lower 2 km of the Similkameen by the late 1960's, they formerly spawned in Salmon and Omak creeks and most of the Similkameen River. These former runs were lost to irrigation development. Parkhurst reported that the large, early-day runs of Chinook were depleted due to a combination of over-exploitation by the commercial fisheries in the lower Columbia River and the destructive Indian fishery. By 1874 over one-half of the normal salmon run reaching the Colville Confederated Tribes was destroyed by lower river commercial fisheries. In 1884, the tribes had lost about three-fourths of their fishery and by 1890, salmon runs to the Colville Confederated Tribes was almost completely destroyed (Ray 1972). The large Chinook run into Salmon Creek was lost when the

Bureau of Reclamation built Conconcully Dam in 1916. When surveyed in 1936, no Chinook were present in Salmon Creek (Parkhurst 1950 as cited in NWPPC 1986)

Historical Indian fisheries for Okanogan salmon in May, June, and early July were likely spring Chinook. Alexander Ross in 1811 wrote that the Southern Okanogans assembled in large bands in June for the purpose of fishing during the summer season (Ray 1972). French and Wahle (1965) designated all Chinook arriving at Rock Island Dam by June 18 to July 9 as spring Chinook. Chapman reported that fifty percent of the spring Chinook run passes Rock Island Dam in mid-May with passage at Wells Dam occurring slightly later. These fish inhabited at least Salmon Creek and Omak Creek. Production in the Similkameen River is uncertain as a 15-foot falls was believed to be a passage barrier at lower flows. Fulton, however, reported the falls as passable. Chapman (Chapman 1995) stated that, "No reliable information indicates that spring Chinook ever used the Similkameen River." As with sockeye, spring Chinook did migrate above Osoyoos Lake into Canada and spawned in the upper Okanogan River and other tributaries. Chapman reports that, "In 1936, spring Chinook were observed in the Okanogan River upstream from Lake Osoyoos by Canadian biologists (Gartrell 1936). That observation for May estimated 100-300 adults present on the spawning grounds." In the late 1950's and early 1960's, spring Chinook were observed in the Okanogan River as far as Okanogan Falls. Chinook were observed spawning from the Falls downstream to Oliver, with concentrated spawning occurring mainly about 1 ½ miles above Oliver near Vasseaux Creek (Roy Wahle, pers. comm.). In recent years, Chinook have been reported in small numbers spawning in the Okanogan River above Osoyoos Lake (Langness 1991, Bartlett 2001 per. com). These remnant runs could now be summer/fall Chinook.

In addition to spring Chinook spawning in Salmon and Omak creeks, they may have inhabited several other smaller, Okanogan tributaries (e.g. Bonaparte and Loup Loup creeks) prior to irrigation development in the late 19th century. As may have occurred in other Columbia subbasins with similar characteristics as the Okanogan, many of the juvenile spring Chinook may have migrated out of the warming waters of the Okanogan subbasin as 0-age pre-smolts or smolts. It is also probable that spring Chinook spawning above Osoyoos Lake reared in the lake prior to smoltification, a life history strategy that is very successful for sockeye and coho salmon. Large, juvenile or residual Chinook have recently been captured in gill nets set in upper Osoyoos Lake (H. Wright pers. comm. 2003). Spring Chinook salmon historically spawned above Redfish Lake in Idaho with the juveniles rearing in the lake with the sockeye salmon prior to their ocean migration. It is also highly likely the juvenile spring Chinook from the White and Little Wenatchee rivers rear in Lake Wenatchee (Bugert, 1998). Reservoir rearing of juvenile spring Chinook was a successful strategy in Fall Creek and Green Peter reservoirs in the Willamette subbasin that produced large smolts and sizeable adult runs.

Artificial production of spring Chinook began in the Columbia Cascade Province in 1939 under the Grand Coulee Fish Maintenance Project (Bugert 1998). Fish were reared and released in the Wenatchee, Entiat, and Methow rivers from three USFWS hatcheries. A fourth hatchery for the Okanogan River was authorized, but not constructed due to the onset of WWII. Broodstock originated from the run-at-large collected at Rock Island

Dam. These early spring Chinook programs were only marginally successful so managers resorted to importing broodstock from other hatchery locations. These programs continued into the 1960's, were stopped for a number of years, and then restarted in the 1970's using Carson stock brood provided by lower Columbia River hatcheries. Broodstock in more recent years has been collected at the provincial hatcheries, particularly Leavenworth NFH. Ironically, all of the spring Chinook mitigation for Grand Coulee Dam has been located downriver, inaccessible to the Colville Tribes who have been most harmed by the dam's construction.

In 2000, the Bureau of Reclamation agreed with the Colville Confederated Tribes that the Federal government had not completed its authorized mitigation for construction of Grand Coulee Dam over 60 years ago. Planned artificial production programs were not implemented for the Okanogan subbasin when the outbreak of WWII halted non-war related construction projects.

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. Fishing opportunity is now severely limited to summer Chinook immediately below Chief Joseph Dam and an occasional sockeye fishery in the Okanogan River.

This situation has been adversely compounded as later formulas for mitigation of mid-Columbia PUD dams have been based on the proportion of smolts lost passing the dams. Without the initial Federal salmon mitigation that other watersheds in the province obtained, the Okanogan subbain and Colville Tribes again were provided without adequate mitigation. Additionally, the Federal government has never provided the Colville Tribes with mitigation for Okanogan anadromous fish resulting from losses of adult and juvenile fish passing through the four Corps of Engineers' hydroelectric projects on the lower Columbia River. Losses at these dams were once estimated at 10% to 15% per project. For the 2001 migration, the in-river survival of juvenile UCR spring Chinook and UCR steelhead through the entire hydroelectric system was estimated at 50% and 25% compared to BiOp performance standards of 66.4% and 67.7%, respectively (BPA et al., 2003). Adult fish losses at each dam may now be less than 2%. From these data, there is obviously a large and excessive loss of salmon and steelhead arising from the Columbia Cascade Province at the Federal dams.

Finally with Federal listings under the ESA, the Okanogan spring Chinook populations were declared extirpated. Again no Federal efforts have been focused on reintroduction of spring Chinook for the use and benefit of the Colville Confederated Tribes.

Anadromous fish waters in and about the Colville Reservation were either blocked or have become devoid of sufficient numbers of salmon and steelhead to maintain viable and productive ceremonial and subsistence fisheries. The traditional salmon ceremony for the first returning spring Chinook salmon, which is currently celebrated by most other tribes in the Columbia River Basin, no longer exists for the Tribes of the Colville Reservation. Under its tribal trust responsibilities, the Federal government is to ensure that natural resources critical to Native American culture and subsistence are maintained.

Historical fisheries critical to the bands of the Colville reservation have been severely limited in geographic scope and extent due to the Federal government's own development of the FCRPS, Federal irrigation projects, mismanagement of marine and main stem fisheries, and overlooking the importance of protecting tributary waters and habitats for anadromous fish. The Federal government's tribal trust responsibilities for the Colville Tribes have been seriously abrogated.

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 based on 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 responsibility mandates and treaty rights. Annual spring Chinook fisheries are conducted with a minimum harvest of 2,000 fish.

Indicator:	Total number of fish harvested in Colville Tribes' spring Chinook fisheries.
Indicator:	Total number of days open to tribal fisheries.
Indicator:	Unmet demand for ceremonial and subsistence fish for Colville Tribal members.

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 accounts for the number of marked spring Chinook passing Wells Dam. Tribal and recreational harvest is conducted within incidental mortality limitations of ESA permits or plans.

Indicator: Annual number of program's hatchery-origin spring Chinook caught in all Columbia River fisheries (Zones 1-6 recreational, Zone 1-5 commercial, Zone 6 treaty, upper Columbia River recreational, Okanogan recreational, Colville Tribes Chief Joseph Dam Tailrace, and Colville Tribes Okanogan River).

Indicator: Annual number of steelhead caught and released during spring Chinook fisheries in the Columbia Cascade Province (Colville Tribes Chief Joseph Dam Tailrace, Colville Tribes 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 Spring 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 (Colville Tribes Chief Joseph Dam Tailrace, Colville Tribes Okanogan River, Okanogan recreational, upper Columbia River recreational)

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

Release groups are sufficiently marked and tagged (100% adipose fin clipped and 42% coded wire tagged) 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 by mark type for each spring Chinook release group (Ellisforde Pond, St. Mary's Mission Pond , Osoyoos net pens, acclimation pond at Colville Trout Hatchery, and 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, Colville Tribes Chief Joseph Dam Tailrace, and Colville Tribes Okanogan River).

Indicator: Number of marks of this spring Chinook program 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, Colville Tribes Chief Joseph Dam Tailrace, and Colville Tribes Okanogan River) and combined ocean fisheries .

Conservation Standards:
The Integrated Recovery Program in Omak Creek provides an increasing number of spawners returning to the Okanogan River to achieve initial escapement objective of 200 adults with at least 50% natural-origin.

Indicator: Annual number of spring Chinook spawners in each Okanogan river spawning area, by age (Omak Creek; possibly Salmon Creek, and Canadian Okanagan River).
Indicator: Spawner-recruit ratios.
Indicator: Annual number of redds in selected natural production index areas.
Indicator: Annual ratio of natural-origin and hatchery-origin spring Chinook on spawning grounds.

Releases are sufficiently marked and tagged (100% adipose fin clipped and 42% 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, including proportion of hatchery-origin fish on the spawning grounds per protocols in Table 7.

Indicator: Annual marking rates by mark type for each spring Chinook release group (see above).
Indicator: Annual number of marks and estimated total proportion of program's hatchery-origin fish in collections of juvenile spring Chinook within the Okanogan basin and at any Columbia River dams.
Indicator: Annual proportion of hatchery-origin spring Chinook on the spawning grounds (see above).

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. (Initially, the early portion of the run may be emphasized in broodstock collection to better match Okanogan habitat conditions.)

Indicator: Annual temporal distribution of spring Chinook broodstock collection and 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 Table 6 are achieved.

Indicator: Annual number of natural-origin spring Chinook removed for broodstock.
Indicator: Annual number of hatchery-origin and natural-origin spring Chinook spawning in the Wenatchee River and in the Columbia

basin above the Methow River.

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

Indicator: Annual estimates of the number of natural-origin spring Chinook migrating from the Okanogan subbasin.

Life history characteristics of the natural population do not change as a result of the artificial production program. [Note: Life history divergence of spring Chinook reared in Omak Creek and above Osoyoos Lake should be expected and can be desirable as fish adapt to their new habitat.]

Indicator: Specific life history characteristics of the hatchery-origin spring 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 spring 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 do not decline.

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

Indicator: Annual release of hatchery-origin spring Chinook in the Okanogan subbasin, Columbia Cascade Province, and Columbia River Basin by life-stage.

Indicator: Annual naturally spawning escapement of Upper Columbia River Spring 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 spring 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. [Note: Genetic divergence of spring Chinook reared in Omak Creek and above Osoyoos Lake should be expected and can be desirable.]

Indicator: Genetic profile of Carson stock and Methow Composite natural-origin spring 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 spring Chinook at point of broodstock collection (see above).
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 (see above).

Hatchery-origin adults in natural production areas do not exceed appropriate proportion of the total natural spawning population per Table 7.

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 spring Chinook passing Wells Dam.

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

Indicator: Location of annual juvenile releases (see above).
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 spring 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).

Research Activities:
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, INAD, and MDFWP.

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 spring 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.

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 spring Chinook (based on proportion of spring Chinook in harvest).
Indicator:	Total Colville Tribes' 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 spring 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 spring Chinook available for Colville Tribes' ceremonial and subsistence use.
Indicator:	Annual number of recreational angler days and length of seasons in fisheries targeting the programs spring Chinook.
Indicator:	Length and geographic extent of tribal fishing seasons targeting programs spring Chinook.
Indicator:	Number of tribes participating in harvest of programs spring Chinook.

Contingency Actions Based on Performance During Phase I:

The collection and evaluation of performance information through an M&E program will likely result in some modifications to the spring Chinook program 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 introgression of spring Chinook with Okanogan River summer/fall Chinook. Actions: increase selective fishing pressure; shift some or all of the juvenile releases from Ellisforde Pond to Chief Joseph Dam Hatchery or Colville Trout Hatchery; reduce production numbers; or change some spring Chinook production to summer/fall Chinook.
2. Excessive introgression of Carson stock spring Chinook with Methow fish. Actions: improve homing to acclimation sites; reduce production; or deploy selective harvest capability to the Methow River.
3. Significant adverse ecological interactions with endemic populations. Actions: improve rearing and release protocols to reduce juvenile residency time; reduce production; shift some or all of the production from Ellisforde Pond to Chief Joseph Dam Hatchery;
4. 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.
5. Underutilized supply of harvestable spring Chinook. Actions: reduce production; develop new release sites to expand fishing opportunity; or open access to fishery for other tribes.
6. Excessive harvest mortality to non-target species or natural-origin spring Chinook. Actions: Improve or restrict selective fishing gears; alter timing or location of fisheries; reduce production; or shift releases to other acclimation sites.
7. Inadequate broodstock collection at Chief Joseph Dam Hatchery. Actions: Increase homing signal to the hatchery; shift production from Ellisforde Pond to the hatchery; use live-capture fishing gear to supplement hatchery broodstock returns; or supplement with surplus broodstock from Leavenworth NFH.
8. Insufficient escapement to Omak Creek. Actions: improve smolt quality; reallocate production from the isolated harvest program to the recovery program; reduce incidental harvest mortalities; increase habitat improvements; or initiate adult supplementation.
9. Inadequate natural production in Omak Creek. Actions: increase habitat improvements; adjust broodstock collection and juvenile rearing protocols; or suspend integrated recovery program until Phase II.

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.

General:

Spring Chinook were extirpated long ago from the Okanogan subbasin due to degradation of tributary and mainstem Okanogan habitat, hydroelectric development and over-fishing on the Columbia River. Therefore, critical information on the viability and likely performance of spring Chinook in the Okanogan does not exist. Also rehabilitation of historical habitats in the Okanogan subbasin is in its infancy. It is therefore premature to establish precise long-term numeric goals for the Isolated Harvest and Integrated Recovery programs. These programs will need to be initiated in an experimental and phased manner with monitoring and evaluation to provide the information to determine long-term program goals and size. In Phase II, the Integrated Harvest Program will be sized base on results of the Phase I programs.

Initial Phase I programs are sized to optimize collection of information about the potential viability of Okanogan spring Chinook and their habitats in the subbasin and the Columbia Basin overall. During Phase I, objectives will focus on identifying any potentially adverse interactions with summer/fall Chinook and steelhead populations, and documenting the extent of tribal and recreational harvest. Scientific information collected from these experimental Phase I activities will be used to refine longer term, Phase II programs. Phase I will also be undertaken with an eye toward minimizing capital costs until sufficient information is obtained to justify a more permanent Phase II program. During Phase I, efforts will be focused on using existing or temporary hatchery, acclimation, and collection facilities to the extent possible and prudent. The duration of Phase I will depend on the results observed, but would be expected to last for at least 9 years (4 brood years and subsequent adult return years). During Phase I, the programs will use Carson stock. Transition to Methow Composite stock would occur later based on Phase I results and the availability of the fish from surpluses in the Methow subbasin.

At any time during Phase I, should irresolvable conflicts arise that threaten the viability of Upper Columbia summer/fall Chinook ESU, Upper Columbia Steelhead ESU, or Upper Columbia Spring Chinook ESU, the program would be discontinued and returning, adult spring Chinook would be collected at Wells Dam or by other means to eliminate the conflict.

Phase I:

Phase I of the Isolated Harvest Program is sized to return 600 adults on average to the Okanogan subbasin (400 – 1,400) and 1,800 adults to the vicinity of Chief Joseph Dam (1,200 – 4,200). This program size should be sufficient to allow for determining critical survival parameters pertaining to viability through monitoring and evaluation and allow assessment of the suitability of Okanogan River habitat. This program should also be sufficient to provide for tribal and recreational fisheries and testing of selective fishing gear.

Phase I of the Integrated Recovery Program is sized to return 300 adults on average to the Okanogan sub-basin (200 – 700). This program size should be sufficient to allow for determining critical survival parameters and allow assessment of habitat health in Omak Creek and possibly later, in Salmon Creek.

Phase I is separated into two steps. During the initial, Step A (prior to construction of Chief Joseph Dam Hatchery), spring Chinook eggs would be obtained at USFWS' Leavenworth NFH. Subsequent incubation and rearing of 400,000 juveniles would occur at the USFWS' Willard/Little White Salmon NFH located on the Little White Salmon River in the Columbia Gorge Province. Another 50,000 juveniles would be reared at Leavenworth NFH. Pre-smolts from both facilities would be transported to acclimation ponds in October for acclimation prior to release the following spring. The spring Chinook rearing capacity at Willard/Little White Salmon NFH may be as high as 500,000 pre-smolts, however, Step A would only need 400,000 smolts for release into the Okanogan and Columbia rivers. Until the M&E program is funded and implemented, and the capabilities of the live-capture, selective fishing gears are known, the Colville Tribes believe it best to initiate releases in the Okanogan River at conservative levels to minimize risks. So 200,000 Chinook would be acclimated at Ellisforde Pond on the upper Okanogan River. For the Columbia River, 200,000 would be acclimated at a proposed new pond at the Colville Trout Hatchery to support the tribal C&S fishery below Chief Joseph Dam.

Step B would begin with the construction Chief Joseph Dam Hatchery's spring Chinook facilities. Eggs obtained at Leavenworth NFH would then be transferred to Chief Joseph Dam Hatchery for incubation and rearing. Eventually, broodstock would be collected at the new hatchery, with egg take at Leavenworth NFH only if shortfalls occur. In Step B, the full Phase I production of 900,000 smolts would occur resulting in a minimum adult return of about 2,700 spring Chinook.

Phase II:

Long-term goals for the Phase II integrated harvest and integrated recovery programs are too speculative at this time. These goals will depend on information gained from the Phase I programs. Annual demand from tribal and recreational fisheries should be greater than the expected minimum return of 2,700 adults estimated for Phase I. The carrying capacity of Omak Creek and other subbasin areas, both in the U.S. and Canada

is not now known. Prior to Phase II, the Colville Tribes will have a better understanding of the natural production capacity of the Okanogan subbasin and survival rates of fish hatched and reared at Chief Joseph Dam Hatchery.

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

Phase I Integrated Recovery Program: 38 adult fish (Step A) increasing to 74 fish assuming later construction of Chief Joseph Dam Hatchery with spring Chinook facilities (Step B).

Phase I Isolated Harvest Program: 286 adult fish (Step A) increasing to 570 fish assuming construction of Chief Joseph Dam Hatchery with spring Chinook facilities (Step B).

Phase I, Step A Isolated Harvest Program:

400,000 yearling smolts / 80% egg-smolt survival = 500,000 eggs
500,000 eggs / 4,400 eggs/female = 114 females
114 females x 2 = 228 spawners
228 spawners / 80% pre-spawn survival = 286 adults collected

Phase I, Step B Isolated Harvest Program:

800,000 yearling smolts / 80% egg-smolt survival = 1,000,000 eggs
1,000,000 eggs / 4,400 eggs/female = 228 females
228 females x 2 = 456 spawners
456 spawners / 80% pre-spawn survival = 570 adults collected

Phase I, Step A Integrated Recovery Program:

50,000 yearling smolts / 80% egg-smolt survival = 62,500 eggs
62,500 eggs / 4,400 eggs/female = 15 females
15 females x 2 = 30 spawners
30 spawners / 80% pre-spawn survival = 38 adults collected

Phase I, Step B Integrated Recovery Program:

100,000 yearling smolts / 80% egg-smolt survival = 125,000 eggs
125,000 eggs / 4,400 eggs/female = 29 females
29 females x 2 = 58 spawners
58 spawners / 80% pre-spawn survival = 74 adults collected

Brood stock calculations are based on the Biological Assessment and Management Plan, Mid-Columbia River Hatchery Program (BAMP, 1998) and the Northeast Oregon Hatchery Master Plan (NEOH, 2000) (80% collection to spawning survival, 4,400 eggs/female, 1:1 sex ratio, 0.3% smolt-adult survival rate, and 80% propagation egg-smolt survival).

Broodstock for the programs will be collected at USFWS' Leavenworth National Fish Hatchery in Phase I, Step A. In Step B, Broodstock collection will be relocated to Chief Joseph Dam Hatchery. During Step A, collection of eggs at Leavenworth NFH would not jeopardize the hatchery's current spring Chinook production program.

In Phase II, the Methow Composite broodstock would be collected initially at USFWS' Winthrop National Fish Hatchery and WDFW's Methow State Hatchery. Later, broodstock would be collected at Colville Tribes' facilities on the Okanogan River and at Chief Joseph Dam Hatchery to be supplemented from the two Methow hatcheries when necessary and available. Anticipated broodstock collection in the Okanogan subbasin would be at a Zosel Dam trap, a weir and trap located in Omak Creek, and with live-capture fishing gears deployed in the Okanogan River. This HGMP will require substantial redrafting upon initiation of Phase II to reflect the significant broodstock and program changes, and integrate information learned during Phase I.

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

Phase I, Step A releases are indicated in the following tables:

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N/A	0
Unfed Fry	N/A	0
Fry		
Fingerling	NA	0
Yearling	Omak Cr. – St. Mary's Mission Pond	50,000 smolts @ 15/lb.

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N/A	0
Unfed Fry	N/A	0
Fry	N/A	0
Fingerling	N/A	0
Yearling	Okanogan R. – Ellisforde Pond	200,000 @ 15/lb

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N/A	0
Unfed Fry	N/A	0
Fry	N/A	0
Fingerling	N/A	0
Yearling	Columbia R. – Colville Trout Hat.	200,000 @ 15/lb

Upon approval of experimental net pen rearing of spring Chinook in Osoyoos Lake, 100,000 of the juvenile fish reared in Ellisforde Pond would be shifted to experimental net pens. This would reduce the releases from Ellisforde Pond to 100,000 fish.

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N/A	0
Unfed Fry	N/A	0
Fry	N/A	0
Fingerling	N/A	0
Yearling	Osoyoos Lake – Zosel Dam	100,000 @ 15/lb

Phase I, Step B releases are indicated in the following tables:

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N/A	0
Unfed Fry	N/A	0
Fry		
Fingerling	NA	0
Yearling	Omak Cr. – St. Mary's Mission Pond	50,000 smolts @ 15/lb.

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N/A	0
Unfed Fry	N/A	0
Fry	N/A	0
Fingerling	N/A	0
Yearling	Salmon Cr. – Irrigation Dam	50,000 smolts @ 15/lb

Releases in Salmon Creek are dependent on the provision of sufficient flows and agreement with the Okanogan Irrigation District. If these fish are not acclimated in Salmon Creek, they will be acclimated at Ellisforde Pond.

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N/A	0
Unfed Fry	N/A	0
Fry	N/A	0
Fingerling	N/A	0
Yearling	Okanogan R. – Ellisforde Pond	200,000 @ 15/lb

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N/A	0
Unfed Fry	N/A	0
Fry	N/A	0
Fingerling	N/A	0
Yearling	Chief Joseph Dam Hatchery	600,000 @ 15/lb

Upon approval of experimental net pen rearing of spring Chinook in Osoyoos Lake, 100,000 of the juvenile fish reared in Ellisforde Pond would be shifted to experimental net pens. This would reduce the releases from Ellisforde Pond to 100,000 to 150,000 Chinook depending on the status of Salmon Creek releases.

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N/A	0
Unfed Fry	N/A	0
Fry	N/A	0
Fingerling	N/A	0
Yearling	Osoyoos Lake – Zosel Dam	100,000 @ 15/lb

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

These Isolated Harvest and Integrated Recovery programs are new and as such do not have past performance information. Test releases of spring Chinook in Omak Creek were initiated in 2001 and every year since, with the first adult returns expected in 2004. A single release of 254,000 spring Chinook was made from Ellisforde Pond in 2002 and 100,000 from Bonaparte Pond in 2003. Again no performance data are available from these actions.

Spring Chinook released from Leavenworth NFH averaged 0.23% return (range 0.009% - 0.655%) from BY 1983 – BY 1994 (USFWS, 2002). Recent returns have been considerably higher. Mid-Columbia spring Chinook survival from smolts to adults is generally expected to be 0.3% (Bugert, 1998). The following goals are based on spring Chinook programs in nearby subbasins.

Program goals for Phase 1 Okanogan Isolated Harvest Spring Chinook Program (hatchery-origin fish):

Smolt – adult survival rate:	0.30%
Total adult production number:	2,700
Escapement:	0

Program goals for Okanogan Integrated Recovery Spring Chinook Program:

Smolt – adult survival rate:	0.3%
Total adult production number:	300
Escapement:	300

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

Phase I, Integrated Recovery Program: Carson stock spring Chinook were first released in 2001 in Omak Creek on an experimental basis as part of an agreement to reduce the release of these fish in the Methow subbasin. Approximately 40,000 BY'99 smolts were scatter-planted below Mission Falls. In 2002, 48,000 BY'00 smolts were scatter-planted in Omak Creek. In 2003, 35,000 smolts were acclimated and released

from a new acclimation pond below Mission Falls. The Phase I program in Salmon Creek is deferred pending necessary agreements with the Okanogan Irrigation District.

Phase I, Isolated Harvest Program: In 2002, 254,000 BY'00 smolts were released in the Okanogan subbasin from the Ellisforde Pond, as a result of negotiations to address excess Carson stock returning to the Methow subbasin. In 2003, 100,000 BY'01 smolts were released from Bonaparte Pond. The proposed Phase I, Step A Isolated Harvest Program, releasing 200,000 smolts in the Okanogan River and 200,000 smolts into the Columbia River, would start no sooner than 2006. The Step B release of 600,000 smolts at Chief Joseph Dam Hatchery would likely occur sometime after 2009. At that time, the 200,000 release from Colville Trout Hatchery would end.

1.14) Expected duration of program.

The Isolated Harvest Program is expected to continue each year provided survivals are satisfactory and interactions with other races of Chinook and steelhead are within acceptable limitations.

The Integrated Recovery Program will continue for at least 4 generations, about 20 years. The program will then be evaluated for its ongoing necessity to assist naturally spawning populations. Given current survival rates in downstream subbasins, the program may be required continuously to supplement natural-origin populations. A significant improvement in SAR for natural-origin spring Chinook is required throughout the Columbia Cascade Province before ending supplementation programs.

1.15) Watersheds targeted by program.

The watersheds targeted by these programs are the Okanogan subbasin and the upper Columbia River immediately below Chief Joseph Dam.

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

Two basic alternatives exist for reintroduction of spring Chinook in the Okanogan River basin, A) natural re-colonization and B) assisted relocation. The other key variable in this analysis is the appropriate spring Chinook stock(s). Concerning stocks, Carson, Methow Composite, and Wenatchee were considered. The Methow Composite and the Wenatchee stocks are populations of the endangered Upper Columbia River Spring Chinook ESU.

The alternative of natural re-colonization is not viable due to the low stray rates into the Okanogan subbasin seen over the past 50 years and the low smolt-to-adult survival rates in the upper Columbia basin that will not allow re-colonization to be successful. The objectives of the Colville Tribes to restore naturally spawning populations, create ceremonial and subsistence fisheries, create recreational fisheries, and help recover the

listed ESU cannot be satisfied by natural re-colonization. This alternative will therefore not be pursued.

Many options exist to implement assisted relocation depending on the life stage used and the area of relocation. Relocation can be undertaken by 1) transplanting adult fish into spawning habitat, 2) placing fertilized eggs into the spawning habitat, 3) planting unfed fry, 4) planting fingerlings or pre-smolts, and/or 5) planting acclimated or un-acclimated smolts. These options are further permutated by which stock(s) are used.

Six strategic options were developed and are described in Appendix A, "Strategic Options for Okanogan Spring Chinook", May 7, 2001 (attached). In summary these strategic options are:

1. Isolated harvest program using Carson stock released at 1-5 locations.
2. Integrated harvest program using Carson stock released at 1-5+ locations.
3. Integrated recovery program using Methow Composite stock released at 1-5+ locations.
4. Dual isolated harvest and integrated recovery programs using Carson stock and Methow Composite stock, respectively, released at 1-3 sites for each program.
5. Dual integrated recovery and isolated harvest programs using Carson stock initially, transitioning to Methow Composite stock when available. Fish would be released at 1-2+ sites for the recovery program and 1-3+ sites for the harvest program.
6. Dual integrated recovery and isolated harvest programs using an as yet determined stock of spring Chinook.

The preferred alternative upon which this HGMP has been developed is strategic option #5. This option was selected as having the highest likelihood of meeting the recovery and harvest goals of the Colville Tribes at the least risk to other fishery objectives in the Columbia Cascade Province.

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

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

No ESA permits or authorizations exist for these spring Chinook programs. This HGMP has been submitted to NOAA Fisheries Phase II/III HGMP Process for ESA review. Ultimately, this HGMP will be a key component of a Tribal Resource Management Plan to be submitted to NOAA Fisheries pursuant to its Section 4(D) regulations, (50 CFR part 223; July 10, 2000).

The propagation programs at USFWS' Leavenworth NFH and Little White Salmon/Willard NFH operate under NMFS' 1999 Biological Opinion on Artificial Production in the Columbia River Basin. These programs are currently under review again by NOAA Fisheries within its Phase I/II HGMP Process.

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.

These proposed spring Chinook programs have the potential to affect Upper Columbia River Steelhead (endangered) that exist in the Okanogan subbasin and Upper Columbia River Spring Chinook (endangered) that reside in the Methow subbasin. Spring Chinook from the Okanogan would share the mainstem Columbia, estuary and ocean environments with a number of other listed species, but with inconsequential effects.

UCR Spring Chinook (from USFWS, 2002)
"Adult spring Chinook destined for the upper-Columbia Basin enter the Columbia River beginning in March and reach peak abundance (in lower river) in April and early May (Chapman et al. 1995). Spring Chinook enter the mainstem portions of tributaries from late-April to July. Spawning occurs from late-July through September, usually peaking in mid to late August (Chapman et al. 1995). From 1991 to 2000, the average date for peak spawning in the upper Wenatchee River and tributaries ranges from August 25th to September 4th (Mosey and Murphy 2002).

Data from post-spawn adults collected and sampled in mid-Columbia tributaries, 1986 to 1993, shows that on average, 5% of males return at age 3, 58% at age 4, and 37% at age 5. Female averages are 58% at age 4, and 42% return at age 5 (Chapman et al. 1995).

On the spawning grounds, Chapman et al. 1995, indicated that females may dominate the males in numbers, but states that the ratio may be closer to 1:1. This is because there is a greater likelihood of recovering females on the spawning grounds than males (Chapman et al. 1994).

From 1994 to 2001, the average length (hypural length) of wild males collected from Wenatchee Basin natural spawning areas is 64cm (range of averages = 52 to 71cm). For females, the average is 66.5cm (range of averages = 63 to 71cm) (Mosey and Murphy 2002). Jacks are included in the male count.

Wild juvenile spring Chinook salmon originating in the upper-Columbia Basin emigrate towards the ocean during their second year. Average size at emigration (April and May) ranges from about 91.8mm to 100.5mm (averages from three emigration studies) (Chapman et al. 1995)." 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 (CCT 2002).

"From 1985 to 1993, the average 10th, 50th, and 90th percentile passage at Rock Island Dam was April 21st, May 10th, and June 3rd respectively (Chapman et al, 1995). Although these percentages are strongly influenced by releases from Leavenworth NFH, Chapman et al. (1995) believe that the naturally produced migrants have a run timing similar to the hatchery component."

The populations of UCR Spring Chinook are greatly depressed, although the 2000, 2001, and 2002 returns showed significant improvement. The table below indicates the runs of spring Chinook escaping to the Columbia Cascade Province, however, these numbers include both the endangered UCR Spring Chinook and unlisted Carson-stock fish. Based on the numbers of natural-origin fish returning to the Wenatchee, Entiat, and Methow rivers, the proportion of the UCR Spring Chinook passing Priest Rapids Dam averaged 13% from 1990 to 1999.

Table 1. Spring Chinook – Adult Counts at Rock Island and Wells Dams*

Year	Rock Island	Wells
2003	16,881	4,504
2002	24,017	7,587
2001	39,785	9,989
2000	14,850	2,130
1990 – 1999 ave.	6,568	753
1980 – 1989 ave.	13,315	2,581

* from FPC

UCR Steelhead:

From USFWS, 2002:

"Steelhead destined for the upper-Columbia region enter the Columbia River between May and September (WDF et al. 1990). They pass Rock Island Dam from July through the following May. All steelhead spawn in the spring regardless of when they enter the Columbia River.

Spawning grounds are not surveyed for steelhead because the adults generally spawn over a 4 to 5 month period coinciding with the spring run-off when water visibility is low and discharge high (Chapman et al. 1994). Spawning is believed to take place between March and June, but has been observed as late as July (Chapman et al. 1994).

Females make up about 65% of adults sampled at Wells Dam; of smolts sampled at Rock Island Dam in 1988, 63% were female (Chapman et al. 1994).

Howell et al. (1985) reported age estimates from creel surveys in the Wenatchee River from the late 1970s to the early 1980s. Scale samples from these surveys were used for age determination. In the Wenatchee River, they report naturally produced steelhead of five different age classes (2.1, 2.2, 2.3, 3.1, and 3.2), with the largest percentage in the 2.1 class. The "European Method" was used for age determination where the first digit represents the number of winters spent in freshwater, and the second digit indicates the number of winters in saltwater.

Migrating steelhead smolts captured at Rock Island Dam average 163 to 188 mm. Adults returning after one year average 59 to 64 cm, whereas those spending two years at sea average 67 to 76 cm when returning to freshwater. Between 1986 and 1993, wild adults of both sexes combined, averaged 66.5 cm (Chapman et al. 1994)."

From the draft Okanogan Basin Steelhead HGMP:
"Spawning grounds are not surveyed for steelhead because adults generally spawn over a 4-5 month period coinciding with the spring run-off when water visibility is low and discharge is high. According to the 2001 Similkameen/Okanogan Subbasin Summary, few wild steelhead currently spawn successfully in the Okanogan Basin because many of the tributaries with spawning habitat are dewatered during the summer months. Furthermore, elevated temperatures and sedimentation in the Okanogan River limit quality and quantity of cold-water refugia.

Salmon Creek, Omak Creek, and the Similkameen River supported small runs, but these were eliminated or reduced by passage barriers (NMFS, 1998). In the spring of 2001, Heather Barlett, WDFW fisheries biologist, and Chris Fisher, CTCR fisheries biologist, observed 2 steelhead redds in Bonaparte Creek and witnessed a steelhead spawning in Tonasket Creek. Whether or not the environmental conditions of Bonaparte Creek remained conducive for steelhead this year is unknown, however, Tonasket Creek is dry (Fisher, 2001). Twelve adult steelhead were observed spawning in Bonaparte Creek April 19, 2002. Water temperatures were measured in Bonapart Creek in July 2002 and found to exceed upper lethal maximums for *O. mykiss*."

"Although steelhead were probably never abundant in the Okanogan River due to natural habitat limitations, an estimated half of the steelhead production may have been lost as a result of fish access restrictions to Salmon Creek by irrigation water withdrawals (WDF and WDFW 1993). In 1955-56, the escapement estimate to the Okanogan was about 50 fish, from a total run size of about 97 fish (WDFW 1990). Assuming a 50 percent loss in production from Salmon Creek since 1916, the average run-size prior to the extensive hydroelectric development in the mid-Columbia River reach is believed to have been about 200 fish. The estimated total run-size of naturally produced summer steelhead to the Okanogan Subbasin declined to between 4 and 34 fish, from 1977 to 1988 (WDFW 1990).

Given that stock status at the sub-watershed level has not been definitively established in the Okanogan, describing the relative importance of specific steelhead stocks throughout the Okanogan watershed has great uncertainty. Nevertheless, 19 adult summer steelhead were observed in Omak Creek in 2001 (C. Fisher, TAG). When considered against a total

escapement to the entire system of between 4 to 34 fish from 1977 to 1988 (WDFW 1990), such populations, although small, become disproportionately important. Regardless whether the 2001 Omak Creek steelhead returns originated from earlier smolt transplants from the Wells Hatchery into the system, the creek may be especially important for the reestablishment/recovery of the summer- run steelhead ESU within the Okanogan watershed. Redd survey data from 2002 identified 38 redds with a 1.7-mile reach of Omak Creek. Similarly, as indicated in the preceding paragraph, steelhead production from Salmon Creek was estimated to represent roughly 50% of the native production throughout the watershed prior to the erection of Conconully Dam."

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

No ESA-listed population would be affected directly by the proposed spring Chinook programs during Phase I. Spring Chinook are extinct in the Okanogan River and do not spawn or rear in the Columbia River immediately below Chief Joseph Dam. At Leavenworth NFH where broodstock would be collected, there are no listed spring Chinook in Icicle Creek. **"**The listed spring Chinook stocks utilizing the Wenatchee basin spawn over 20 river miles above Icicle Creek in the mainstem Wenatchee River and tributaries. If listed summer steelhead enter the collection ladder at Leavenworth NFH, we are required to pass them above the barrier at the hatchery. Effects of the barrier dam on listed fish are being addressed under a separate consultation process (USFWS 2002)." (USFWS, 2002).

In Phase II, ESA-listed Methow Composite stock Spring Chinook would be enhanced by the programs. Excess Methow and Winthrop hatchery fish would be reared and then released into the Okanogan subbasin. This HGMP will be rewritten prior to initiation of Phase II.

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

Spring Chinook from the Okanogan River and Columbia River immediately below Chief Joseph Dam would share the lower Columbia River, estuary and ocean environments with a number of other listed species, but with inconsequential effects.

Upper Columbia River Summer Steelhead exist in the Okanogan primarily as a result of a supplementation program using Wells Hatchery. The current program consists of releases of 100,000 smolts into Omak Creek, Salmon Creek, and scatter planted in the Okanogan and Similkameen rivers (BAMP, 1998). No steelhead would be expected to reside in the Columbia River upstream from the confluence with the Okanogan.

Fishery managers are re-directing steelhead programs toward the development of locally adapted broodstocks and improving the fitness of the Wells Fish Hatchery population (BAMP, 1998). In the Okanogan subbasin, the Colville Tribes are preparing an HGMP for developing a local broodstock for use in the Okanogan subbasin. The program will

include kelt reconditioning to increase the viability of this ESU.

Steelhead adults migrate into the Mid-Columbia tributaries in the fall and spring months after spending 1-3 years in the ocean, although most spend 1-2 years in the ocean. Spawning occurs primarily in May, but may extend later. Eggs incubate from late March through July, and fry emerge in early summer to September. Fry and smolts disperse downstream in late summer and fall. Smolts typically leave the sub-basins in March to early June after spending 1-7 years (mostly 2-3 years) in rearing waters. Repeat migrations and spawning have been eliminated by development of the hydroelectric system (BAMP, 1998).

The degree that first and second-generation hatchery steelhead can reproduce successfully in the natural environment is a critically unanswered question. While the Wells Hatchery steelhead is essential to recovery, there may be genetic differences in life history traits between this hatchery stock and natural steelhead (BAMP, 1998). The Colville Tribes are presently assisting in a newly funded study to quantify the relative reproductive success of natural-origin, hatchery-origin and reconditioned kelt steelhead in Omak Creek.

A recent 5-year (1989-1993) average annual escapement estimates are 450 for the Methow and Okanogan rivers. Natural cohort replacement rates in the Mid-Columbia Region is estimated to be no greater than 0.3. The original Okanogan population may be extinct, with the possible exception of resident morphs in Salmon and Omak creeks (BAMP, 1998)

Implementation of the spring Chinook programs in the Okanogan subbasin will indirectly affect listed steelhead in Omak Creek and later in Salmon Creek, and in the Okanogan River. Adult steelhead enter the creeks in the early spring to spawn and will co-habit these waters with returning adult spring Chinook. This co-habitation is a natural occurrence. Trapping and collection activities associated with the spring Chinook program will encounter adult and juvenile steelhead.

Natural-origin spring Chinook juveniles will co-habit rearing waters with natural-origin juvenile steelhead. This co-habitation is a natural occurrence. The two species minimize competition for food and space by largely occupying different rearing habitats.

Hatchery-origin spring Chinook will also occupy waters with juvenile steelhead, but interactions should be minimized by acclimation procedures and volitional releases. Chinook smolts are expected to migrate promptly out of the creeks and Okanogan River on their downstream migration.

Spring Chinook will be reared at Little White Salmon/Willard NFH on the Little White Salmon River. Water for the hatchery is withdrawn from the River, springs, and a well. River water is taken from above an impassable falls so there are no effects to anadromous fish (USFWS, 1999).

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

The UCR Spring Chinook, listed as endangered, are extirpated in the Okanogan subbasin. This subbasin was therefore not included in the designation of critical habitat for this endangered species. The ESU is still in serious jeopardy, with a population growth rate recently estimated at 0.85 (95% CI of 0.62 – 1.17). The probability that the ESU's population growth rate is less than 1.0 has been estimated at 82% and less than 0.9 has been estimated at 63% (McClure et al. 2003).

The UCR Steelhead may have been extirpated in the Okanogan subbasin (WDFW et. al, 1993, as quoted in BAMP) and now exist as a result of the Wells Hatchery supplementation program. Recent returns have averaged less than 450 in the Methow and Okanogan subbasins. The status of the ESU may be improving, with a population growth rate recently estimated at 1.00 (95% CI of 0.66 – 1.52). The probability that the ESU's population growth rate is less than 1.0 has been estimated at 50% and less than 0.9 has been estimated at 27% (McClure et al. 2003).

For both ESUs, there has been a rather dramatic increase in the recent runs of natural-origin fish that has caused at least a short-term upswing in the 5-year geometric mean populations. Since the 2000 FCRPS Hydrosystem BiOp, there has been over a 1,200% increase in the 5-year geometric mean of UCR Spring Chinook and over 400% increase for UCR Steelhead (BPA et al. 2003).

- 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.

Progeny-to-parent ratios for the Okanogan steelhead have not been calculated, but should be no greater than the 0.3 rate estimated for populations in other Mid-Columbia sub-basins.

UCR Spring Chinook are extirpated in the Okanogan River and in the Columbia River above its confluence.

- 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.

Steelhead spawning counts and abundance estimates for the Okanogan subbasin do not exist. Estimates of seeding rates for natural-origin steelhead likewise are not available. The Colville Tribes, using the WDFW GAFM@ model has estimated the potential smolt production in the Okanogan Basin at 17,570 smolts. Replacement of natural spawners

would require a 3.4% smolt-to-adult survival rate, thus producing an adult replacement run size of 597 steelhead (BAMP, 1998).

UCR Spring Chinook are extirpated in the Okanogan River and in the Columbia River above its confluence.

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

These data do not exist for steelhead in the Okanogan subbasin.

UCR Spring Chinook are extirpated in the Okanogan River and in the Columbia River above its confluence.

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

Broodstock collection of spring Chinook at Leavenworth NFH has a low potential for take of listed spring Chinook. Since 1994, only one verified UCR spring Chinook has been used in propagation (USFWS, 2002). Steelhead migrating into the Leavenworth fishway are passed upstream unharmed.

Rearing of spring Chinook at Willard NFH is not expected to take any listed fish. The water supply for the hatchery is above a natural barrier to anadromous fish.

Rearing of spring Chinook at St. Mary's Mission and Ellisforde ponds is not expected to take any listed fish as the intakes for these facilities are fully screened. Rearing of spring Chinook at a new acclimation pond at Colville Trout Hatchery would not be expected to take any listed fish as the intake for this facility would be fully screened.

See Section 11 for research, monitoring and evaluation activities that may take listed fish.

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

As these programs are new, and listed spring Chinook have been extirpated in the Okanogan subbasin, there is no past take. At Leavenworth NFH, only one UCR spring Chinook has been knowingly taken since 1994. Any additional take associated with collecting sufficient eggs to supply the Phase I Okanogan spring Chinook program should be similarly inconsequential.

- **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).**

Projected take associated with broodstock collection at Leavenworth NFH should average less than one adult UCR spring Chinook. All adult steelhead entering the hatchery's fishway will be handled, but immediately released with unintentional lethal take of one fish (USFWS, 2002). No juvenile take is expected during broodstock collection.

Rearing of spring Chinook will occur initially at Willard NFH on the Little While Salmon River. No listed fish are expected to be "taken" at Willard. Spring Chinook will then be reared and acclimated at Ellisforde Pond on the Okanogan River and at Colville Trout Hatchery on the Columbia River. No take of juvenile or adult UCR Steelhead is expected at this time as the pump intakes are fully screened. Solid waste products from the rearing ponds will be removed from the pond and properly disposed on land. Disease transmission will be minimized through regular health checks.

Take of listed fish during the RM&E phases of the propagation program can be expected during juvenile trapping. This take and any other associated with the RM&E program will be evaluated in a separate consultation.

- 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.

Contingency plans are not in place at Leavenworth due to the low level of take that occurs during broodstock collection (USFWS, 2002).

A contingency plan will be developed for operations at Ellisforde Pond and at Colville Trout Hatchery to cover possible take associated with operation of the pumps and any emergency mass release of rearing juveniles.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan Explain any proposed deviations from the plan or policies.

No specific plan covers the reintroduction of spring Chinook in the Okanogan subbasin. This program was not reflected in the now expired "Columbia River Fish Management Plan" of the *US v. Oregon* settlement. Negotiations are currently underway to develop a new production program, however, the Colville Tribes are not party to the settlement agreement. Although this spring Chinook program will be coordinated with *US v Oregon* parties, it will not be an integral part of that management process.

There is no ESA recovery plan addressing spring Chinook in the Okanogan. The Okanogan subbasin was excluded from the critical habitat designation for the UCR Spring Chinook ESU.

A comprehensive ESU-wide plan for the propagation of spring Chinook in the Columbia Cascade Province 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. This plan omitted any activities related to spring Chinook in the Okanogan sub basin. The BAMP provides a framework for managing spring Chinook in the Wenatchee, Entiat, and Methow rivers. Given the precarious state of these endangered populations, the BAMP provides a "spread the risk" strategy for application of artificial propagation to aid in their recovery.

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 spring 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 C).

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

Spring Chinook management in the Okanogan River and in the Columbia River above its confluence was omitted from many of the recent salmon management plans and agreements addressing the Columbia River Basin and the Mid-Columbia River region.

Spring Chinook management in the Okanogan River and in the Columbia River above its confluence was not addressed in the now expired Columbia River Fish Management Plan adopted pursuant to *US v Oregon*.

Spring Chinook management in the Okanogan River and in the Columbia River above its confluence was not addressed in the draft Mid-Columbia River Hatchery Program of the Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects.

The Okanogan River and the Columbia River above its confluence was not included as critical habitat in the Federal government's listing of Upper Columbia River Spring Chinook as an endangered species pursuant to the Endangered Species Act. The role of the Okanogan River in recovery of listed spring Chinook will be an issue for NMFS' Technical Recovery Team.

However, by letter of June 8, 2000, the Bureau of Reclamation agreed that hatchery mitigation associated with the construction of Grand Coulee Dam in 1937 was never fully implemented. According to the Bureau, "…hatcheries were to be used to mitigate for the loss of 'upper Columbia River migratory fish runs' by providing greater production in the 'lower tributaries' – the Wenatchee, Entiat, Methow, and Okanogan." The obligation still exists, and will be pursued.

The Colville 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 key management tool for managing harvest of spring Chinook in the project area will be the marking protocols. All spring Chinook in Phase I of the Isolated Harvest Program will be uniquely marked (adipose fin clip) and 42% coded wire tagged (for evaluation purposes). The adipose fin clip will allow these fish to be distinguished from hatchery-origin and natural-origin UCR Spring Chinook that are ESA-listed. All spring Chinook released in Phase I of the Integrated Recovery Program will not be adipose fin clipped, but will be 100% coded wire tagged. This marking protocol will protect them from

selective fisheries, but allow their differentiation from natural-origin fish returning to the Okanogan River and from UCR Spring Chinook.

In conjunction with this production program, the Colville Tribes and WDFW plan on initiating selective fisheries in the Okanogan and Similkameen rivers, in the tailrace of Chief Joseph Dam and in the Wells Pool, near the confluence of the Okanogan, targeting on these Carson-stock fish. During the Phase I, Step A timeframe of this Isolated Harvest Program, the goal of the harvesting activities will be to remove all adult fish from the waters of the Okanogan subbasin for ceremonial, subsistence, and recreational purposes. During the Phase I, Step B timeframe of the program, broodstock will also need to be collected to support production activities at Chief Joseph Dam Hatchery.

Spring Chinook originating from Phase I of the Integrated Recovery Program will be 100% coded wire tagged, but not adipose fin clipped. Harvest of these fish in Omak Creek, and possibly later in Salmon Creek, will only be allowed for ceremonial and subsistence purposes in the highest run years.

The Colville Tribes will be pursuing development of selective fishing gear through the Columbia Cascade Provincial Review. A proposed project, #29042, was submitted for BPA funding. The purpose of this project is to develop, test, and deploy selective fishing gear. The goal of this project will be to maximize the harvest of the adipose fin clipped spring Chinook with minimal impact on listed steelhead, natural-origin summer/fall Chinook, and spring Chinook from the Integrated Recovery Program. The timing and location of spring Chinook fisheries and allowable gear will minimize mortality of steelhead, unmarked spring Chinook, and natural-origin summer/fall Chinook.

Related to research on testing live-capture, selective fishing gear, the Colville Tribes are proposing research in the upcoming Master Plan on Chief Joseph Dam Hatchery to use similar gears to collect summer/fall Chinook broodstock. This research should also provide important information on the use of live-capture gear for purposes of harvesting spring Chinook.

Spring Chinook bound for the Okanogan and the Columbia River above its confluence will be passing through Columbia River fisheries managed pursuant to the Columbia River Compact and *US v Oregon*. Okanogan River fisheries are not included in any existing harvest plan or regulations as this is a new program. From 1988 to 1999, 86% of the harvest of Carson stock spring Chinook returning to Leavenworth NFH occurred in the Wenatchee subbasin while 14% occurred in all other fisheries (USFWS, 2002). With the recent advent of selective recreational fisheries and larger runs, this harvest distribution has likely changed in more recent years. A harvest distribution similar to that for Leavenworth NFH fish would be expected for spring Chinook released into the Okanogan River and below Chief Joseph Dam. Future negotiations for harvest management in *US v. Oregon* will need to specifically account for Colville Tribes' and recreational harvest in the Columbia Cascade Province.

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) Columbia River Zone 1-5 commercial fishery
2) Columbia River Zone 1-6 recreational fishery
3) Columbia River Zone 6 tribal C&S and commercial fisheries
4) Mid-Columbia River recreational fisheries
5) Upper Columbia and Okanogan rivers Colville Tribal C&S fisheries
6) 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 (#5 and #6, above).

Based on recent harvest rates of Carson stock, the following adult allocations can be expected to benefit fisheries to the extent indicated:

	Carson Stock Spring Chinook
U.S. Ocean Sport & Comm.	0%
Col. River Sport	1.3%
Col. River N-T Comm.	0.7%
Col. River Treaty	13%
Okanogan Tribal C&S	60%
Okanogan Sport	25%
Escapement	0%

The primary purpose of the Isolated Harvest Program is to recreate tribal ceremonial and subsistence fisheries and recreational fisheries in the Okanogan subbasin and upper Columbia River. The spring Chinook release from this program will be the only adipose fin clipped spring Chinook returning to above Wells Dam. The Phase I goal of this harvest program is to return 1,600 to 5,600 adult spring Chinook to the Okanogan and upper Columbia rivers. Given this expectation, selective harvest would be based on the following allocation:

Table 2. Future Tribal & Recreational Selective Harvest of Spring Chinook Above Wells Dam

Wells Dam Ad-Clip Chinook Count April 1 – June 30	Maximum CCT Ad-Clip Chinook Harvest	Maximum Recreational Ad-Clip Chinook Harvest
< 1,500	< 1,500	0
1,500 – 2,000	1,500	500
2,001 – 3,000	2,500	500
3,001 – 4,000	3,250	750
4,001 – 5,000	4,250	750
5,001 – 6,000	5,000	1,000
> 6,000	80%	20%

During the spring Chinook fishery and subsequent summer/fall Chinook fishery, tribal incidental harvest of UCR Steelhead will be based on the following guidance:

Table 3. 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

During the spring Chinook fishery, tribal and recreational fishermen could catch unmarked spring Chinook. The unmarked fish could originate from the Integrated Harvest Program in the Okanogan subbasin or from hatchery and natural production in the Methow River. Mortality of unmarked spring Chinook would be managed based on the following guidance:

Table 4. Tribal & Recreational Incidental Take Thresholds for Unmarked Spring Chinook

Wells Dam Count Unmarked Spring Chinook April 1 – June 30	Maximum CCT Take	Maximum Recreational Take
< 1,000	1%	0%
1,000 – 2,000	3%	0.5%
2,001 – 3,000	5%	1%
3,001 – 8,000	7%	2%
8,001 – 10,000	10%	3%
> 10,000	15%	5%

3.4) Relationship to habitat protection and recovery strategies.

The major factors affecting natural production of all species in the Okanogan subbasin 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 subbasin. 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 spring 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 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.

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 spring Chinook.

Comprehensive habitat restoration has been initiated in the Okanogan subbasin to provide functional habitat conditions again for salmon and steelhead. The Colville Confederated Tribes are working in cooperation with the Okanogan Irrigation District to restore flows in lower Salmon Creek, Project # 199604200. The Tribes have initiated a broad effort of riparian, stream channel, and uplands improvements in the Omak watershed to improve flows and habitat quality, Project # 200000100.

A Subbasin Summary has been completed (Golder 2001) and a Subbasin Plan will follow that will provide a comprehensive approach to stream flow restoration, water quality improvement, diversion screening and passage improvements, and riparian habitat restoration. In conjunction with this planning, the Colville Confederated Tribes have submitted several project proposals in the Columbia Cascade Provincial Review to improve habitat and fisheries management throughout the Okanogan subbasin. These proposals include:
#29001 – Evaluation of 1872 water rights
#29007 – Determine sources and solutions to poor water quality
#29008 – Adult passage counting and trapping at Zosel Dam
#29016 – Thermal imaging of the Okanogan River
#29017 – Mastering planning for habitat restoration
#29032 – Okanogan Basin water strategy
#29033 – Design and conduct monitoring and evaluation of Okanogan natural production

3.5) Ecological interactions.

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 subbasin using various state-of-the-art methods. The following table summarizes this information:

Table 5. Estimated Carrying Capacity of Natural-Origin Anadromous Fish – Okanogan Subbasin*

Species	Smolt Capacity	Recent 10-yr Ave.	Percent Capacity
Summer 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)

The low carrying capacity for Okanogan steelhead results from the degraded state of habitat in tributary streams and the intolerable temperatures for over-summering steelhead in the mainstem Okanogan River. The tributary habitats critical to steelhead will not be utilized by hatchery-origin spring Chinook.

The carrying capacity of the Columbia River and its estuary for migrating smolts 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 spring Chinook program will be monitored and evaluated pursuant to this HGMP and is reflected in a comprehensive research 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 Ellisforde acclimation pond will be much lower than standard propagation standards thereby reducing the opportunity for disease outbreaks. The volitional release strategy for this pond should also minimize interactions with other species 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.

All 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 15/pound, and being released in early April, the only natural-origin steelhead they should encounter would be of sufficient size that the hatchery-origin fish would not prey upon them. At this time of year, listed steelhead would be either residing in tributary streams as sub-yearlings or rearing and migrating in the Okanogan River as larger yearling fish. Predation could occur on newly emerged summer/fall Chinook from the Okanogan River. 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 will be examined in the M&E program. A more thorough discussion of competition and predation risks can be viewed in the BAMP (Bugert 1998).

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.

Several water supplies would be used in these spring Chinook programs as a number of rearing and acclimation facilities would be used. Descriptions of the water supplies are as follows:

Phase I, Step A

Egg take and early incubation - will occur at Leavenworth NFH from spawning in late August and early September until transfer to Little White Salmon NFH after egg eyeing in October. Leavenworth NFH obtains its water from several sources: surface waters from Icicle Creek (18,900 gpm), water from Nada and Snow lakes (16,000 af), and groundwater from several wells (6,700 gpm) (USFWS 2002).

For the Omak Creek Integrated Recovery Program, egg take and early incubation would occur at Colville Trout Hatchery. Water to the hatchery is supplied by local wells.

Late egg incubation, fry and fingerling rearing – will occur at Little White Salmon/Willard NFH Complex. Little White Salmon NFH has water rights totaling 33,868 gpm from the river and springs.

Pre-smolt rearing and acclimation – will occur at Ellisforde Pond and Colville Trout Hatchery from late October until early April of the following year. Ellisforde Pond is supplied by 6 pumps producing up to 30 cfs at ambient river temperatures from the Okanogan River. The pumps are screened with 3/32" wedge wire. Water temperatures should range from the 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.

A proposed acclimation pond at Colville Trout Hatchery would be served from an existing, on site well and from a new pump from the Columbia River. Waters from the two sources would be mixed to provide optimal rearing temperatures in the pond. The acclimation facility would require a total of 4,000 gpm from both sources. Water temperatures in the Hatchery's wells are about 6 months off from those in the river, thereby providing warmer winter flows and cooler summer flows to mix with ambient river temperatures.

Acclimation of up to 50,000 spring Chinook will also occur at St. Mary's Mission Pond. This pond is served by a screened gravity feed from Omak Creek and a well that delivers up to 550 gpm. Water from either or both sources is used to provide the rearing fish with an optimum temperature regime and suitable water quality. Well water is used when necessary to avoid frazil ice.

Phase I, Step B

With construction of Chief Joseph Dam Hatchery's spring Chinook facilities, incubation and rearing of all spring Chinook will occur at this facility. Water will be supplied from Lake Rufus Woods (22 cfs) and an aquifer located above Chief Joseph Dam (16.5 cfs). Waters from these sources will be mixed to achieve desired temperatures.

Pre-smolt rearing and acclimation will continue at St. Mary's Mission and Ellisforde ponds. Acclimation might also occur, on an experimental basis, in Osoyoos Lake immediately above Zosel Dam, from late October until early April using floating net pens. Flow through the net pens would depend on currents derived from flows past Zosel Dam. Water quality would be ambient in the lake. Acclimation at the Colville Trout Hatchery, carried out in Step A, would be terminated. This pond could then be available for summer/fall Chinook acclimation or production.

Pre-smolt rearing and acclimation may also occur at a future date in Salmon Creek at the Okanogan Irrigation District's diversion dam. Fish would be acclimated to Salmon Creek surface waters.

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.

1. Leavenworth National Fish Hatchery: Endangered Upper Columbia River Steelhead use Icicle Creek in the vicinity of the hatchery. The hatchery intake is currently not in compliance with screening criteria. USFWS is addressing options for upgrading the intake and water delivery system. This action is being addressed in a separate Biological Assessment (USFWS 2002).
2. Little White Salmon National Fish Hatchery: No listed natural fish reside in the Little White Salmon River or in the springs from which the hatchery obtains its water supply.
3. Ellisforde Pond: Listed Upper Columbia River Steelhead may reside in the Okanogan River at the pond site. The water intake is screened to NOAA screening criteria.
4. Colville Trout Hatchery: Endangered Upper Columbia River Steelhead adults and endangered Upper Columbia River spring Chinook adults are known to wander up the Columbia River in the vicinity of the hatchery. None are known to, or would be expected to spawn or rear in the area. A water intake to the river would be screened to meet NOAA criteria.
5. St. Mary's Mission Pond: Listed Upper Columbia River Steelhead reside in Omak Creek near the pond site. The water intake is screened to NMFS screening criteria.
6. Chief Joseph Dam Hatchery: The hatchery will not be taking water from critical habitat and will therefore not affect listed species.
7. Osoyoos Net Pen: Some listed Upper Columbia River Steelhead migrate through Osoyoos Lake to tributary spawning and rearing waters. Adult and juvenile steelhead may pass near experimental net pens during their migrations. The net structures or water quality near the pens should not affect steelhead survival or behavior.

Effluent from all hatcheries and acclimation ponds will be monitored and kept within discharge thresholds.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Phase I, Step A:
During this initial phase of the Isolated Harvest Program, broodstock will be collected at Leavenworth NFH. Broodstock used for production are volunteers to the facility. Adults swim up the collection ladder and into one of two holding ponds. The holding ponds measure 15 x 150 feet, and are joined in the middle by an adjustable slide gate. The gate is opened, and adults are allowed to enter the second pond during sorting, counting, etc. The holding ponds supply attraction water for the ladder (USFWS 2002). The fish ladder and trap at Leavenworth NFH are typically operated from late May through early or mid June. The spring Chinook-directed trapping operation extends into July in some years (USFWS 1999).

The Leavenworth program requires about 1,000 brood fish. Collection would need to be initially increased by up to 324 fish (286 for Isolated Harvest Program and up to 38 for the Integrated Recovery Program).

An annual average of 1,282 spring Chinook adults trapped at Leavenworth NFH are surplus to broodstock collection and juvenile hatchery fish production needs. These surplus spring Chinook salmon have been routinely distributed in unspawned condition to tribal and non-profit groups, including the Yakama Indian Nation and Colville Confederated Tribes for ceremonial and subsistence purposes. Trout Unlimited, a private fish conservation organization, has also received surplus spring Chinook salmon adults for various functions to raise money for fish restoration purposes (Dan Davies, USFWS, pers. comm.). Again, spawned-out carcasses are typically buried to reduce the potential for fish disease transmission (USFWS 1999), although carcasses may also be distributed in natural production areas for stream enrichment purposes.

For the Integrated Recovery Program, up to the full 38 broodstock would be trapped at a proposed weir in lower Omak Creek. These fish would be transported to Colville Trout Hatchery for holding in two temporary 22' diameter tanks served by 47º F to 52º F well water. Eggs would be later transported to Willard NFH for hatching and rearing.

Adult spring Chinook will be collected per the protocol described in Table 6 and assuming an initial natural escapement goal for Omak Creek of 200 adults and an initial proportion of natural-origin to hatchery-origin fish in the run of 50%.

Table 6. Broodstock Collection Protocol for Omak Creek

Spring Chinook Return to Omak Creek	Max. % Broodstock Natural-Origin	Max. % of Natural Origin Fish in Broodstock
<50	0%	0%
50 – 100	25%	20%
100 – 200	50%	30%
>200	100%	50%

Rebuilding a spring Chinook population in Omak Creek and other historical habitats in the Okanogan subbasin 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 spawning population should be managed to maximize 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 7) 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 and Omak Creek habitat rehabilitation still in its early stages, 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 reintroduction program, 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. For example at this time, the likely proportion of natural-origin spring Chinook in future Omak Creek runs is highly speculative.

Table 7. Desired Proportion of Naturally-Spawning, Hatchery-Origin Spring Chinook Adults in Omak Creek *

	Short-Term Max. % Hatchery-Origin	Long-Term Max. % Hatchery-Origin
Omak Cr. Escapement < 100	100%	100%
Omak Cr. Escapement 100 – 200	100%	50%
Omak Cr. Escapement 200 – 300	75%	30%
Omak Cr. Escapement > 300	50%	20%

* Assumes in the long-term that the run is about 50% natural-origin fish and the initial escapement goal of 200 adults

It will take a number of years to correlate an expected run size into Omak Creek to passage at Wells Dam or catch rate in the Tribes' selective fisheries. Therefore precise management of the proportion of hatchery-origin fish allowed in the escapement will be difficult.

Phase I, Step B:
With the construction of Chief Joseph Dam Hatchery, adult holding, egg incubation, and rearing of all spring Chinook will be transferred to this new facility. Broodstock needs will increase to 644 to rear the full Phase I objective of 900,000 smolts.

Broodstock for the Isolated Harvest Program will be collected by three means. Chinook will enter a fishway and trap at the hatchery, be trapped at proposed facilities at Zosel Dam, or be taken by live-capture fishing gear in the Okanogan and Columbia rivers. The ladder at the hatchery will be operated from May through November to allow entry of spring and summer/fall Chinook. While broodstock will be collected from throughout the run, an emphasis may be placed on the earlier arriving spring Chinook. This potnential selection might be attempted to create a spring Chinook run that would return prior to high summer water temperatures. Earlier returning spring Chinook would also provide for better separation in fisheries between spring and summer run Chinook. A decision to emphasize earlier returning Chinook in the broodstock will be informed by the 2004 to 2007 adult spring Chinook returns from experimental releases made in the Okanogan River and Omak Creek. Fish excess to spawning needs will be distributed to tribal members.

Broodstock for the Integrated Recovery Program will continue to be collected from fish returning to Omak Creek, supplemented, when needed, with spring Chinook captured (in priority order) at Zosel Dam, in the Okanogan River with live-capture gear, or at the hatchery. A weir is being constructed in Omak Creek for Chinook and steelhead management.

Phase II:
In Phase II, an Integrated Recovery Program and an Integrated Harvest Program will be operated using Methow Composite stock surplus to needs at Winthrop NFH and Methow State Hatchery. Prior to initiation of Phase II, this HGMP will be revised and updated to reflect current information. Broodstock collection will initially occur at the two hatcheries on the Methow River, but will shift to the Okanogan River to promote a locally adapted broodstock.

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

Broodstock collected at Leavenworth National Fish Hatchery are collected on station and require no transportation.

The small numbers of broodstock collected at Omak Creek will be transported via a pickup truck with an aerated holding tank to holding facilities at Colville Trout Hatchery, located about 30 miles distant.

Eyed eggs of spring Chinook collected at Leavenworth NFH and Colville Trout Hatchery will be transported in October to Little White Salmon NFH for hatching and rearing. In October of the following year, the sub-yearling spring Chinook (at about 25/pound) will be transported back to Colville Trout Hatchery, Ellisforde Pond and possibly experimental Osoyoos Lake net pens. Egg transportation will be conducted by USFWS. Transportation of the sub-yearling Chinook will be undertaken using standard fish transport trucks.

5.3) Broodstock holding and spawning facilities.

At Leavenworth NFH, all adults are held in two 15 x 150 foot concrete ponds. The spawning building sits next to the holding ponds. This area has access to pathogen-free well water, which is used in the spawning process. After the gametes are mixed, the enumerated egg buckets are taken inside the hatchery building (USFWS 2002).

At Colville Trout Hatchery, adults will be held in two 22' diameter circular tanks, filled to a depth of about 3 feet (8,500 gallons). About 150 gpm of water will be supplied to each tank providing a turnover rate of about 1/hour.

At the proposed Chief Joseph Dam Hatchery, adult spring Chinook collected for broodstock will be held in 2 raceways (10' x 80' x 5') with a total capacity of about 8,000 cubic feet. Minimum water flow will be 1 gpm/fish or at least 1 pond turnover per hour.

5.4) Incubation facilities.

Leavenworth NFH: From fertilization to the eyed stage, eggs are in individual bucket incubators receiving one gallon per minute of ground water. Throughout the incubation period, eggs are treated daily with 1,667 ppm of formalin for fungus control. During the eyed stage, eggs are culled for BKD, mortalities picked and the remaining eggs enumerated. At this time, eggs will be transferred to Little White Salmon/Willard NFH Complex. Incubation at Leavenworth NFH may soon be altered to use standard Heath tray incubators.

Colville Trout Hatchery: Heath tray incubators will be used until the eyed stage at which point eggs will be transferred to Little White Salmon/Willard NFH.

Chief Joseph Dam Hatchery: Incubation facilities for spring Chinook at Chief Joseph Dam Hatchery will be designed to serve 1.125 million eggs. A Heath incubator will be provided for each female's eggs (4,400) therefore requiring 256 trays. Incubation of spring Chinook will require 7.0 gpm of disease free ground water for each half stack. Incubation water will need to be slightly chilled to achieve optimum incubation temperature of 48°F. The hatchery will include a separate incubation building.

5.5) Rearing facilities.

Willard: Following early rearing in the incubators, fry will be placed in 2 circular, fiberglass tanks (16'x 5'), 40 concrete troughs (16.4' x 1' x 0.5') and 20 fiberglass troughs (4.5' x 1.2' x 1'). Subsequent rearing will occur in 10 intermediate raceways (27.5' x 3.8' x 2') with 2,090 cu.ft. of volume and 20 production raceways (79.5' x 9.8' x 2.2') with 32,720 cu.ft. of volume (IHOT, 1995).

Chief Joseph Dam Hatchery: Spring Chinook rearing facilities will include startup tanks (3' x 40' x 2.5') for ponding at about 1,400 fish/pound. Fish will be initially reared at a density of about 0.3 pounds/cu. ft. and at 1.0 lbs./inch/gpm. In early spring, Chinook will be transferred to outdoor raceways (8' x 120' x 4') supplied by flows from the Chief Joseph Dam relief tunnel and Rufus Woods Lake.

5.6) Acclimation/release facilities.

Ellisforde Pond is an open-air pond, is 225' x 90' x 6' deep, and has 121,500 cubic feet of useable rearing volume. The Pond's water is supplied by six pumps, each delivering 5 cfs from the Okanogan River. The pond is located on the left bank of the Okanogan River at river mile 62, near the community of Ellisforde.

The Colville Trout Hatchery, located on the right bank of the Columbia River downstream from Chief Joseph Dam, would be modified to include two 1/3 acre acclimation ponds each served with 2,000 gpm of well and river water. These ponds are envisioned to be asphalt lined with concrete outlets.

Floating net pens for use in Osoyoos Lake would be 20'x 20'x 10' deep with 3,400 cubic feet of capacity. Fish would be reared at 0.5 lbs./cu. ft. Pens would be covered by a net to prevent avian predation, provide shade, and minimize unwanted human access. The pens would be located in waters where the lowest extent of a pen is at least 3 feet off the lake bottom and where water exchange in the pen would occur at least once an hour.

St. Mary's Mission Pond is 72' x 12' x 4' and served with gravity flow from Omak Creek and from a well. Either water source can provide the necessary 550gpm water supply.

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

As this is a new program, no operation difficulties or disasters have occurred. However, the extensive transportation involved with this program does have risks to the health of pre-smolts and will need to be conducted with the utmost care.

In 2001 – 2002, 254,000 spring Chinook pre-smolts were over-winter reared in Ellisforde Pond. Rearing was complicated by surface ice in the pond and by unrestricted avian predation. However, no significant mortalities occurred and the smolts were successfully released in April 2002.

In October 2002, a catastrophic loss of summer Chinook occurred at the Similkameen Pond, killing nearly all of the 360,000 sub-yearling fish. Losses were due to a parasitic protozoan, *Ichthyophthirius multifilis*, caused by Similkameen flows of only 336 cfs (compared to average flows of 712 cfs) and water temperatures of 59 degrees compared to average temperatures of 47-54 degrees. Similar conditions on the Okanogan River and at Ellisforde Pond will be avoided.

In 2003, summer Chinook transferred to Similkameen and Bonaparte ponds suffered significant mortalities. The cause of these deaths is still being investigated, but may have been due to initial acclimation water temperatures being significantly less than temperatures at Eastbank Hatchery.

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.

During Phase I of this program, unlisted fish will be reared and released with eggs obtained from Leavenworth NFH. Therefore, take of listed fish will not occur due to equipment failure, water loss, flooding, or other similar events. Take could occur indirectly from disease transmission during rearing at Little White Salmon/Willard NFH Complex. To minimize this threat, eggs will be inspected at Leavenworth NFH prior to shipment and certified disease free. Once in Little White Salmon/Willard NFH Complex, regular disease inspections and, if necessary, treatments will occur to contain disease outbreaks**.**

The USFWS has implemented disease prevention and control programs to maximize production of healthy salmon smolts. The USFWS complies with fish disease control policies as outlined by the Co-manager's of Washington Fish Health Policy (NWIFC and WDFW 1998), the Integrated Hatchery Operation Team (IHOT 1995) and the Pacific Northwest Fish Health Protection Committee (PNFHPC 1989), to promote production of healthy fish and to reduce the incidence of diseases. Leavenworth NFH implements a monthly monitoring program to detect and diagnose disease outbreaks within the facility. USFWS' general policy is to bury all adult Chinook carcasses used to provide gametes, juvenile mortalities and dead eggs as general risk minimization measures to reduce the potential for the horizontal (downstream) transmission of fish disease pathogens. Subject to disease-free certification protocols and the issuance of necessary permits, USFWS also distributes spring Chinook carcasses in natural spawning areas for nutrient enhancement purposes.

At Chief Joseph Dam Hatchery, a disease prevention and control program will be developed to implement the Washington Fish Health Policy and the guidance of the Pacific Northwest Fish Health Protection Committee. This program will be prepared concurrent with final hatchery design and construction.

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.

During Phase I of the Integrated Recovery and Isolated Harvest programs broodstock will be supplied from spring Chinook voluntarily returning to Leavenworth NFH and excess to that program's needs.

The history of broodstock is reflected in Table 8.

Table 8. History of Leavenworth NFH Broodstock*

Egg Source	Broodyear	Stock Origin
Rock Island Dam	1940 - 1943	Commingled Upper Columbia
McKenzie River, OR	1941	McKenzie River
Icicle Creek	1947, 58-63, 69, 71, 74, 76 to present	Volunteers to hatchery
Willamette River, OR	1965	Willamette River
Eagle Creek NFH	1966	Eagle Creek
Carson NFH	1970-73, 75-81, 85	Bonneville Dam
Cowlitz River, WA	1974, 76	Cowlitz River
Little White Salmon NFH	1974, 77-79	Little White Salmon River

* from the Leavenworth NFH HGMP

There are no wild or naturally spawning spring Chinook in the Okanogan subbasin.

During Phase II of both the Integrated Recovery and Isolated Harvest Programs, the unlisted Carson stocks will be replaced by endangered spring Chinook of the Methow Composite Stock from excess escapement at Methow State Hatchery and Winthrop National Fish Hatchery. This transition from unlisted Carson stock to listed Methow Composite stock will occur only if the listed fish can be introduced into the Okanogan subbasin and upper Columbia River as an experimental population, without take prohibitions that would limit tribal and recreational fishing and activities affecting habitat. With replacement of the Carson stock with the Methow stock, the Isolated Harvest Program will also transition to an Integrated Harvest Program.

6.2) Supporting information.

6.2.1) History.

From (citation):
Leavenworth NFH collects, rears, and releases non-listed spring chinook salmon into Icicle Creek, a Wenatchee River tributary. Leavenworth NFH spring chinook are primarily derived from a mixed lineage spring Chinook salmon broodstock originally maintained at Carson NFH, a USFWS facility located on the Wind River, a lower Columbia River tributary (Myers et al. 1998). The Leavenworth NFH is the only permanent Federal facility operating in the Wenatchee River Basin. Carson NFH spring Chinook stock was established in the 1950s through the collection of broodstock from the spring Chinook run-at-large at Bonneville Dam, the most seaward dam on the mainstem Columbia River. The majority of these fish were likely Snake River Basin-origin fish, although other populations from rivers in the upper and middle Columbia River regions were also significantly represented (Myers et al. 1998, quoting Hymer et al. 1992). In addition to transfers of Carson NFH-lineage stock(s), the present spring Chinook stock propagated at Leavenworth was established through large transfers of spring stocks from other non-local sources, including Little White Salmon NFH, WDFW's Klickitat Hatchery, and WDFW's Cowlitz Hatchery. WDF et al. (1993) identified the Leavenworth NFH spring Chinook stock as of mixed, non-local stock ancestry. Genetic evaluations by WDFW determined that the Leavenworth stock is primarily derived from Carson NFH stocks (Marshall et al. 1995).

In the "Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California" (Myers et al. 1998), NMFS reviewed the history of Upper Columbia River salmon populations at some length and concluded that substantial genetic homogenization of Upper Columbia River spring Chinook (as well as other species) must have occurred during the Grand Coulee Fish Maintenance Project (GCFMP) in the late 1930's and early 1940's. However, NMFS concluded that the indigenous spring Chinook in the Upper Columbia River tributaries still represented an important genetic resource, containing the last remnants of the gene pools for Columbia River headwater populations (Myers et al. 1998). Widespread transplants of non-native Carson stock spring Chinook salmon were cited by the BRT as a cause of concern (Myers et al. 1998). Subsequently, the BRT and a work group from the NWFSC's Conservation Biology Division (CBD) concluded that the Carson-origin stocks propagated at the Leavenworth, Entiat and Winthrop NFH's were not biologically part of the Upper Columbia River spring Chinook salmon ESU (CBD 1999). This conclusion was based primarily on the history of the broodstocks and on recommendations from WDFW and the USFWS. NMFS CBD findings regarding the non-native status of Carson-lineage fish, and threats to the native spring Chinook populations posed by programs producing them, were documented in the NMFS "endangered" listing decision for the ESU (NMFS 1999 - 64 FR: 14308 - March 24, 1999). The listing decision specifically identified concerns regarding straying of non-indigenous Carson stock into natural spawning areas and resultant potential adverse genetic introgression effects. In it's ESA listing decision, NMFS determined that the Leavenworth NFH spring Chinook salmon stock is non-local, and not part of the Upper Columbia River Evolutionarily Significant Unit (ESU) (FR 64: 14308 - March 24, 1999).

6.2.2) Annual size.

Phase I, Step A:
Isolated Harvest Program – 286 adults
Integrated Recovery Program – 38 adults
Phase I, Step B:
Isolated Harvest Program – 570 adults
Integrated Recovery Program – 74 adults

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

From Leavenworth NFH HGMP:
"Adults used for broodstock are assumed to be hatchery fish. Currently, all adults retained for brood are spawned. Staff collects snouts from all ad-clipped adults, and scales from a portion of ad-present fish. Origin (natural or hatchery) of these adults can be determined by scale analysis and de-coding of the CWT. Since 1994, only one confirmed "natural" fish has been included in production. This was not determined until post spawn because CWT's and scales were not read until weeks latter. This fish originated from the Chiwawa Rearing Ponds (WDFW)."

As natural production is restored to Omak Creek, natural –origin fish will be included in the broodstock as specified in Table 6. In Phase I, a maximum of 74 natural-origin, Carson stock fish could be collected.

6.2.4) Genetic or ecological differences.

Spring Chinook in the Okanogan are extinct. There are no natural stocks in the subbasin. There are no genotypic, phenotypic, or behavioral information on the extinct population(s).

6.2.5) Reasons for choosing.

For Phase I programs, Carson stock is chosen since it is available in the Columbia Cascade Province and has a history of relative success in the hatchery environment. The stock has been propagated for over 50 years in the Columbia Cascade Province. Its productivity rate varies substantially based on the spring migration conditions at Columbia River dams and with conditions in the marine environment. It is an early returning spring Chinook, a trait that will be critical for returning to the Okanogan River before water temperatures reach excessive levels in July.

For the Phase II programs, Methow Composite stock is chosen as it has evolved in the subbasin most proximal to the Okanogan. This stock may be available in the future given that two hatcheries use it for broodstock and may have production capacities greater than the needs of the Methow subbasin. The Methow stock may also still harbor some of the genetic material from spring Chinook originally evolved in the Okanogan subbasin.

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

There are no risks to listed natural fish in the Okanogan subbasin from broodstock selection as spring Chinook are presently extinct in the Okanogan subbasin. There is no indigenous population.

Initial use of Carson stock can, however, have genetic risks to listed populations of spring Chinook in other basins, particularly the Methow River. These risks arise in two ways. First, the Carson stock from the Okanogan programs could stray into the Methow and spawn with listed Chinook. Straying could be caused by inadequate acclimation in Okanogan waters, or excessive water temperature in the Okanogan causing Carson stock to seek other holding and spawning habitat. Secondly, Carson stock from the Okanogan may be misidentified and included in Methow broodstock if collected at Wells Dam.

These risks will be minimized by 1) initiating the Okanogan programs with smaller releases to gather risk and other information prior to ramping up to full production levels, 2) marking all hatchery-origin Carson stock, 3) emphasizing early arriving adults in the broodstock to build the isolated harvest program with fish that will likely return prior to occurrence of excessive water temperatures at the mouth of the Okanogan, 4) using trap nets near the mouth of the Okanogan to harvest hatchery-origin fish and collect broodstock, thereby preventing later straying, 5) acclimating all hatchery-origin fish to Okanogan and upper Columbia waters for a minimum of 150 days prior to release, and finally 6) transitioning over to Methow Composite stock upon its availability.

Naturally produced Carson stock originating from the Integrated Recovery Program in the Okanogan will not be readily distinguishable from Methow stock at Wells Dam. Risks of these fish being included in Methow broodstock will be minimized by 1) eventually collecting Methow broodstock in the Methow subbasin, 2) monitoring the success of natural spawning in the Okanogan subbasin and marking natural-origin smolts should their numbers become excessive, and 3) transitioning to Methow Composite stock upon its availability. Initially, the numbers of unmarked, adult, natural-origin Carson stock Chinook arising from the Omak Creek program should be very small in comparison to numbers of returning Chinook to the Methow subbasin.

In Phase II, when Methow Composite stock is used in the Okanogan subbasin, the program will use adults returning to the Okanogan for broodstock. If successful, this new population can be expected to eventually adapt to Okanogan habitat and evolve separately from the original Methow subbasin population. Based on the information gained in the ensuing decades, straying into the Methow subbasin should be manageable to no greater than natural rates.

SECTION 7. BROODSTOCK COLLECTION

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

Adult fish for both the Isolated Harvest and Integrated Recovery programs will be collected for broodstock.

7.2) Collection or sampling design.

Phase I, Step A

For both the Isolated Harvest and Integrated Recovery program, broodstock will initially be obtained from adults voluntarily entering Leavenworth NFH. This collection occurs from mid-May to mid-July, covering the full spectrum of the run.

For the Isolated Harvest program, broodstock will be chosen from throughout the run with an emphasis on the earlier portion of the run to the extent feasible. This emphasis on the early portion of the run will be done in an attempt to have spring Chinook return to the Okanogan River prior to late June when water temperatures could become excessive.

For the Integrated Recovery Program, broodstock will be collected from Omak Creek per the protocol outlined in Table 6. Within this protocol, efforts will be made to collect the necessary fish randomly from throughout the run. Escapement can be expected to be highly variable. When escapement is inadequate, broodstock will be supplemented from fish returning to Leavenworth NFH using procedures normal for Leavenworth NFH.

Phase I, Step B

With construction of spring Chinook facilities at Chief Joseph Dam Hatchery, broodstock for the Isolated Harvest Program will be collected via a fishway and trap at the new hatchery. Broodstock will be supplemented from fish taken at Leavenworth NFH only if shortages occur. The recovery program will still obtain its broodstock from Omak Creek.

7.3) Identity.

In Phase I, all spring Chinook in the Okanogan subbasin will be Carson stock. All hatchery-origin fish will be adipose fin clipped to distinguish them from natural-origin fish. About 42% of spring Chinook releases will be coded-wire tagged. The fin clips will distinguish the hatchery-origin Carson stock from spring Chinook destined for the Methow River.

The early timing of the spring Chinook returning to the Okanogan River and the Columbia River below Chief Joseph Dam will segregate most of them from later arriving summer/fall Chinook, although some overlap can be anticipated. The spring Chinook will be distinguishable from natural-origin summer/fall Chinook by the fin clips.

Hatchery-origin summer/fall Chinook and the Carson stock spring Chinook will both be fin clipped. Interactions of these fish will need to be ascertained by inferences from reading the coded-wire tags. These interactions will be the subject of the M&E program.

When Methow Composite stock becomes available it will be acclimated and released into Omak Creek (and possibly Salmon Creek) as an Integrated Recovery program. These fish will not be adipose fin clipped, but will be 100% coded wire tagged. If feasible, these fish may also receive an external mark other than a fin clip. At that time, planting of Carson stock will be discontinued. All marked Chinook (Carson stock) will be removed. Natural-origin Carson fish will also be removed when distinguishable from Methow stock by age-class (size). This procedure should limit the introgression of Carson stock during the transition period.

Later, as more Methow Composite stock becomes available, they will replace the Carson stock in the Isolated Harvest Program (will also convert to an Integrated Harvest Program). These two populations will be distinguishable in the interim because all Carson fish will be adipose fin clipped and Methow Chinook will not. After the Carson stock is fully replaced, natural-origin and hatchery-origin Methow Composite stock will be distinguishable by adipose fin clipping of the hatchery-origin fish.

7.4) Proposed number to be collected:

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

Phase I Integrated Recovery Program:	38 adult fish increasing to 74 fish.
Phase I Isolated Harvest Program:	286 adult fish increasing to 570 fish.

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

These are new programs with no history of prior brood stock collection.

For the Leavenworth NFH, broodstock has been collected in the numbers shown in Table 9.

Table 9. History of Spring Chinook Broodstock Collection at Leavenworth NFH*

Year	Adults Females	Males	Jacks	Eggs Taken	Juveniles released
1988	851	852		3,811,000	3,725,211
1989	1,309	629	7	6,086,752	4,585,370
1990	1,147	863	10	5,002,287	3,055,636
1991	981	527	19	3,027,595	2,288,631
1992	493	489	4	2,075,629	1,522,846
1993	510	510		1,914,216	1,712,648
1994	460	462	10	2,361,879	1,706,060
1995	212	167	29	965,402	919,025
1996	497	465	48	2,060,619	1,701,753
1997	500	452	7	2,240,533	1,636,402
1998	495	404	5	2,263,338	1,680,904
1999	469	383	40	1,892,607	1,630,089

* from Leavenworth NFH HGMP, data source: Hatchery records. Note: broodstock numbers vary because production numbers and protocols have changed over the years. Also, not all fish were released as smolts (some fry, etc.).

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

From Leavenworth NFH HGMP: "Under an agreement with Bureau of Indian Affairs, adults collected in excess of broodstock needs are donated to various tribes for ceremonial and subsistence purposes. A small portion also goes to non-profit groups."

At Chief Joseph Dam Hatchery, any additional fish surplus to broodstock needs will be provided to tribal members for ceremonial and subsistence purposes.

7.6) Fish transportation and holding methods.

From Leavenworth NFH HGMP:
"All adults used for broodstock are volunteers to the hatchery. No adults are transported to the facility. Adults swim into two 15' X 150' adult holding ponds. Adults may be held up to three months before spawning. A flow-through formalin treatment is administered daily to help control parasites and fungus. Treatment procedures are

consistent with the protocols outlined in INAD permit #9013."

At Omak Creek, adult fish trapped during Phase I, Step A, will be anesthetized and transported in an aerated tank mounted in a pickup truck to Colville Trout Hatchery. During Step B, these fish will be transported to Chief Joseph Dam Hatchery.

7.7) Describe fish health maintenance and sanitation procedures applied.

From Leavenworth HGMP:
"Fish health services are provided by staff from the USFW Services Olympia Fish Health Center (OFHC) which is a full service aquatic health facility capable of monitoring, diagnostic, and certification procedures that meet or exceed all national, international, IHOT or co-manager requirements.

Pathogen and disease monitoring start with adult testing of captured populations for all reportable aquatic viruses and bacteria at the minimum assumed pathogen prevalence level of 5% (i.e. 60 individuals). For the past 10 years, the actual sampling has been a minimum of 210 adults (60 males and 150 females) for these pathogens. In addition, all females spawned are specifically and individually tested for *Renibacterium salmoninarum*, the causative agent of bacterial kidney disease (BKD). This is essential to determine the pathogen levels and eliminate or segregate the resulting eggs from different risk levels. This process greatly reduces the impact of transmission of disease from infected females to progeny. All eggs and accompanying containers are disinfected with iodine solution during the water hardening process following fertilization.

Juveniles are monitored throughout the rearing period by monthly visits by fish health biologists for routine purposes. More frequent diagnostics are performed if hatchery staff notices undue mortality or morbidity. Disease outbreaks are prevented or treated by legal application of appropriate chemicals or by modification of rearing parameters. During the rearing period, fish culture equipment is rinsed in disinfectant following use in each pond. Bird exclusion devices are used on all rearing units to minimize the spread of disease through bird predation. At the end of the rearing period, all production lots are again tested for reportable pathogens at the minimum assumed prevalence level of 5% prior to release."

When spring Chinook facilities are approved for construction at Chief Joseph Dam Hatchery, fish health protocols will be developed based on the latest procedures used at spring Chinook facilities in the Columbia Cascade Province and reported in the scientific literature.

7.8) Disposition of carcasses.

From Leavenworth NFH HGMP:
"Since all females are injected with Erythromycin prior to spawning, they cannot be placed into basin tributaries for nutrient enhancement. These adults are buried on-site in an earthen pit. Since 2000, all post-spawn adult male carcasses are scatter planted in

several basin tributaries for nutrient replacement under permits obtained from WDFW and FWS."

Similar procedures will be applied for fish spawned at Chief Joseph Dam Hatchery. Carcasses will be distributed in the Okanogan River, Omak Creek or placed in the Columbia River below Chief Joseph Dam. Carcasses will only be placed into the select rivers and creeks 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.

No listed fish are collected at Leavenworth NFH.

No listed Chinook occur in the Okanogan River or Omak Creek.

Upon operation of Chief Joseph Dam Hatchery, any unmarked Chinook entering the hatchery trap will be promptly returned to the Columbia River.

SECTION 8. MATING

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

The following information is from the Leavenworth NFH HGMP:

8.1) Selection method.
"The fish ladder operates and adult trapping is conducted throughout the entire run. If run size is large, excess fish are periodically removed and broodstock moved to a separate holding pond in proportion to the run size. This enables us to retain adults from the entire run spectrum. All ripe females are spawned weekly. No other selection occurs."

8.2) Males.
"Milt from the primary male is used first for fertilization. A secondary male (backup), which was the primary male in the prior mating, is used again about one minute after the primary male. Precocious males (3-year-old jacks) are used randomly throughout spawning as primary and backup males."

8.3) Fertilization.
"A 1:1 female to male spawning ratio is the objective. Due to the continuous number of fish removed, and separate male and female staging areas, there is no selectivity in mating. When the abdomen of a female is opened, egg's flow freely into a colander where the ovarian fluid is decanted. Eggs are transferred to a bucket where fertilization takes place. After milt from the primary male is added to the eggs, pathogen-free well water is added. Eggs are destroyed if the female displays gross BKD lesions. Each female is given a number, which corresponds to an individual incubator and a fish health tissue sample. The ELISA (Enzyme-Linked Immunosorbent Assay) method is used to detect BKD, which takes about 30 days to process. Eggs are not combined until fish health reports are completed. Egg lots are categorized via the ELISA method, ranging from very high to no detection. Egg lots, depending on their numeric value, are segregated from others. Eyed eggs are physically shocked before egg picking begins. The undeveloped or infertile eggs remain tender and will rupture when shocked. Within a few hours, these eggs turn white and are easily identified. Due to the large number of fish returning, cryopreserved gametes and pooled and factorial mating is felt to be unnecessary."

In Step B at Chief Joseph Dam Hatchery, similar ELISA procedures will be used with each family's eggs kept separate in jar incubators until test results are reviewed. Eggs will then be transferred to Heath tray incubators with each family's eggs assigned to an individual tray.

8.4) Cryopreserved gametes.

"Not used (see 8.3)."

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 measures are applied as no adverse effects are foreseen."

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

The following quoted information is from the Leavenworth NFH HGMP:
"The goals that pertain to the Leavenworth facility are 95% survival for both green egg-to-fry and fry-to-smolt (IHOT 1995)."

9.1) Incubation:

Table 10. Spring Chinook Egg Take and Survival at Leavenworth NFH*

Year	Total eggs taken	Survival rate to eye-up
1988	3,811,000	96 %
1989	6,086,752	96 %
1990	5,002,287	96 %
1991	3,027,595	96 %
1992	2,075,629	93 %
1993	1,914,216	97 %
1994	2,361,879	93 %
1995	965,402	96 %
1996	2,060,619	97 %
1997	2,240,533	97 %
1998	2,263,338	97 %
1999	1,892,607	96 %
2000	1,917,429	97 %

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

During Phase I, Step A, when fertilized eggs will be transported from Leavenworth NFH and Colville Trout Hatchery to Little White Salmon/Willard NFH, higher mortality might be expected. Additional mortality might be initially expected at Colville Trout Hatchery as this program would be the first time for Chinook spawning at that facility.

In Step B, with operation of Chief Joseph Dam Hatchery, incubation goals will be 95% survival of green egg-to-eyed egg and 95% survival eyed egg-to-fry ponding.

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

"Surplus eggs are taken to allow for the culling of moderate to high risk BKD infected eggs. It is common practice to cull (destroy) eggs that have a very high ELISA rating. We use historical data to determine egg collection levels. The culled eggs are disposed of in an earthen pit on station property."

Similar practices will be instituted at Colville Trout Hatchery and later at Chief Joseph Dam Hatchery.

9.1.3) Loading densities applied during incubation.

"The dry-weight method is used to enumerate eggs. Several random samples of 100 eggs are taken from each basket containing several families. An average weight is obtained after combining sample eggs. Average weight is 117 eggs/ounce.

From fertilization to the eyed stage, eggs are in individual bucket incubators receiving

one gallon per minute of ground water. Throughout the incubation period, eggs are treated daily with 1,667 ppm of formalin for fungus control. During the eyed stage eggs are culled for BKD, mortalities picked and the remaining eggs enumerated. Deep troughs with trays are used for incubation to the button-up stage. Our goal is low density incubation, 1,500 eggs per tray, which is well below the IHOT recommendation of 5,000 eggs per single tray. Water flows in the deep troughs is 15 gallons per minute."

At Colville Trout Hatchery and later at Chief Joseph Dam Hatchery, eggs will be incubated in stacked Heath trays, one tray per female or about 4,400 eggs/tray.

9.1.4) Incubation conditions.

"Eggs are incubated in pathogen free (well) water. Water temperature is continuously monitored and recorded via a computer. Water temperatures are converted to temperature units for each spawning day. For the Leavenworth SCS stock, it takes about 750 temperature units to reach the eyed stage and 1,700 temperature units to the button-up stage or initial feeding.

Well water passes through a de-gassing media prior to entering the nursery. Water oxygen levels are always near saturation. When cleaning the nursery, the effluent passes through a pollution abatement facility prior to entering Icicle Creek."

Eyed eggs of spring Chinook collected and incubated at Leavenworth NFH will be transported in October to Little White Salmon NFH for hatching and rearing. Well water is used for egg incubation.

Later with construction of Chief Joseph Dam Hatchery, eggs will be incubated in Heath incubator half stacks of 8 trays and 7gpm water flow. Incubation temperature will be 48° F. Water will be from wells or similar ground water captured in the Chief Joseph Dam relief tunnel.

9.1.5) Ponding.

From the Little White Salmon/Willard NFH Complex Spring Chinook HGMP:
During Phase I, Step A, ponding will occur at the Little White Salmon/Willard NFH Complex when fry are 99% buttoned-up at around 1,700 temperature units. Following early rearing in the incubators, fry (about 1,250 to 1,350 fish/pound) will be placed in 10-16' x 3' x 1.9' concrete nursery tanks. The fish are held in the tanks and fed using automatic feeders until they are large enough to be moved into raceways. Average length at initial ponding is 33mm.

During Step B at Chief Joseph Dam Hatchery, fry will be placed in start tanks in mid-December when they are at least 1,400 ffp having accumulated 1,800 – 1,900 temperature units. The fry will remain in start tanks until about early March when, at a size of at least 1,300 fpp, they will be placed into outdoor raceways. A fry survival objective of 95% is assumed during ponding.

9.1.6) Fish health maintenance and monitoring.

"Disease monitoring is accomplished through daily observations by hatchery staff and monthly monitoring by fish health biologists/pathologists from the OFHC.

Any abnormal situations observed by hatchery personnel are called to the attention of the OFHC, which performs diagnostic and confirmatory clinical tests before recommending appropriate treatments. Treatment procedures may include environmental manipulation to control stresses and enhance the fish's ability to recover from infectious agents and/or appropriate chemicals or antibiotics. Antibiotics and chemicals that are registered for fish disease treatments are applied as per labeled instructions. Other therapeutic drugs and chemicals may be applied through appropriate INAD permits or by allowable extra-label prescription by staff Veterinary Medical Officer or local veterinarian."

A fish health protocol will be drafted for Chief Joseph Dam Hatchery prior to its construction. The protocol will be developed based on the latest procedures used at spring Chinook facilities in the Columbia Cascade Province and reported in the scientific literature.

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.

"No listed stocks are propagated at this station; therefore no adverse effects are anticipated."

Similarly, no listed stocks will be incubated at Chief Joseph Dam Hatchery until Phase II, at which time this HGMP will be revised.

9.2) Rearing:

Table 11. Spring Chinook Fry and Fingerling Survival at Leavenworth NFH

Broodyear	Fry to Fingerling (%)	Fingerling to Smolt (%)
1988	98.8	98.3
1989	98.4	98.2
1990	97.5	98.4
1991	97.4	98.7
1992	98.7	97.0
1993	98.7	98.1
1994	99.1	97.9
1995	98.3	96.4
1996	98.2	98.3
1997	98.8	97.1
1998	99.0	96.8
1999	98.8	98.1

* From Leavenworth NFH HGMP

Table 12. Spring Chinook Egg and Fry Survival at Little White Salmon/Willard NFH

Brood Year	Eggs Taken	% Survival to Eyed Stage	% Survival Green to Ponding	% Survival Ponding to Release
1989	4,134,045	90.5	89.9	84.4
1990	3,493,268	81.7	79.6	78.3
1991	3,207,155	78.3	73.1	65.1
1992	2,981,646	96.3	93.1	82.7
1993	3,718,222	91.3	82.8	89.5
1994	1,307,102	92.2	89.9	92.1
1995	900,581	95.9	94.8	95.5
1996	2,190,460	94.1	93.6	96.0
1997	1,961,472	93.9	89.7	97.1
1998	2,419,139	94.2	93.6	97.8
1999	1,716,264	94.5	92.0	90.0
2000	1,732,592	95.1	93.9	95.9
Ave.	2,480,162	91.5	88.8	88.7

* from Little White Salmon/Willard NFH HGMP

For Chief Joseph Dam Hatchery, this HGMP has assumed a survival objective of 95% from fed fry to fingerling and 95% from fingerling to smolt. Cumulatively, the

operational objectives for spring Chinook result in about an 80% green egg-to-smolt survival .

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

From Little White Salmon/Willard NFH HGMP:

"Current production goals are to have a final density index of below 0.25 and a flow index of no higher than 1.5 (ref. Fish Hatchery Management, Piper et al. 1982). Maximum density and loading criteria are for maximum loadings of 4.5 lbs/gpm or 0.87 lbs/cubic foot."

The Chief Joseph Dam Hatchery has been designed based on density and loading criteria of 1.0 lbs/inch/gpm, 1.0 minimum turnover/hr, and a maximum density of 0.75 lbs/cu. ft.

9.2.3) Fish rearing conditions

Again, from Little White Salmon/Willard NFH HGMP:

Table 13. Spring Chinook Rearing Conditions at Little White Salmon/Willard NFH*

Month	Stage	Temperature	Water Source	Raceway Flow (gpm)
December	egg	41.7	well/river	30
January	sac/egg	41.4	well/river	30
February	fry	41.0	well/river	30
March	fry	41.0	well/river	30
April	fingerling	42.0	river	420
May	fingerling	44.0	river	420
June	fingerling	43.7	river	420
July	fingerling	44.7	river	420
August	fingerling	44.9	river	420
September	fingerling	43.9	river	420
October	fingerling	42.6	river	420
November	fingerling	42.0	river	420

* from Little White Salmon/Willard NFH HGMP

"Fingerling spring Chinook will be held in 8' x 80' raceways with shade covers over 50% of the raceway during the May thru October rearing period. Temperature readingsare monitored using data loggers taking readings every 30 minutes. Temperatures in the raceways range from 38°F to 49°F during the year. Mortalities are removed daily and raceways are cleaned with a broom while effluent water is drained to a pollution control structure. Cleaning is performed as needed but no less than once a week. Dissolved oxygen, carbon dioxide and total gas pressure have never been problems and are not recorded on a regular basis. Fish are reared on river water most of their rearing cycle."

With the three sources of water available for the Chief Joseph Dam Hatchery, mixing capabilities will allow rearing temperatures to be maintained within the ideal range of 48 to 54 °F. An ample water supply should also allow for ideal flow conditions for optimal rearing. These capabilities should allow the Hatchery to meet ideal flow and density indices for optimal survival and growth. Spring Chinook will be reared in 120' x 8' x 4' raceways.

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.

In Phase I, Step A of this program, eggs will be obtained from Leavenworth NFH, but the fish will be reared at Little White Salmon/Willard NFH. Growth information from both hatcheries is provided.

Table 14. Spring Chinook Growth Parameters at Leavenworth NFH*

MONTH	Number on Hand	Total Weight (lbs.)	Ave Size (#/lb)	Ave Size (gms)	Length Ave (mm)	Length Ave (in)	Condition Factor (K = gms/mm^3)	Growth Rate (mm/mo.)	Growth Rate (gms/mo.)
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	1,724,000	1,437	1,200.0	0.4	32.52	1.28	1.10008E-05	NA	NA
December	1,717,939	1,894	906.9	0.5	35.7	1.41	1.10028E-05	3.18	0.122
January	1,711,899	3,249	526.9	0.9	42.79	1.68	1.09968E-05	7.09	0.361
February	1,705,880	5,481	311.2	1.5	50.99	2.01	1.10032E-05	8.20	0.597
March	1,699,882	8,085	210.3	2.2	58.12	2.29	1.09987E-05	7.13	0.701
April	1,693,906	13,734	123.3	3.7	69.43	2.73	1.09979E-05	11.31	1.522
May	1,687,950	18,865	89.5	5.1	77.27	3.04	1.09988E-05	7.84	1.393
June	1,682,015	32,064	52.5	8.7	92.32	3.63	1.09987E-05	15.05	3.580
July	1,676,102	49,223	34.1	13.3	106.62	4.2	1.10008E-05	14.30	4.679
August	1,670,209	58,958	28.3	16.0	113.36	4.46	1.10009E-05	6.74	2.692
September	1,664,336	69,019	24.1	18.8	119.62	4.71	1.10014E-05	6.26	2.805
October	1,658,485	72,620	22.8	19.9	121.81	4.8	1.09979E-05	2.19	1.047
November	1,652,654	74,141	22.3	20.4	122.79	4.83	1.10016E-05	0.98	0.490
December	1,646,843	74,530	22.1	20.5	123.15	4.85	1.09992E-05	0.36	0.175
January	1,641,053	75,295	21.8	20.8	123.72	4.87	1.10022E-05	0.57	0.292
February	1,635,283	76,276	21.4	21.2	124.4	4.9	1.09994E-05	0.68	0.340
March	1,629,534	81,144	20.1	22.6	127.14	5.01	1.10013E-05	2.74	1.434
April	1,623,805	90,354	18.0	25.3	131.93	5.19	1.10021E-05	4.79	2.655

***** From Leavenworth NFH HGMP

Table 15. Spring Chinook End of Month Growth Parameters at Little White Salmon NFH for Brood Year 2000*

Month	Length	#/lb	Conversion For Month	Density Index	Flow Index
December 2000	1.417	976	1.53	0.09	0.63
January 2001	1.724	542	1.18	0.10	0.59
February	1.977	359	1.65	0.13	0.89
March	2.414	197	0.97	0.20	0.90
April	2.827	123	1.01	0.28	0.93
May	3.308	76.7	0.83	0.30	0.98
June	3.547	62.2	1.39	0.34	1.13
July	3.949	45.1	1.27	0.17	0.53
August	4.309	34.7	1.22	0.20	0.64
September	4.746	26.0	1.16	0.24	0.77
October	4.822	24.8	3.86	0.25	0.80
November	4.866	24.1	3.26	0.20	0.95

* from Little White Salmon/Willard NFH HGMP:

In Phase I, Step B, fish will be reared at the proposed Chief Joseph Dam Hatchery. With three sources of water available at this hatchery, mixing capabilities will allow rearing temperatures to be maintained within the ideal range of 48 – 54 °F. An ample water supply should also allow for ideal flow conditions for optimal rearing. These capabilities should allow the hatchery to achieve optimal survival and growth, in excess of that achieved at the other two hatcheries (see above).

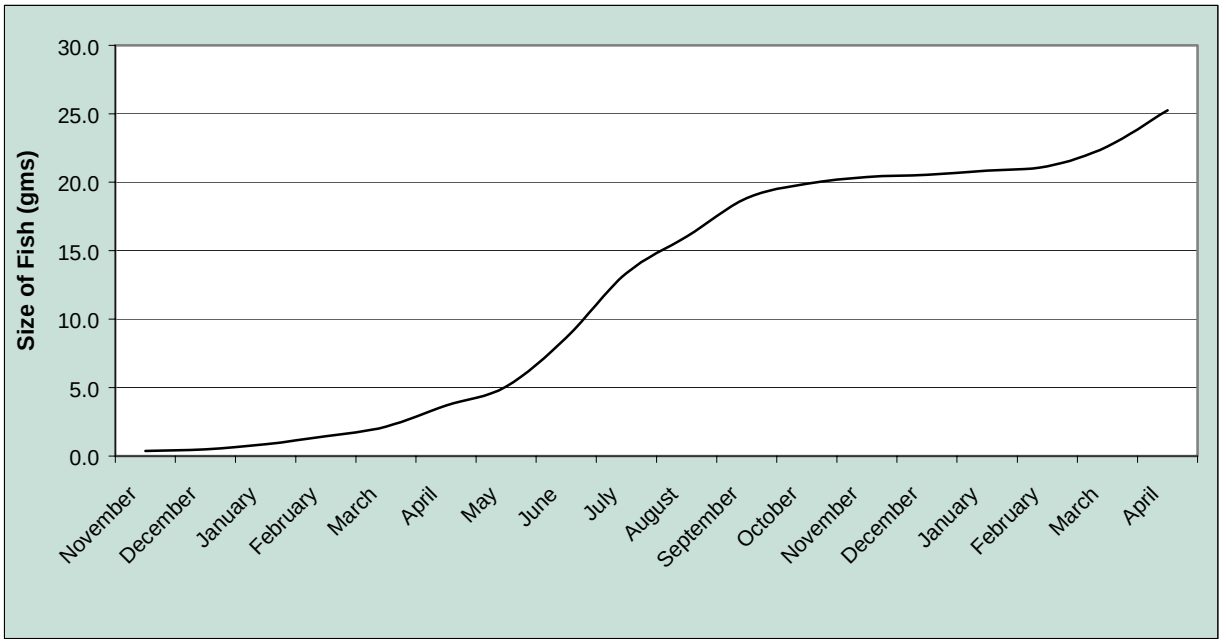
9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Energy reserve information is not available for the Little White Salmon/Willard NFH.

This information is not available for the proposed Chief Joseph Dam Hatchery.

For information purposes only, growth information is from the Leavenworth NFH HGMP.
"…predominant growth occurs the first spring and summer from May through September. Minimal growth occurs during the fall and winter followed by a secondary period of rapid growth just prior to release in April." "Energy reserve data through routine monitoring of body fat content is not conducted on a routine basis. On a quarterly basis fish health profiles are conducted through the collection of a Goede Index that ascribes qualitative values to external and internal observations of fish health. Data are available through LNFH."

Figure 1. Average Growth Rate of Leavenworth NFH Spring Chinook in Grams.



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*).

From Little White Salmon/Willard NFH HGMP:
"The fish are fed BioMoist starter, grower and feed following manufacturer recommendations (generally between 3.5% and 0.5% of body weight per day). They are fed between two and nine times daily depending on fish size. Overall conversions are around 1.1."

For informational purposes, the following data is provided from the Leavenworth NFH HGMP (since it is the source of the eggs):

Table 16. Leavenworth NFH Feed Type, Application Rates, and Food/Length Conversion Rates for Spring Chinook an Average Production Year.

MONTH	Feed Type	Feed Fed Per Day (lbs.)	Total Fed (lbs./mo.)	Feeding Rate %BW/day[3]	Food Conversion (lbs. Fed/lb. Gain)	Conversion Temp. Units per in. growth[4]
August	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA
December	BioDry™ Starter	19	NA	1.00%	NA	NA
January	BioMoist™-Grower	22	621	0.68%	1.36	139
February	BioMoist™-Grower	70	1,879	1.28%	1.39	43
March	BioMoist™-Grower	115	3,092	1.42%	1.39	33
April	BioMoist™-Grower	129	3,564	0.94%	1.37	26
May	BioMoist™-Grower	291	7,828	1.54%	1.39	33
June	MooreClark™ - Dry Feed	249	6,982	0.78%	1.36	33
July	MooreClark™ - Dry Feed	680	18,293	1.38%	1.39	40
August	MooreClark™ - Dry Feed	858	23,562	1.46%	1.37	40
September	MooreClark™ - Dry Feed	456	13,160	0.66%	1.35	132
October	MooreClark™ - Dry Feed	469	13,604	0.65%	1.35	109
November	MooreClark™ - Dry Feed	170	5,034	0.23%	1.40	135
December	MooreClark™ - Dry Feed	78	2,318	0.10%	1.52	55
January	MooreClark™ - Dry Feed	28	1,339	0.04%	3.45	354
February	MooreClark™ - Dry Feed	54	1,625	0.07%	2.12	60
March	MooreClark™ - Dry Feed	227	6,734	0.28%	6.86	25
April	MooreClark™ - Dry Feed	427	12,511	0.47%	2.57	51

[3]Factor utilized to determine feed application rates calculated as the % of body weight (BW) in total mass divided by total pounds fed.
[4]Temperature units per inch of growth are calculated by subtracting 32^0F from the average monthly temperature and length gain.

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

For Leavenworth NFH, "The OFHC provides fish health monitoring. Examinations are once per month or more, if necessary. Normally, treatments for BKD and both internal and external parasites are customary for a broodyear of fish. The frequency of a treatment is determined by the severity and persistency of the problem."

For the Little White Salmon/Willard NFH (per its HGMP), fish health care services are provided by the Lower Columbia River Fish Health Center. Care is provided pursuant to policy 713FW of the Fish and Wildlife Service Manual and chapter 5 of IHOT's "Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries". These documents provide the guidance for preventing and minimizing diseases within and outside the hatchery. Fish health exam and certification must be done prior to any releases or transfers from the hatchery to minimize risks from possible disease transmission. Fish are examined at least once per month. Fish are randomly sampled to ascertain general health. Diagnostic exams are conducted when prudent or needed based on concerns of hatchery personnel, fish behavior, history of the facility, or concerns of the pathologist.

At two to four weeks prior to release or transfer from the hatchery, 60 fish from the stock of concern are tested for the presence of listed pathogens. These pathogens include infectious hematopoietic necrosis virus, infectious pancreatic necrosis virus, viral

hemorrhagic septicemia virus, *Renibacterium salmoninarum, Aeromonas salmonicida, Yersinia ruckeri, and Myxobolus cerebralis.*

Spring Chinook are given prophylactic medicated feedings once in July a rate of 100 mg of erythromycin/kg fish/day for 21 days. Administration of erythromycin in mid-summer appears to control outbreaks of bacterial kidney disease later in the rearing cycle.

For Chief Joseph Dam Hatchery, a fish health monitoring program will be developed concurrent with final hatchery design and construction that reflects the Washington Fish Health Policy (NWIFC and WDFW 1998), the Integrated Hatchery Operation Team (IHOT 1995) and the Pacific Northwest Fish Health Protection Committee (PNFHPC 1989), to promote production of healthy fish and to reduce the incidence of diseases.

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

From Little White Salmon/Willard NFH HGMP:
"Fish are given a 24 hour saltwater challenge before release and observed for survival and outward signs of smoltification, i.e. loss of parr marks, etc. Survival is typically at or near 100%."

Measurement of smolt indices will be included in an M&E program for the proposed Chief Joseph Dam Hatchery.

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

From Little White Salmon/Willard NFH HGMP:
At Willard NFH the 52 rearing tanks have been sprayed with a colored coating to darken nursery rearing environment. Rraceways are covered by 50% shade cloth, shading about half of the rearing waters. Barrels are placed in raceways in the summer to provide additional shade and cover. At Little White Salmon NFH raceways contained colored concrete to simulate the river bottom. Baffles also provide the fish a variety of water conditions from which to choose.

During the final design of the Chief Joseph Dam Hatchery, the most recent information on the cost-effectiveness of natural rearing methods will be reviewed and integrated into the hatchery's design if prudent. The hatchery's conceptual design is based on low-density incubation and rearing. At a minimum, the use of Ellisforde Pond will allow very low-density rearing of pre-smolts for 5-6 months. During the 3-step process, the Colville Tribes will investigate the utility of placing temporary structures in the Pond to mimic natural rearing conditions and lower likely avian predation.

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.

During Phase I, no listed fish will be reared in these programs. For Phase II when ESA-listed UCR Spring Chinook would be reared, this HGMP will be rewritten to reflect the knowledge gained during Phase I and the latest research information on Chinook propagation.

SECTION 10. RELEASE

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

10.1) Proposed fish release levels.

Phase I, Step A:

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	200,000 +/- 10%*	15/lb	mid - April	Ellisforde Pond

*may be reduced to 100,000 to provide 100,000 for net pen rearing in Osoyoos Lake.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	200,000 +/- 10%*	15/lb	mid - April	Colville Trout Hatchery

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Age Class	**Maximum Number**	**Size (fpp)**	**Release Date**	**Location**
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	50,000 +/- 10%	15/lb	mid – April	St. Mary's Mission Pond

Phase I, Step B:

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	200,000 +/- 10%*	15/lb	mid - April	Ellisforde Pond

*may be reduced to 100,000 to provide 100,000 for net pen rearing in Osoyoos Lake.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	600,000 +/- 10%	15/lb	mid – April	Chief Joseph Dam Hatchery

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	50,000 +/- 10%	15/lb	mid – April	St. Mary's Mission Pond

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	50,000 +/- 10%*	15/lb	mid – April	Salmon Creek Acclimation Site

* Release contingent on habitat improvement and local agreements

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	100,000 +/- 10%	15/lb	Early April	Lake Osoyoos*

* Fish from allocation to Ellisforde Pond

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

Stream, river, or watercourse: Okanogan River
Release point: Ellisforde Pond, river mile 61.7 (rkm 99.3)
Major watershed: Okanogan River
Basin or Region: Columbia River

Stream, river, or watercourse: Columbia River
Release point: Colville Trout Hatchery
Major watershed: Columbia River
Basin or Region: Columbia River

Stream, river, or watercourse: Columbia River
Release point: Chief Joseph Dam Hatchery, river mile 543 (rkm 875)
Major watershed: Columbia River
Basin or Region: Columbia River

Stream, river, or watercourse: Omak Creek
Release point: St. Mary's Mission Pond, river mile 5 (rkm 8)
Major watershed: Okanogan River
Basin or Region: Columbia River

Stream, river, or watercourse: Salmon Creek
Release point: Okanogan Irrigation Dist. Div. Dam, stream mile 3.8 (rkm 6.1)
Major watershed: Okanogan River
Basin or Region: Columbia River

Stream, river, or watercourse: Osoyoos Lake
Release point: Osoyoos Lake net pens, approx. river mile 77.4 (rkm 124.6)
Major watershed: Okanogan River
Basin or Region: Columbia River

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

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
2000							0	
2000							0	
2001							0	
2001	Omak Cr						40,000	17.7/lb
2002	Omak Cr						48,000	24/lb
2002	Ellisforde						254,000	25.5/lb
2003	Omak Cr.						35,000	22.6/lb
2003	Bonaparte						100,000	19.5/lb
Average								

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

In March 2001, 40,000 yearlings were scatter planted in Omak Creek, below Mission Falls and largely prevented from migrating using blocking nets to allow for acclimation. The nets were pulled from the stream a week later allowing a volitional migration. In March 2002, about 48,000 spring Chinook yearlings were again scatter planted into Omak Creek, below Mission Falls. The yearlings at Ellisforde Pond were forced released on April 18, 2002.

Construction of St. Mary's Mission Pond on Omak Creek in 2002 allowed for complete acclimation of Chinook released in 2003. On April 15, 2003, 35,000 fish were released. That evening, the Chinook were forced released from Bonaparte Pond following a period of volitional release. In 2004, the Tribes plan to release 100,000 yearlings from Ellisforde Pond. The release in Omak Creek was lost when the water supply failed.

10.5) Fish transportation procedures, if applicable.

No spring Chinook will be transported immediately prior to release. In Phase I, Step A, fish will be acclimated in Ellisforde Pond and at Colville Trout Hatchery (and possibly Osoyoos Lake net pens) for 5-6 months prior to release. Fish will be acclimated for at

least 30 days in the St. Mary's Mission Pond prior to release. In Step B, additional spring Chinook will be released directly from Chief Joseph Dam Hatchery without any prior transport.

At time of fingerling transport, efforts will be taken to ensure that water temperatures in the hatchery raceways, transport trucks, and receiving acclimation facility are comparable to avoid unnecessary shocking of the fish.

10.6) Acclimation procedures

Ellisforde Pond: Sub-yearling Chinook will be transported to the acclimation pond in October depending on fish size and temperature of the Okanogan River. Fish will be over-winter reared in the Pond on pumped Okanogan River water until release in about mid-April, providing at least a 5 month acclimation period.

Colville Trout Hatchery: Sub-yearling Chinook will be transported to the acclimation ponds in October depending on fish size and temperature of the Columbia River. Fish will be over-winter reared in 1/3 acre ponds on a mix of well and Columbia River water until release in about mid-April, providing at least a 5 month acclimation period. Prior to release, acclimation will be solely in river water.

Osoyoos Lake Net Pens: Sub-yearling Chinook will be transported to the net pens in mid-October to early November depending on fish size and temperature of Osoyoos Lake. Fish will be over-winter reared in the pens until release in early to mid April. Nets will be dropped allowing the Chinook to migrate naturally to the lake outlet at Zosel Dam.

St. Mary's Mission Pond: Yearling Chinook will be transported to the site in late February to early March depending on fish size and water temperatures. Fish will be acclimated on a mix of creek and well water until mid-April when they will be allowed volitional migration. Later, remaining fish will be forced from the facility. Prior to release, acclimation will be solely in creek water.

Chief Joseph Dam Hatchery: In Phase I, Step B, Chinook will be hatched, reared, and released from this facility as yearlings. Prior to release, fish will be reared on a mix of relief tunnel water from Chief Joseph Dam and water from Rufus Woods Lake to promote homing back to the hatchery site and terminal fisheries. Prior to release, acclimation will be solely in river water.

Salmon Creek Diversion Facility: Yearling Chinook will be transported to the site in late February to early March depending on fish size and water temperatures. Fish will be acclimated on creek water in the ladder pools and upper irrigation canal until mid-April when they will be allowed volitional migration. Later, any remaining fish in will be forced from the canal.

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

In Phase I, all hatchery-origin spring Chinook in the Isolated Harvest Program will be adipose fin clipped and about 42% coded wire tagged. All fish released into Omak Creek for the Integrated Harvest Program will be coded wire tagged and adipose fin clipped. Another external mark may be applied to these fish (rather than the adipose fin clip) if too many are harvested.

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 program levels with allowances for over-winter mortality.

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.

Little White Salmon/Willard NFH Complex: Under no circumstances will spring Chinook from Leavenworth NFH destined for the Okanogan River be knowingly released into the Little White Salmon River.

Colville Trout Hatchery: The hatchery will have pumped well and Columbia River water supplies with back-up power. In the event of an irresolvable water supply emergency that threatens the health of the Chinook, the fish will be immediately forced from the ponds to the Columbia River.

Chief Joseph Dam Hatchery: The hatchery will have three water sources: well, relief tunnel, and subsurface lake water. In the event of a failure in the primary relief tunnel water, the hatchery will be switched over to gravity feed from Rufus Woods Lake.

Ellisforde 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.

St. Mary's Mission 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 facility.

Salmon Creek Acclimation Facility: In the event of an irresolvable water supply emergency that threatens the health of the Chinook, the fish will be immediately released

from the ladder and canal, and forced to migrate down the creek into the Okanogan River.

Osoyoos Lake Net Pens: In the event of an irresolvable emergency, e.g. serious icing, storm conditions or low oxygen, that threatens the health of the Chinook, the nets will be dropped and the fish allowed to rear in the Lake.

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 Carson stock spring Chinook is not part of the ESA-listed UCR Spring Chinook ESU and poses a potential threat to the genetic integrity of the ESU if it should spawn with the listed fish in significant numbers. There are, however, no UCR Spring Chinook spawning in the Okanogan and upper Columbia rivers. Should significant numbers of the spring Chinook released from the programs described in this HGMP migrate into the Methow River and spawn with listed fish, then adverse genetic effects could occur. To minimize this threat, all hatchery-origin spring Chinook released from these programs will be yearling fish, fully acclimated to Okanogan and upper Columbia river waters. Such acclimation should minimize the potential of these Carson stock Chinook from entering and spawning in the Methow River. Additionally, the Colville Tribes anticipate developing live-capture, selective fishing gear that will be deployed to harvest returning adult Carson stock Chinook, preventing their straying back down to the Methow River. All program fish will be adipose fin clipped to distinguish them from Chinook originating from the Methow River. A thorough M&E program will be implemented to document any straying of Carson stock Chinook into the Methow River. Should irresolvable straying occur that adversely affects the integrity of the Methow spring Chinook populations, the Okanogan program can be halted and adult fish collected at Wells Dam.

Similarly, the interactions of the Carson stock spring Chinook with the local, unlisted summer/fall Chinook population will be closely monitored. Propagation and harvest activities will be managed to minimize potential interactions of spring and summer Chinook to avoid adverse genetic effects to the indigenous summer/fall Chinook. Again, should irresolvable interbreeding of these races occur, the offending spring Chinook program would be discontinued and returning spring Chinook collected at Wells Dam.

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

All spring Chinook released in the Okanogan River in mid-April will be yearling smolts that are expected to actively migrate down to and through the Columbia River. These fish will be about 110-130 mm in length. Spring Chinook released from Chief Joseph Dam Hatchery will be yearlings of a similar or slightly larger size and at a similar time.

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 spring Chinook should have migrated from the Okanogan River prior to any steelhead fry 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 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.

In Omak and Salmon creeks, the Integrated Recovery Program will be attempting to reestablish natural-origin populations of spring Chinook. If successful, these populations will be co-habiting these tributaries with ESA-listed UCR Steelhead as naturally occurred prior to the Chinook being extirpated. Competition for food and space between the Chinook and steelhead will occur to some extent, but this should be limited, as Chinook and steelhead tend to occupy different habitats, with steelhead rearing in riffles and Chinook in pools. Predation of steelhead fry should be minimal as the larger yearling Chinook, capable of predation, should have migrated from the creeks prior to the emergence of steelhead. Sub-yearling Chinook would be of an insufficient size to prey on juvenile steelhead. On the positive side, Chinook carcasses should provide a valuable nutrient source for juvenile steelhead and their prey organisms. The spawning action of Chinook should also clean gravels impacted by silt, which is a significant problem throughout the Okanogan subbasin. Emerging Chinook fry will also provide a food supply for yearling steelhead.

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.

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

The Colville Confederated Tribes have developed a Conceptual Hatchery M & E Plan as part of the Master Plan for Chief Joseph Dam Hatchery that is specific to the performance indicators in this HGMP and the Okanogan River Summer/Fall Chinook HGMP. This hatchery M&E Plan has been developed in concert with the broader Okanogan Basin Monitoring and Evaluation Plan that is to be funded pursuant to approval under the Columbia Cascade Provincial Review. Together these M&E plans will provide a comprehensive assessment of the performance indicators for this spring Chinook program as well as summer/fall Chinook and steelhead. With approval of the Chief Joseph Dam Hatchery Master Plan, a detailed hatchery M&E plan will be developed that fully describes the methods and sampling design necessary to fully respond to the performance indicators in this HGMP.

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

As stated above, funding for the Okanogan Basin Monitoring and Evaluation Plan has been approved for development and implementation. The additional hatchery M&E plan will be an integral part of the hatchery project when approved for construction and operation.

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 and the Conceptual Hatchery M&E Plan. The key spring Chinook program activities that will affect listed fish are:

Leavenworth NFH Broodstock Collection: There should be little effect on listed ESU's from the broodstock collection activities at the hatchery as all steelhead entering the hatchery's ladder are promptly passed upriver. Spawning actions include elimination of fish and eggs with excessive BKD to reduce the opportunity for disease transmission. M&E activities associated with these operations should not affect listed species.
Little White Salmon River/Willard Hatchery Rearing: There should be no effect on listed ESU's from this propagation activity as the diversion of the hatchery's water supply occurs above critical habitat for listed anadromous fish. This is an existing

hatchery facility that follows all fish health protocols to reduce the potential for disease transmission. Fish are examined prior to release or transfer. M&E activities associated with these operations should not affect listed species.

Chief Joseph Dam Hatchery: All rearing activities at the proposed hatchery will be on water supplies obtained above the critical habitat of listed anadromous fish. Disease management protocols will be developed to minimize the opportunity for disease transmission to listed species. Listed species do not spawn or likely rear in the Columbia River in the vicinity of the proposed hatchery. All unmarked fish entering the hatchery's fishway and trap will be promptly returned to the Columbia River.

Fish Marking and M&E: Hatchery-origin spring Chinook propagated for the Isolated Harvest Program pursuant to this plan will be 100 % adipose fin clipped and about 42% coded wire tagged. Those fish reared for the Integrated Recovery Program will be 100% adipose fin clipped at 100% coded wire tagged. This marking should allow for subsequent monitoring and evaluation of interactions with listed species and selective harvest.

Acclimation: The program proposes to fully acclimate yearling smolts to minimize interactions with listed species. Adverse effects of straying, competition, and predation should be minimized by the proposed acclimation protocols. The Ellisforde and St. Mary's Mission ponds are existing facilities so that new construction will not be required. The acclimation ponds at Colville Trout Hatchery will be constructed in a manner such that their operations will not affect listed species. All acclimation sites are or will be screened to criteria necessary to protect all life stages of listed species. The effects of M&E associated with these sites will be fully described in the M&E plan.

Selective Fishing: The Colville Tribes plan to test, and deploy live-capture, selective fishing gear to harvest all possible marked spring Chinook in the upper Columbia River (a terminal fishery) and the Okanogan River to minimize or eliminate the possibility of unwanted spawning activity. The effects of this fishery and its associated M&E plan will be fully described in those plans.

Program Termination: Should irresolvable conflicts develop between the proposed spring Chinook programs and listed species that significantly affect the viability of the listed species (also the unlisted UCR summer/fall Chinook ESU), then the spring Chinook programs will be terminated and returning adult fish collected at Wells Dam.

SECTION 12. RESEARCH

Other than a comprehensive M&E plan to measure the benefits and risks of this spring 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

Ashe, B. et. al, Northeast Oregon Hatchery Project, Spring Chinook Master Plan, 2000

Bonneville Power Administration, US Army Corps of Engineers, Bureau of Reclamation, Endangered Species Act 2003 Check-In Report for the Federal Columbia River Power System, September 2003.

Bugert, B. et. al., Biological Assessment and Management Plan, Mid-Columbia River Hatchery Program, 1998.

Golder & Associates, Okanogan/Similkameen Subbasin Summary, September 27, 2001

Integrated Hatchery Operations Team, Operations Plans for Anadromous Fish Production Facilities in the Columbia River Basin, Volume III – Washington, 1995.

McClure, M. M., Holmes, E. E., Sanderson, B. L., and Jordan, C. E., A Large-Scale Multispecies Status Assessment: Anadromous Salmonids in the Columbia River Basin. 2003. Ecological Applications, 13 (4), pgs 964-989.

Pedde, Kenneth, Letter to Joe Peone concerning Grand Coulee mitigation for the Okanogan River, June 8, 2000.

USFWS, Hatchery & Genetic Management Plan – Little White Salmon/Willard NFH Complex; December 14, 1999

USFWS, Hatchery & Genetic Management Plan – Leavenworth National Fish Hatchery, Draft, 2002

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:_____

APPENDIX A: PROGRAM OPTIONS CONSIDERED IN DEVELOPMENT OF THE OKANOGAN RIVER SPRING CHINOOK HGMP

May 7, 2001

DRAFT # 2

STRATEGIC OPTIONS FOR OKANOGAN SPRING CHINOOK

The Okanogan Spring Chinook Hatchery & Genetic Management Plan would be developed based on *one* of the following four strategic options. Any spring Chinook reintroduction must be done at minimal risk to the summer Chinook population. The preferred option at this time is IV.

I. CARSON STOCK SPRING CHINOOK ONLY

A. HATCHERY RUN ONLY (isolated harvest)

The goals of this program would be to 1) provide hatchery-origin fish to maintain an artificial run of spring Chinook into the Okanogan basin and to 2) create tribal and sport harvest. Returning adult fish would be targeted for complete harvest in the main stem river and the tributaries. Brood stock and juvenile fish would originate from ongoing programs in other mid-Columbia tributaries. No adult fish would be allowed into Osoyoos Lake.

Omak Creek: Acclimate and release ad-clipped smolts from an off-channel, low-cost facility just below Mission Falls.
Salmon Creek: Acclimate and release ad-clipped smolts from the OID diversion dam and canal.
Oroville Mill Site: Acclimate and release ad-clipped smolts from an off-channel facility at old mill site below Zosel Dam.
Similkameen River: Acclimate and release ad-clipped smolts from an off-channel facility near the existing summer Chinook pond.*****
Osoyoos Lake: 1) Acclimate for 1-2 months and release ad-clipped smolts from floating net pens near the lake outlet, and 2) Over-winter rear and release ad-clipped smolts from floating net pens near the lake outlet, if conditions permit.

B. SUPPLEMENTED NATURAL PRODUCTION (integrated harvest)

The goals of this program would be to 1) provide a hatchery-supplemented natural-origin run of spring Chinook into the Okanogan basin and to 2) create

tribal and sport harvest. Returning adult, hatchery-origin fish would be managed for natural spawning, hatchery brood stock, and selective harvest. Returning natural-origin fish would be managed for natural spawning and hatchery broodstock. No adult fish would be allowed into Osoyoos Lake for reproduction unless and until agreed upon by the Canadian government and First Nations.

Omak Creek: Allow returning hatchery-origin and natural-origin fish to spawn in the creek. Plant adult surplus Carson stock from other upper Columbia hatcheries in the creek up to escapement objectives. Acclimate and release ad-clipped smolts from an off-channel facility just below Mission Falls.

Salmon Creek: Allow returning hatchery-origin and natural-origin fish to spawn in the creek. Plant adult surplus Carson stock from other upper Columbia hatcheries in the creek up to escapement objectives. Acclimate and release ad-clipped smolts from the OID diversion dam and canal.

Oroville Mill Site: Acclimate and release ad-clipped smolts from an off-channel facility at old mill site below Zosel Dam. Use returning adults for hatchery brood stock and harvest.

Similkameen River: Acclimate and release ad-clipped smolts from an off-channel facility near the existing summer Chinook pond. Use returning adults for hatchery brood stock and harvest.*****

Osoyoos Lake: 1) Acclimate for 1-2 months and release ad-clipped smolts from floating net pens near the lake outlet, and/or 2) Over-winter rear and release ad-clipped smolts from floating net pens near the lake outlet, if conditions permit. Use returning adults for hatchery brood stock and harvest. If, or when, the Canadian government and First Nations agreed with spring Chinook re-introduction into waters above Zosel Dam, then adults returning to the dam would be collected for hatchery brood stock and allowed to pass for spawning and Canadian harvest.

Other Tributaries: Manage other tributaries, as appropriate, in a manner similar to Omak and Salmon creeks.

II. METHOW COMPOSITE STOCK SPRING CHINOOK ONLY

A. SUPPLEMENTED NATURAL PRODUCTION (integrated recovery)

The goals of this program would be to 1) create self-sustaining, natural-origin populations of spring Chinook in suitable habitat to aid in ESA recovery and achieve tribal management objectives (allowing Methow stock to adapt into a potentially unique Okanogan stock), 2) create a hatchery-supplemented, natural-origin populations of spring Chinook as appropriate, and 3) create tribal and sport harvest. Returning adult, hatchery-origin fish would be managed for natural spawning, hatchery brood stock, and selective harvest. Returning natural-origin fish would be managed for natural spawning and

hatchery brood stock. No adult fish would be allowed into Osoyoos Lake for reproduction unless and until agreed upon by the Canadian government and First Nations. Methow stock would be introduced into the Okanogan basin only as an "experimental population" under the ESA with no special take prohibitions on fish migrating, spawning, and rearing while in the basin

Omak Creek: Allow returning hatchery-origin and natural-origin fish to spawn in the creek. Plant surplus Methow stock adults from Winthrop and/or Methow hatcheries in the creek only when absolutely needed. Acclimate and release ad-clipped smolts from an off-channel facility just below Mission Falls.

Salmon Creek: Allow returning hatchery-origin and natural-origin fish to spawn in the creek. Plant surplus Methow stock adults from Winthrop and/or Methow hatcheries in the creek only when absolutely needed. Acclimate and release ad-clipped smolts from the OID diversion dam and canal, or an off-channel acclimation facility, if needed.

Oroville Mill Site: Acclimate and release ad-clipped smolts from an off-channel facility at old mill site below Zosel Dam. Use returning adults for hatchery brood stock and harvest.

Similkameen River: Acclimate and release ad-clipped smolts from an off-channel facility near the existing summer Chinook pond. Use returning adults for hatchery brood stock and harvest.*****

Osoyoos Lake: 1) Acclimate for 1-2 months and release ad-clipped smolts from floating net pens near the lake outlet, and/or 2) Over-winter rear and release ad-clipped smolts from floating net pens near the lake outlet, if conditions permit. Use returning adults for hatchery brood stock and harvest. If, or when, the Canadian government and First Nations agreed with spring Chinook re-introduction into waters above Zosel Dam, then adults returning to the dam would be collected for hatchery brood stock and allowed to pass for natural spawning and Canadian harvest. If spawning is allowed above Osoyoos Lake, then management of spring Chinook in the Okanogan basin should focus on two populations to account for adaptation to a lake rearing strategy.

Other Tributaries: Manage other tributaries, as appropriate, in a manner similar to Omak and Salmon creeks.

III. JOINT CARSON AND METHOW STOCKS

A. HATCHERY RUN ONLY (isolated harvest) & SUPPLEMENTED NATURAL PRODUCTION (integrated recovery)

The goals of this program would be to 1) create self-sustaining, natural-origin populations of spring Chinook in suitable habitat to aid in ESA recovery and achieve tribal management objectives (allowing Methow stock to adapt into a

potentially unique Okanogan stock), 2) create hatchery-supplemented, natural-origin populations of Methow-stock spring Chinook as appropriate, and 3) create tribal and sport harvest targeting on an artificial run of Carson stock Chinook. Returning adult, Methow stock would be managed for natural spawning and hatchery brood stock. Returning hatchery-origin, Carson stock would be managed for tribal and sport harvest, and hatchery brood stock. No adult fish would be allowed into Osoyoos Lake for reproduction unless and until agreed upon by the Canadian government and First Nations. If agreeable to all parties, Methow stock would be allowed to escape into Osoyoos Lake for spawning and Canadian harvest. Methow stock would be introduced into the Okanogan basin only as an "experimental population" under the ESA with no special take prohibitions on fish migrating, spawning, and rearing while in the basin. Performance of Methow and Carson stocks would be compared.

Omak Creek: Use Methow Composite stock. Allow returning hatchery-origin and natural-origin fish to spawn in the creek. Plant surplus Methow stock adults from Winthrop and/or Methow hatcheries in the creek only when absolutely needed. Acclimate and release unmarked smolts from an off-channel facility just below Mission Falls.

Salmon Creek: Use Methow Composite stock. Allow returning hatchery-origin and natural-origin fish to spawn in the creek. Plant surplus Methow stock adults from Winthrop and/or Methow hatcheries in the creek only when absolutely needed. Acclimate and release unmarked smolts from the OID diversion dam and canal, or an off-channel acclimation facility, if needed.

Oroville Mill Site: Acclimate and release ad-clipped, Carson stock smolts from an off-channel facility at old mill site below Zosel Dam. Use returning adults for hatchery brood stock and harvest.

Similkameen River: Acclimate and release ad-clipped, Carson stock smolts from an off-channel facility near the existing summer Chinook pond. Use returning adults for hatchery brood stock and harvest.*****

Osoyoos Lake: 1) Acclimate for 1-2 months and release ad-clipped Carson stock smolts from floating net pens near the lake outlet, and/or 2) Over-winter rear and release ad-clipped Carson stock smolts from floating net pens near the lake outlet, if conditions permit, and 3) Acclimate for 1-2 months and release unmarked Methow stock smolts from floating net pens.

Other Tributaries: Manage other tributaries, as appropriate, in a manner similar to Omak and Salmon creeks.

IV. CARSON STOCK TRANSITIONING TO METHOW STOCK

A. SUPPLEMENTED NATURAL PRODUCTION (integrated recovery) & HATCHERY RUN ONLY (isolated harvest)

The goals of this program would be to initiate spring Chinook re-introduction into the Okanogan basin using Carson stock to 1) assess habitat viability for spring Chinook and 2) provide tribal and sport harvest. As surplus hatchery-origin Methow stock become available on a consistent basis from Winthrop and/or Methow hatcheries, Methow stock would replace Carson stock in the Okanogan and its tributaries. At that time, program goals would be to 1) create self-sustaining, natural-origin populations of spring Chinook in suitable habitat to aid in ESA recovery and achieve tribal management objectives (allowing Methow stock to evolve into a potentially unique Okanogan stock), 2) create hatchery-supplemented, natural-origin populations of Methow stock spring Chinook as appropriate, and 3) create tribal and sport harvest. Carson and Methow stocks released from main stem Okanogan and Similkameen acclimation sites would be targeted for complete harvest and collection for brood stock.

No adult fish would be allowed into Osoyoos Lake for reproduction unless, and until, agreed upon by the Canadian government and First Nations. If agreeable to all parties, Methow stock would be allowed to escape into Osoyoos Lake for spawning and Canadian harvest. Methow stock would be introduced into the Okanogan basin only as an "experimental population" under the ESA with no special take prohibitions on fish migrating, spawning, and rearing while in the basin.

Omak Creek: Use Carson stock initially. Allow returning hatchery-origin and natural-origin fish to spawn in the creek. Supplement low escapements with surplus adult Carson stock from other upper Columbia hatcheries up to minimum escapement objective. Acclimate and release ad-clipped smolts from an off-channel facility just below Mission Falls. When Methow stock becomes available (second priority for use of Methow stock), replace the Carson stock. Acclimate and release ad-clipped Methow smolts from the off-channel facility, allowing natural and hatchery-origin fish to spawn in the creek. Supplement low escapements with surplus hatchery adults from Methow and/or Winthrop hatcheries.

Salmon Creek: Use Carson stock initially. Allow returning hatchery-origin and natural-origin fish to spawn in the creek. Supplement low escapements with surplus adult Carson stock from other upper Columbia hatcheries up to a minimum escapement objective. Acclimate and release ad-clipped smolts from the OID diversion dam and canal. When Methow stock becomes available (first priority for use of Methow stock), replace the Carson stock. Acclimate and release ad-clipped Methow smolts from the acclimation facility (in or off-channel), allowing natural and hatchery-origin fish to spawn in the creek. Supplement low escapements with surplus hatchery adults from Methow and/or Winthrop hatcheries.

Oroville Mill Site: Use Carson stock initially. Acclimate and release ad-clipped, Carson stock smolts from an off-channel facility at the old mill site below Zosel Dam. Use returning adults for hatchery brood stock and harvest. When Methow stock becomes available (third priority for use of

Methow stock), replace the Carson stock. Acclimate and release ad-clipped Methow smolts from the acclimation facility. Use returning Methow adults for hatchery brood stock and harvest. If, or when, the Canadian government and First Nations agreed with spring Chinook re-introduction into waters above Zosel Dam, then Methow adults returning to the dam would be collected for hatchery brood stock and allowed to pass for natural spawning and Canadian harvest.

Similkameen River: Use Carson stock initially. Acclimate and release ad-clipped, Carson stock smolts from an off-channel facility near the existing summer Chinook pond. Use returning adults for hatchery brood stock and harvest. When Methow stock becomes available (fourth priority for use of Methow stock), replace the Carson stock. Acclimate and release ad-clipped Methow smolts from the acclimation facility. Use returning Methow adults for hatchery brood stock and harvest.*****

Osoyoos Lake: Use Carson stock initially. 1) Acclimate for 1-2 months and release ad-clipped smolts from floating net pens near the lake outlet, and/or 2) Over-winter rear and release ad-clipped smolts from floating net pens near the lake outlet, if conditions permit. Use returning adults for hatchery brood stock and harvest. When Methow stock becomes available (fifth priority for use of Methow stock), replace the Carson stock. If, or when, the Canadian government and First Nations agreed with spring Chinook re-introduction into waters above Zosel Dam, then Methow adults returning to the dam would be collected for hatchery brood stock and allowed to pass for natural spawning and Canadian harvest.

Other Tributaries: Manage other tributaries, as appropriate, in a manner similar to Omak and Salmon creeks.

V. OTHER SPRING CHINOOK STOCKS

The goal of this program would be to use other than Carson stock and Methow stock in the Okanogan basin should these stocks not perform adequately in the above programs. Potential stocks for consideration include Wenatchee stock spring Chinook and Fraser River stock spring Chinook that may have evolutionary links to the Okanogan basin.

***** Any reintroduction of spring Chinook into the Similkameen River would be undertaken only if further planning indicates the population could be kept isolated from the summer Chinook, with inconsequential genetic introgression, competition, predation, and disease transmission.

[sprchinoptions]

APPENDIX B: 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 by the Tribes to assist the Council in decisions on whether to include spring Chinook facilities in further development of the Chief Joseph Dam Hatchery and on implementation of this HGMP.

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 natural and hatchery populations of spring 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 salmon resources and fisheries in the Columbia Cascade Province. Additionally the construction of Grand Coulee and Chief Joseph Dams have inundated and blocked much of the historical spring 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, spring Chinook in the Okanogan may be productive. But, with poor freshwater conditions and in poor ocean productivity conditions, populations of spring Chinook are likely not sustainable and will likely support only 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 spring Chinook management plan is

designed to reinitiate and provide stability to a tribal C&S fisheries. The HGMP also provides a plan to test the capability of the Okanogan River to again support a natural spawning population of spring Chinook. In addition to the constraints created by the hydroelectric system, habitat quality in the Okanogan subbasin will need further improvements to support natural production. When environmental conditions are poor, continued augmentation with hatchery fish will most likely be necessary to maintain spawning fish in the habitat.

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 program will provide the information 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. The flexibility designed in this plan should allow the Tribes to cost-effectively achieve harvest and conservation objectives while minimizing risks.

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

Spring Chinook were extirpated from the Okanogan River early in the 20th century. The long-term goal of this HGMP, in Phase II, is the restoration of the ESA-listed Upper Columbia River Spring Chinook in the Okanogan subbasin, both in the U.S. and ultimately Canadian waters. Successfully achieving this goal would improve the abundance, productivity, distribution, and diversity of this endangered ESU that has been permanently constricted in its range by the Federal government's construction of multi-purpose dams. In Phase II, broodstock collection, mating protocols, and rearing will be designed to allow the population to adapt and evolve to be productive in its Okanogan habitat.

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

The Integrated Recovery Program in Phase I of this HGMP has been designed to monitor the reintroduction of spring Chinook in Omak Creek. Broodstock will be collected from adults returning to Omak Creek to build a gene pool from those fish that successful adapt to the tributary spawning and rearing, and mainstem passage habitats. Life history of juvenile fish will be documented then emulated by the artificial production program. Phase I may have limited success given the non-local, domesticated Carson-stock spring Chinook that will be utilized. But, critical knowledge will be gained prior to Phase II when the Carson stock will be replaced with Methow Composite stock.

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. Phase I releases in the Okanogan and Columbia rivers are to support an Isolated Harvest Program while those fish released into Omak Creek are to support an Integrated Recovery 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.

Biological risks from implementing Phase I programs should be manageable given key elements of this HGMP. The plan includes a comprehensive set of performance standards and measures to guide an M&E program to monitor and assess risks. The programs include marking 100% of the hatchery-origin fish. Acclimation procedures and release locations have been designed to isolate returning Carson stock Chinook from the province's indigenous spring Chinook populations. The HGMP includes development of a live-capture fishing program to allow a highly adaptable, selective harvest of the hatchery-origin spring Chinook. The Plan includes the ability to adjust production numbers and release sites to maximize conservation and harvest benefits and minimize risks to natural populations.

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 for both tribal and recreational fishermen. Harvest capacity will be adjusted to remove spring Chinook produced for the Isolated Harvest Program while having minimal impact on natural origin spring Chinook and non-target species. Further, most spring Chinook will be acclimated to return to the Tribes' terminal fishing site below Chief Joseph Dam, away from the critical habitat of ESA-listed species.

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 C: 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 to support the Integrated Recovery Program in Omak Creek. 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 Table 6.

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 a natural-origin population in Omak Creek and each major production group (Okanogan River releases and Columbia River releases) will be established.

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

An experimental design will be developed for the Integrated Recovery Program in Omak Creek. The funding of spring Chinook M&E in Omak Creek is contingent upon the Council and BPA agreeing to fund Step A or Step B of the Phase I programs. With a permanent weir being constructed in Omak Creek, the opportunity exists to quantify the results of reintroduction and ongoing supplementation activities.

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 (see Table 6).

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

Smolt release numbers will be varied based on results of the M&E program. Release numbers in Omak Creek will be adjusted based on early run sizes and subsequent estimates of carrying capacity in the stream. Releases from the Isolated Harvest Program, both in the Okanogan River and the Columbia River will also be adjusted. 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 7).

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

Spring Chinook are extirpated in the Okanogan subbasin. Despite decades of spring Chinook propagation in the Methow, Entiat, and Wenatchee rivers, spring Chinook have not naturally recolonized the Okanogan River. Therefore maintaining a reference population does not apply to the Okanogan subbasin. In a larger, provincial context, 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.

Spring Chinook are extirpated in the Okanogan subbasin. Despite decades of spring Chinook propagation in the Methow, Entiat, and Wenatchee rivers, spring Chinook have not naturally recolonized the Okanogan River. Therefore maintaining a reference population does not apply to the Okanogan subbasin at this time. In a larger, provincial context, 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 spring Chinook in Omak Creek, possibly Salmon Creek, and possibly in Canadian waters above Osoyoos Lake. During this time, information will be gathered to determine Chinook carrying capacity and productivity rates. 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 (Isolated 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. A similar study in Omak Creek could be established for spring Chinook to investigate the relative reproductive success of hatchery-origin and natural-origin fish. More interesting would be an investigation as to how well the Carson stock Chinook (a non-local, domesticated stock) adapt to Omak Creek habitat as measured by changes in productivity rates over time. A similar study could then be conducted in Phase II, when Methow Composite stock replace the Carson stock. Results from both stocks could be compared.

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

The planned M&E program will collect the information necessary to test the effectiveness of both the Integrated Recovery Program and the Isolated 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.

With spring Chinook being extirpated in the Okanogan subbasin and its location above nine mainstem dams, supplementation to re-establish populations is warranted. Omak Creek offers unique capabilities to quantify the results of Chinook re-introduction and supplementation. The planned use of live-capture, selective fishing gears by the Colville Tribes to harvest hatchery-origin fish also offers a unique opportunity to allow a natural population to establish with an emphasis on natural-origin fish.

APPENDIX D: ACRONYMS AND ABBREVIATIONS

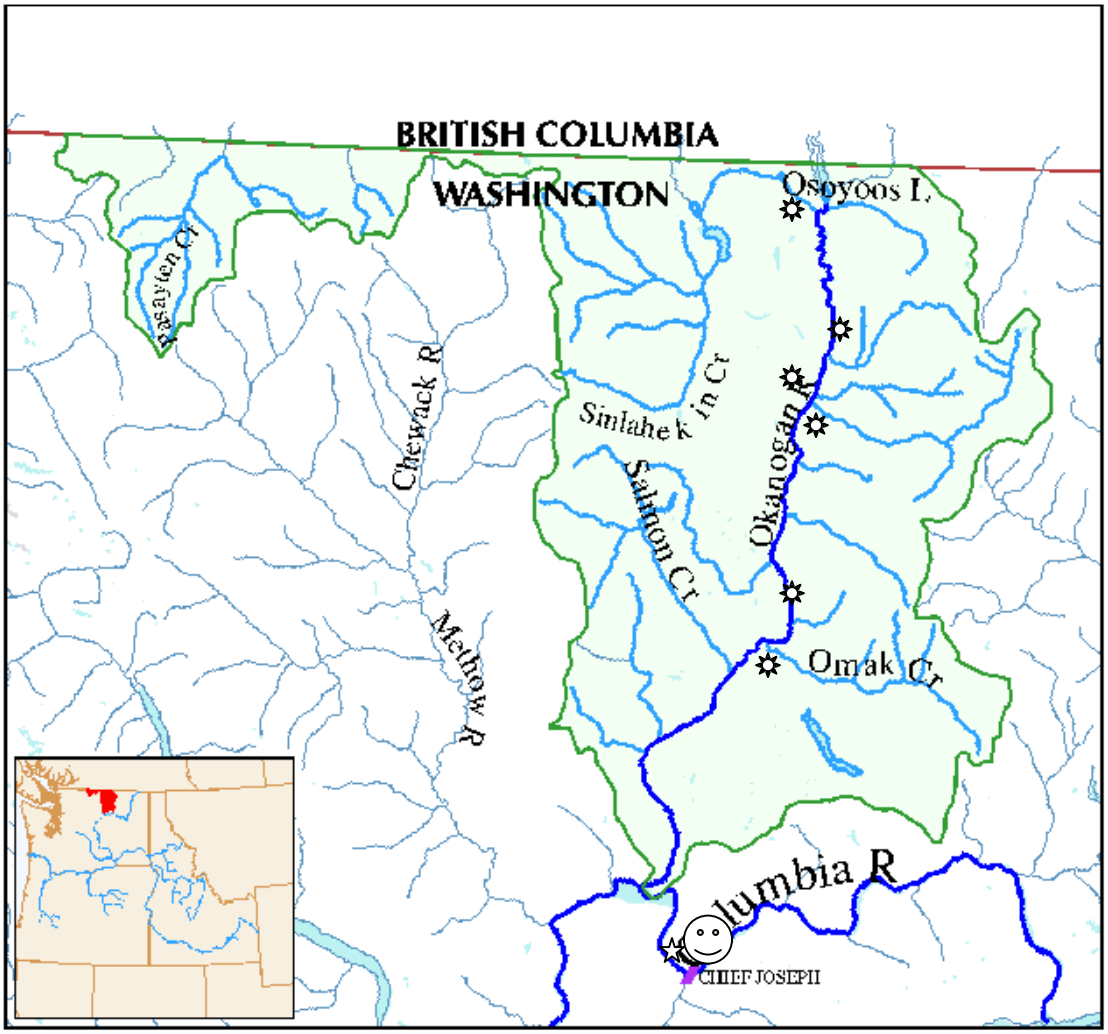
ATP:	Adenosine Triphosphate
BAMP:	Biological Assessment and Management Plan – Mid-Columbia River Hatchery Program (April 1998)
BIOP:	Biological Opinion
BKD:	Bacterial Kidney Disease
BPA:	Bonneville Power Administration
BOR:	Bureau of Reclamation
C&S:	Ceremonial and Subsistence
CCT:	Colville Confederated 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

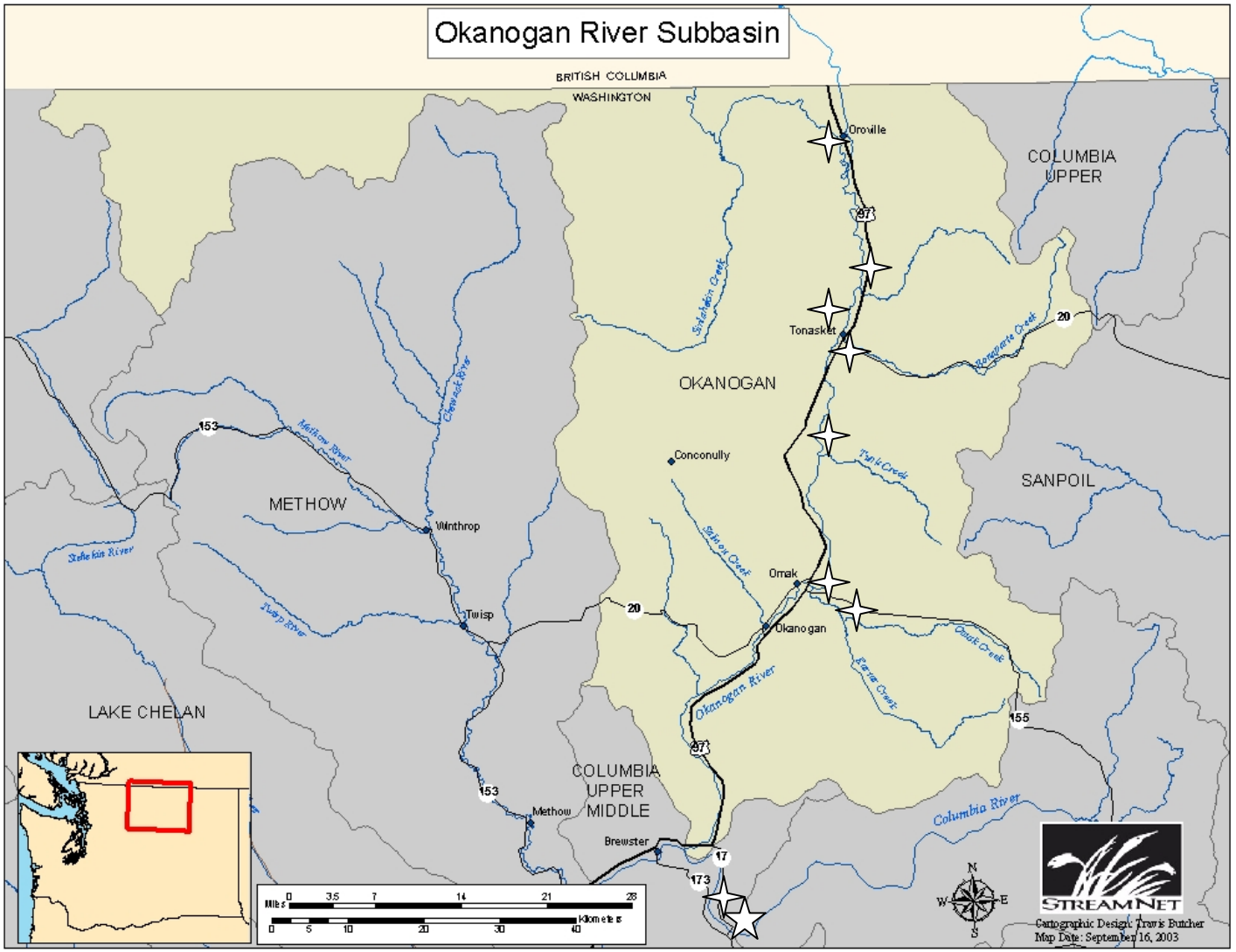
[SpringChinookHGMP404]

Figure 2 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
Okanogan River
155
97
153
COLUMBIA
UPPER
MIDDLE
Methow
Brewster
17
173
Columbia River
N
W
E
S
Miles 0 3.5 7 14 21 28
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Cartographic Design: Travis Butcher
Map Date: September 16, 2003