HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Leavenworth National Fish Hatchery Leavenworth Hatchery Complex
Species or Hatchery Stock:	Spring Chinook salmon
Agency/Operator:	U. S. Fish and Wildlife Service (USFWS)
Watershed and Region:	Icicle Creek, tributary to Wenatchee River, Columbia River Basin, Washington State
Date Submitted:	November 25, 2002
Date Last Updated:	August 2005

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.
Leavenworth National Fish Hatchery (LNFH)

1.2) Species and population (or stock) under propagation, and ESA status.
Carson NFH ancestry stock of spring Chinook salmon *(Oncorhynchus tshawytscha)*, unlisted.

1.3) Responsible organization and individuals

Name (and title): Julie Collins (Project Leader)
Agency or Tribe: U.S. Fish and Wildlife Service
Address: 12790 Fish Hatchery Road, Leavenworth, WA
Telephone: (509) 548-7641
Fax: (509) 548-6263
Email: julie_collins@fws.gov

Name (and title): Dan Davies (Hatchery Manager)
Agency or Tribe: U.S. Fish and Wildlife Service
Address: 12790 Fish Hatchery Road, Leavenworth, WA
Telephone: (509) 548-7641
Fax: (509) 548-6263
Email: dan_davies@fws.gov

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

Involved parties include those associated with the Columbia River Fish Management Plan and the *US v. Oregon* court decision.

1.4) Funding source, staffing level, and annual hatchery program operational costs.
Leavenworth NFH spring Chinook salmon program is funded by the Bureau of Reclamation (BOR) at about $1,000,000 annually, and is staffed by 18 FTE's. Fish marking, evaluation, and fish health programs are not included in the above operational costs. Other USFWS offices funded by the BOR conduct these programs.

1.5) Location(s) of hatchery and associated facilities.
Leavenworth NFH is part of the Leavenworth Complex, which also includes Entiat and Winthrop NFH's. The latter two hatcheries will be covered under separate HGMP's.

Leavenworth NFH is situated on Icicle Creek near Leavenworth, WA. Icicle Creek flows into the Wenatchee River (WRIA 45), tributary to the Columbia River. Fish returning to Leavenworth NFH must travel about 800 km (4.5 km Icicle Creek, 42 km Wenatchee River, and 740 km Columbia River), and must negotiate passage through seven Columbia River hydroelectric dams.

1.6) Type of program.
Isolated harvest/mitigation.

1.7) Purpose (Goal) of program.
The hatchery was originally authorized through the Grand Coulee Fish Maintenance Project in 1937 and again by the Mitchell Act in 1938. Operations began in 1942. Leavenworth is one of three mid-Columbia hatcheries constructed by the BOR as mitigation for the Grand Coulee Dam-Columbia Basin Project. It is used for adult collection, egg incubation and rearing of spring Chinook salmon. The goal of this program is to provide fish to satisfy legally mandated harvest in a manner which minimizes the risks of adverse effects to listed wild populations.

1.8) Justification for the program.
Smolt releases are made directly into Icicle Creek so adults returning from these releases can provide sport and tribal fishing opportunities while minimizing adverse affects to listed fish. There is no primary intent for returning adults to be used for any purpose other than harvest, broodstock, and stream nutrient enhancement.

1.9, 1.10) List of program "Performance Standards and Indicators."
Performance Indicators are designated as "Risk assessment" (R) or "Benefits" (B).

Legal Mandates:
Performance Standard (1): Program contributes to fulfilling tribal trust responsibility mandates and treaty rights, as described in applicable agreements such as under *U.S. v. Oregon.*

> *Indicator (a):* **(B)** Total number of fish harvested in tribal fisheries targeting this program.
>
> *Indicator (b):* **(B)** Total fisher days or proportion of harvestable return taken in tribal resident fisheries, by fishery.

Performance Standard (2): Program contributes to mitigation requirements as stated in the Columbia River Fish Management Plan and the *U.S. v. Oregon* decision.

> *Indicator (a):* **(B)** Number of fish released by program, returning, or harvested, as applicable to given mitigation requirements.

Performance Standard (3): Program addresses ESA responsibilities.

> *Indicator (a):* **(R)** ESA consultations under Section 7 have been completed. A draft Biological Opinion has been issued. Modifications to existing BA's are done in a timely manner.

Harvest:
Performance Standard (4): Fish produced for harvest are produced and released in a manner enabling effective harvest, while avoiding over-harvest of non-target species.

Indicator (a): **(R)** Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated mortalities, by fishery.

Indicator (b): **(R)** Annual numbers of each listed, non-target species caught (including fish released) in fisheries targeting this population.

Indicator (c): **(B)** Recreational angler days, by fishery.

Indicator (d): **(B)** Catch per unit effort, by fishery.

Indicator (e): **(R)** Annual escapements of SCS natural populations that are affected by fisheries targeting program fish.

Performance Standard (5): Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.

Indicator (a): **(R)** Marking rate by mark type for each release group.

Indicator (b): **(R)** Sampling rate by mark type for each fishery.

Indicator (c): **(B)** Number of marks of this program observed in fishery samples, and estimated total contribution of this population to fisheries, by fishery.

Conservation of Wild/Naturally Spawning Populations:
Performance Standard (6): Releases are sufficiently marked to allow statistically significant evaluation of program effects on the local natural population.

Indicator (a): **(R)** Marking rates and type of mark.

Indicator (b): **(R)** Number of marks and estimated total proportion of this population in juvenile dispersal and in adults on natural spawning grounds.

Life History Characteristics:
Performance Standard (7): Annual release numbers do not exceed estimated basin-wide and local habitat capacity.

Indicator (a): **(R)** Carrying capacity criteria for basin-wide and local habitat, including method of calculation.

Indicator (b): **(R)** Annual release numbers from all programs in basin and sub-basin, including size and life-stage at release and length of acclimation, by program.

Indicator (c): **(R)** Location of releases and natural rearing areas.

Indicator (d): **(R)** Timing of hatchery releases, compared to natural populations.

Indicator (e): **(R)** Migration behavior of releases from this program.

Genetic Characteristics:
Performance Standard (8): Juveniles are released on-station to maximize homing ability to intended return location.

Indicator (a): **(R)** Location of juvenile releases.

Indicator (b): **(R)** Releases type, whether forced, volitional, or direct stream releases.

Indicator (c): **(R)** Proportion of adult returns to program's intended return location, compared to returns to unintended upstream dams, fisheries, and artificial or natural production areas.

Performance Standard (9): Juveniles are released at fully smolted stage.

Indicator (a): **(R)** Level of smoltification at release, compared to a regional smoltification index (when developed). Release type, whether forced, volitional, or direct stream release.

Research Activities:
Performance Standard (10): The artificial propagation program uses standard scientific procedures to evaluate various aspects of artificial propagation.

Indicator (a): **(R)** Scientifically based experimental design, with measurable objectives and hypotheses.

Performance Standard (11): 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 (a): **(R)** Monitoring and evaluation framework including detailed time line.

Indicator (b): **(R)** Annual and final reports.

Operation of Artificial Production Facilities:
Performance Standard (12): The artificial production facility is operated in compliance with all applicable fish health guidelines and facility operation standards and protocols.

Indicator (a): **(R)** Annual reports indicating level of compliance with applicable standards and criteria.

Indicator (b): **(R)** Periodic audits indicating level of compliance with applicable standards and criteria.

<u>Performance Standard (13):</u> Effluent from the artificial production facility will not detrimentally affect natural populations.

Indicator (a): **(R)** Discharge water quality compared to applicable water quality standards and guidelines, including those relating to temperature, nutrient loading, chemicals, etc.

<u>Performance Standard (14):</u> Water withdrawals and in-stream water diversion structures for facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.

Indicator (a): **(R)** Water withdrawals compared to applicable passage criteria.

Indicator (b): **(R)** Water withdrawal facilities comply with National Marine Fisheries Service (NMFS), USFWS, and Washington Department of Fish and Wildlife (WDFW) juvenile screening criteria.

Indicator (c): **(R)** Proportion of diversion of total stream flow between intake and outfall.

<u>Performance Standard (15):</u> Releases do not introduce pathogens not already existing in the natural populations, and do not significantly increase the levels of existing pathogens.

Indicator (a): **(R)** Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence.

Indicator (b): **(R)** Juvenile densities during artificial rearing/meet standard.

<u>Performance Standard (16):</u> Distribution of carcasses for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines.

Indicator (a): **(B)** Number and locations of carcasses distributed for nutrient enrichment.

Indicator (b): **(R)** Statement of compliance with applicable regulations and guidelines.

<u>Performance Standard (17):</u> Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.

Indicator (a): **(R)** Size at, and time of, release of juvenile fish, compared to size and timing of natural fish present.

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish). Approximately 1,000 adults are needed for production. Additionally, up to 500 adults are secured (when possible) for transfer to Peshastin Creek. This lower Wenatchee River tributary has had few reported SCS in recent years. This re-introduction effort began through a cooperative agreement (2001 Methow River) between USFWS, NMFS, WDFW, Yakama Nation (YN), and Columbia River Inter-tribal Fish Commission (CRITFC).

1.11.2) Table 1. Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	Icicle Creek	1.625 million (goal)
Adults	Peshastin and Ingalls creeks	Up to 500

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

Table 2. Number of yearling spring Chinook released from Leavenworth NFH, 1983 to 1994. Also listed is the number of returning adults and their survival rate (Carie and Hamstreet 2000).

Broodyear	Yearlings released	Adult returns (BY)	Smolt to adult survival (%)
1983	2,190,000	6,737	0.308
1984	1,969,668	3,723	0.189
1985	2,336,868	5,496	0.235
1986	2,207,294	3,865	0.175
1987	2,239,677	6,427	0.287
1988	2,304,237	15,100	0.655
1989	2,258,034	7,435	0.329
1990	2,286,828	203	0.009
1991	1,757,931	564	0.032
1992	1,522,846	1,569	0.103
1993	1,712,648	5,456	0.319
1994	1,706,060	1,299	0.076

Note: fry and fingerlings were also released in some of these years. These groups were not marked for evaluation and their contribution was probably minimal, therefore are not included here.

1.13) Date program started (years in operation), or is expected to start.
First spring Chinook release was in 1942 (fingerlings) and the first yearling release occurred in 1967.

1.14) Expected duration of program.
Ongoing.

1.15) Watersheds targeted by program.
Wenatchee River Basin (WRIA #45). Returning adults of LNFH origin are expected to return to Icicle Creek only, although some adults are harvested in lower Columbia and ocean fisheries.

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

1.16.1 Brief Overview of Key Issues
A portion of the issues stated below were presented by entities other than the USFWS and therefore are not necessarily the opinion of the management entity.

Icicle Creek restoration is now occurring. This involves the removal of old in-stream structures used for adult holding during the initial phase of the Grand Coulee fish program. This will allow salmonids (and others) access to an additional portion of the old river channel, but does not allow them to areas above the intake for the hatchery. Another issue/concern is the use of a non-indigenous/non-listed stock for the program. Water quality and quantity also have negative impacts on the production program at LNFH.

The Colville Tribes will be submitting an HGMP for comprehensive management of spring Chinook in the Okanogan River and the Columbia River below Chief Joseph Dam. This HGMP outlines an Isolated Harvest Program using Carson stock spring Chinook. This program would mitigate the effects of Federal hydroelectric development to the Colville Confederated Tribes. The Chinook would be acclimated and released in both the Okanogan and Columbia rivers to support tribal C&S and recreational fisheries. The Tribes have also initiated an Integrated Recovery Program for spring Chinook in Omak Creek using the Carson stock (this program will shift to Methow Composite eggs when available – see discussion below) The egg needs for these programs will need to come, in the near term, from Leavenworth NFH.

For the Integrated Recovery Program, 50,000 smolts are provided on an ad-hoc basis from Leavenworth NFH. For the Isolated Harvest Program, rearing would occur at an existing, lower river hatchery (likely Willard NFH). Later, with anticipated construction or expansion of the Chief Joseph Dam Hatchery, these Chinook would be reared locally. The needs of these two programs could be integrated formally into the Leavenworth NFH HGMP and operations.

The Integrated Recovery Program using Carson stock is intended to develop information, skills, and capabilities necessary prior to the planned reintroduction of ESA-listed Upper Columbia River Spring Chinook into the Okanogan Basin. Re-introduction of the listed fish into the

Okanogan would increase its abundance, distribution, and diversity, thereby aiding in its recovery.

The Isolated Harvest Program and accompanying live-capture, selective fisheries is being developed to provide mitigation to the Colville Tribes for development of the Federal hydroelectric system. All current spring Chinook mitigation has been located down river in waters inaccessible to the Colville Tribes.

1.16.2 Potential Alterations to the Current Program

The potential alternatives presented are in draft form and are not necessarily endorsed by the management entity, as mitigation responsibilities may override the desire to implement the alternative.

Alternative 1: Develop a new broodstock and eventually eliminate the unlisted Carson ancestry stock from the basin. This action would potentially eliminate concerns on the negative impacts to the listed, endemic stocks in the basin. The current status of the endemic stocks (very low numbers) negates this alternative at this time.

Alternative 2: Reduce the production goal for the unlisted stock at LNFH. This may be expected to lessen impacts to the listed stocks in the basin. Impacts could include straying, predation, competition, etc. Current mitigation responsibilities negate this alternative at this time.

Alternative 3: Program the Leavenworth NFH to formally collect the eggs necessary to support a 50,000 smolt Integrated Recovery Program in Omak Creek and a 900,000 smolt Isolated Harvest Program in the Okanogan and Columbia rivers. The program in Omak Creek requires 50,000 smolts incubated and reared at Leavenworth NFH. Under this alternative, this production would become a requirement for hatchery operations. The egg take to produce 900,000 smolts would also become part of Leavenworth NFH operations, although a secondary priority to meeting the current production goals at the facility. This egg take would be initiated once the Colville Tribes obtained approval and funding from Federal parties to rear the smolts.

1.16.3 Potential Reforms and Investments

The potential reforms and investments stated below are in draft form, presented for further discussion, and do not represent final decisions by the management entities.

Reform/Investment 1: Obtain additional water/water rights for the facility. This action would allow additional production (different stock or species) and/or a reduction in raceway densities, which promotes improved fish health and hence, survival. Because this basin is already over-appropriated and the current wells are considered to be in continuity with the river, this reform/investment has not recently been pursued. Monetary costs for this project are not known at this time.

Reform/Investment 2: Bring the intake and water delivery system up to required standards.

This project has been funded and construction is slated for 2004 or 2005.
Reform/Investment 3: Increase egg take at Leavenworth NFH and transport to designated incubation and rearing facility. In most years, the hatchery obtains sufficient surplus broodstock to supply eggs to the Colville's proposed programs. Spawning and incubation operations would need to be expanded and eyed eggs transported to a designated incubation and rearing facility. Cost: <$50,000. This mitigation reform may require some additional incubation facilities and additional operational costs during spawning.

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

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

1. FWS # 1-9-99-I-112 (bull trout).
2. NMFS – NOAA Fisheries, 10/22/03 Biological Opinion for production of unlisted salmonid species.
3. Permit #1119 (research), NMFS.
4. FWS # 05-0153
5. FWS # 02-F-E-0081

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.

Spring Chinook salmon (SCS)

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 state 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 64 cm (range of averages = 52 to 71 cm). For females, the average is 66.5 cm (range of averages = 63 to 71 cm) (Mosey and Murphy 2002). Jacks are included in the male length data.

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 91.8 mm to 100.5 mm (averages from three emigration studies) (Chapman et al. 1995).

From 1985 to 1993, the average 10^{th}, 50^{th}, and 90^{th} percentile passage at Rock Island Dam was April 21^{st}, May 10^{th}, and June 3^{rd} 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.

Summer Steelhead (SST)
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).

- Identify the ESA-listed population(s) that will be directly affected by the program.
There are no listed SCS stocks in Icicle Creek, only an unlisted hatchery stock. 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).

- Identify the ESA-listed population(s) that may be incidentally affected by the program.
UCR steelhead and Wenatchee Basin (UCR) spring Chinook salmon. In 1995, the small steelhead program at LNFH was moved to Winthrop NFH. Remnants of this program still return to and spawn in Icicle Creek. Affects to listed steelhead and spring Chinook during the harvest of returning LNFH adults is consulted on by WDFW under a separate and annual process. Listed Snake River stocks may be affected in the migration corridor. See Ecological Interactions section for information.

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

3. Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds.
NMFS determined that the annual rate of population change for the UCR spring Chinook and summer steelhead ESU is less than 0.9, and decreasing in abundance at a rate of at least 10% per year. These populations are at dire risk, with only small fractions of their already depressed populations expected to persist through the next 24 years under current conditions (NMFS 2001). Therefore, UCR spring Chinook and summer steelhead are considered at a "critical population threshold."

- 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.
Unknown for SCS or SST, please see below.

- 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.

Table 3. Number of SCS redds located outside Icicle Creek (listed stocks) but within the Wenatchee Basin (Mosey and Murphy 2002)

Year	# of Redds	Year	# of Redds
1990	446	1996	72
1991	251	1997	175
1992	491	1998	83
1993	536	1999	48
1994	115	2000	280
1995	23	2001	1,788

Table 4. Estimates of the number of natural-origin SCS returning to the Wenatchee Basin (excludes Icicle Creek and Leavenworth NFH), 1990 to 1999 (Mosey and Murphy 2002).

Year	# of SCS	Year	# of SCS
1990	1,425	1995	278
1991	1,109	1996	364
1992	1,726	1997	369
1993	3,835	1998	499

1994	758	1999	316

Table 5. Estimates of the number of steelhead utilizing Wenatchee Basin. These estimates use dam counts (subtracting the Rocky Reach count from the Rock Island count), whereas the difference is the Wenatchee River population (NMFS 2001).

Year	# of SST	Year	# of SST
1987	5,534	1993	1,776
1988	3,680	1994	2,795
1989	3,232	1995	2,351
1990	1,922	1996	1,531
1991	3,277	1997	1,114
1992	4,941	1998	545

- 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.
Stray estimates for years 1990 to 2000 show that SCS adults of LNFH origin have a high fidelity to Icicle Creek. Of an estimated 62,375 surviving adults of LNFH origin, only 442 (0.71%) are considered as "strays." Of the 442, only 193 (0.31%) were estimated to have strayed into natural spawning areas. Historical data for the same years show that of 12,013 adults spawning in the upper Wenatchee Basin (Mosey and Murphy 2000), only 193 (1.6%) were of LNFH origin.

Table 6. Percentage of wild proportion of SST passing Priest Rapids Dam (destined for the upper Columbia) (NMFS 2001).

Year	Wild % of Total	Year	Wild % of Total
1987	28.4	1993	16.3
1988	26.2	1994	12.7
1989	25.2	1995	22.7
1990	20.2	1996	10.1
1991	20.0	1997	8.8
1992	11.4	1998	15.9

2.2.3) <u>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</u> .

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.
Broodstock collection directed at unlisted adults returning to Leavenworth NFH has a low potential to "take" listed spring Chinook salmon. Since 1994, only one verified listed spring Chinook has been used for propagation.

There is potential for "take" during the harvest of LNFH adults. This activity is consulted

on by WDFW annually, pre-harvest.
When LNFH was constructed in 1938 – 1941, a barrier dam was built to help secure broodstock for the facility. This barrier has blocked migrating salmonids for over 60 years. The effects of and potential solutions to the "blockage problem" in Icicle Creek, is being addressed through a separate process. A Final Environmental Impact Statement (FEIS) has been issued by the USFWS, which was crafted in cooperation with various federal, state, tribal, and private entities (USFWS 2002).

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.
The only verified listed spring Chinook adult "taken" (used for production) was in 1994, and they were not listed at that time.

- 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).
See Table 1 and 2 in the Appendix.

- 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.
Since there are no listed spring Chinook stocks in Icicle Creek, and rarely are listed Chinook found in collected brood, there is no contingency plan in place. If listed steelhead enter the collection ponds, they are netted and placed back into the river. Also, the increased proportion (100%) of marked hatchery fish further reduces the chance of taking listed SCS.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.
The Columbia River Fish Management Plan *(US v Oregon)* directs the operation/production of this facility.

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

<u>Original Authorities</u>

- Grand Coulee Dam Project, 49 Stat. 1028, 08/30/1935
- Grand Coulee Fish Maintenance Project, 04/03/1937

- Mitchell Act, 52 Stat. 345, 05/11/1938
- Columbia Basin Project Act, 57 Stat. 14, 03/10/1943
- Mitchell Act (amended), 60 Stat. 923, 08/14/1946
- Fish and Wildlife Coordination Act, 60 Stat. 1080, 08/14/1946

Description of Roles/Responsibilities/Authorities Beyond Those Initially Authorized
- Treaty with the Walla Walla, Cayuse, Umatilla Tribes, 06/09/1855
- Treaty with the Yakama, 06/09/1855
- Treaty with the Nez Perce, 06/11/1855
- Treaty with the Tribes of Middle Oregon, 06/25/1855
- Executive Order (Treaty with Bands of Colville), 04/08/1872
- U.S. v. Oregon (Sohappy v. Smith, "Belloni decision", Case 899), 07/08/1969
- Endangered Species Act of 1973, 87 Stat.884, 12/28/1973
- Salmon and Steelhead Conservation and Enhancement Act, 94 Stat. 3299, 12/22/1980
- Pacific Salmon Treaty Act of 1985 (U.S./Canada Pacific Salmon Treaty), Public Law 99-5, 16 U.S.C. 3631, 03/15/1985

3.3) Relationship to harvest objectives.

Although the role in harvest has varied considerably for LNFH, the current program is geared to provide a terminal (isolated) tribal and sport harvest in Icicle Creek. LNFH and Icicle Creek provide the only spring Chinook fishery in the upper Columbia Basin (above the Yakima River).

Production numbers that provide harvest are outcomes of the *U.S. v. Oregon* decision.

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.

Fisheries that benefit from the program:
- Marine sport and commercial
- Columbia River gill net and freshwater net
- Columbia River and freshwater (tributary) sport
- Treaty ceremonial and tribal harvest

Table 7. Number of LNFH SCS adults harvested, 1988 to 1999.

Year	1988	1989	1990	1991	1992	1993
Wenatchee Basin Harvest (1)	4,119	2,963	1,943	1,548	9,388	12,460
Adults harvested outside Wenatchee Basin (2)	113	57	189	1,053	2,127	1,531
Year	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Wenatchee Basin Harvest (1)	101	29	228	3,448	1,129	1,023
Adults harvested outside Wenatchee Basin (2)	155	14	32	115	29	36

(1) – Wenatchee Basin harvest includes sport and tribal harvest and adults taken in excess of production needs. The YN provide tribal harvest estimates.

(2) - Out-of-basin is an estimate using CWT recoveries. These figures include all LNFH adults harvested outside Wenatchee Basin.

Note: due to the increased marking of our hatchery stock, there is greater potential for an increase in harvest.

3.4) Relationship to habitat protection and recovery strategies.

As previously mentioned, LNFH is a mitigation facility constructed to compensate for lost habitat due to the construction of Grand Coulee Dam.

Anadromous salmonid populations in the Wenatchee sub-basin are influenced by the following out-of-sub-basin impacts; degraded estuarine habitat, fish harvest, unfavorable ocean conditions, and the effects of seven Columbia River reservoirs and hydroelectric dams on smolt and adult migration (Andonaegui 2001).

Within the sub-basin, human alterations to the environment are exacerbating naturally limiting conditions by reducing habitat quality and quantity, thereby reducing a species' chances of successfully completing its life cycle. These alterations have primarily occurred in the lower gradient, lower reaches of watersheds in the lower sub-basin and include road building and replacement, conversion of riparian habitat to agriculture and residential development, water diversion, reduced large woody debris (LWD) recruitment, and flood control efforts that include LWD removal, berm construction, and stream channelization (Andonaegui 2001).

Along with the above document, past and existing efforts to maintain and restore salmon habitat and other watershed management needs, are identified in the Draft Wenatchee Sub-basin Summary (CBFWA 2001).

3.5) Ecological interactions.

Table 8. Fish species present in Icicle Creek.

Salmonid Species	Scientific Name	Non-salmonid Species	Scientific Name
Spring Chinook salmon	*Oncorhynchus tshawytscha*	Longnose dace	*Rhinichthys cataractae*
Summer Chinook salmon	*O. tshawytscha*	Mottled sculpin	*Cottus bairdi*
Sockeye salmon	*O. nerka*	Largescale sucker	*Catostomus macrocheilus*
Coho salmon	*O. kisutch*	Bridgelip sucker	*C. columbianus*
Summer steelhead	*O. mykiss*	Pacific lamprey	*Entosphenus tridentatus*
Westslope cutthroat trout	*O. clarki lewisi*	Northern pikeminnow	*Ptychocheilus oregonensis*
Redband trout	*O. mykiss gairdneri*		
Bull trout	*Salvelinus confluentus*		
Brook trout	*S. fontinalis*		
Mountain whitefish	*Prosopium williamsoni*		

Ecological effects/interactions of LNFH fish on natural populations is broken-down into two categories; 1) effects associated with juvenile releases, and 2) effects associated with returning adults. Potential effects to listed stocks are described below. Effects to non-salmonid species are unknown, but felt to be minimal.

Juvenile Releases

Competition:

When hatchery-origin Chinook are released into the Wenatchee River Basin, the potential exists for intra- and inter-specific competition with natural-origin juvenile salmonids, including listed spring Chinook salmon and steelhead (NMFS 2001). Listed wild spring Chinook and steelhead are present year-round in Upper Columbia River region tributary and mainstem areas. Spring Chinook fry emerge from the gravel in late winter or early spring at an average size of approximately 30 mm fl, with most fry immediately moving downstream to mainstem tributary areas for rearing (NMFS 2001). Upper Columbia River spring Chinook salmon migrating seaward as yearling fish between April and June, average 87 to 127 mm fl (NMFS 2001). Steelhead fry egress from late spring through August at a size of 30 to 33 mm fl (NMFS 2001). The fry disperse to downstream areas in late summer and fall. Upper Columbia River steelhead emigrate seaward as age 2+ (43.2%) or 3+ (46.4%) smolts (Peven 1990) during April and May at an average size of 163 to 188 mm (Chapman et al. 1994).

For the species viewed as posing competition risks by SIWG (1984), spring Chinook, summer Chinook, and coho salmon yearling smolts released from the hatcheries by the action agencies (which includes LNFH) in April and May likely encounter newly emerged, listed spring Chinook salmon fry adjacent to the hatchery release sites. These release groups may also encounter spring Chinook fry and juvenile steelhead in river reaches downstream of the release sites. Emigrating spring Chinook and steelhead smolts in the action area may also be encountered during the hatchery fish emigration period. The SIWG (1984) identified a high risk that competition by hatchery-origin Chinook and coho salmon juveniles will have a significant negative impact on productivity of wild Chinook salmon and steelhead juveniles in freshwater. Due to the fact that no listed spring Chinook stocks reside in Icicle Creek, coupled with minimal spawning in areas below the Icicle confluence, these impacts would be lessened.
The release of migration-ready smolts limits the duration of interaction between the hatchery fish and listed wild spring Chinook and steelhead rearing in areas adjacent to, and downstream of, the hatchery fish release locations. This release practice therefore likely decreases resource competition and behavioral dominance risks posed by the larger hatchery fish. The larger size of the hatchery fish relative to the wild fry and fingerlings present at the time of releases also decreases the likelihood for competition for the same food resources by the hatchery and wild fish. The larger, seaward migrating hatchery smolts will also tend to use different habitat than rearing steelhead and spring Chinook fry and fingerlings that may be encountered (NMFS 2001).

Predation:
By virtue of their large size compared to wild juvenile fish that they may encounter after release, and considering the areas where hatchery fish are released, hatchery spring Chinook yearlings have the potential to prey upon listed fish in the Wenatchee River Basin and mainstem Columbia River (NMFS 2001). The SIWG (1984) identified that the release of hatchery Chinook and coho salmon would adversely affect the productivity of wild Chinook and steelhead populations through predation, but to what extent is unknown.

Hatchery spring Chinook salmon yearling predation on wild Chinook juveniles has been documented in other Columbia River Basin areas. Spring Chinook yearling releases from LNFH are made into Icicle Creek, which lacks a listed spring Chinook population. Listed spring Chinook production in the mainstem Wenatchee River downstream of this release location is low (NMFS 2001). Based on recent spawner counts, most spring Chinook production occurs in tributaries well upstream of the mouth of Icicle Creek. The number of Wenatchee Basin-origin spring Chinook fry that may be encountered and affected during LNFH spring Chinook yearling emigration is expected to be low (NMFS 2001). However, predation effects of the LNFH SCS and WDFW's SUS programs on rearing unlisted natural-origin summer Chinook fry may be substantial (NMFS 2001).

Hatchery spring Chinook released at LNFH in April and May, may encounter emigrating spring Chinook and steelhead smolts in the action area during the hatchery fish release and downstream migration period. Predation by hatchery fish on listed spring Chinook and steelhead smolts commingling with hatchery fish during seaward emigration is unlikely, given the similar size of hatchery salmon and wild spring Chinook, and the generally larger size of emigrating wild steelhead smolts (NMFS 2001). The hatchery releases may pose indirect predation risks to the wild fish in Basin reaches where hatchery fish are densely distributed and commingled with wild fish, however, by attracting avian or fish predators (NMFS 2001).

Residualism:
Spring Chinook, summer Chinook, sockeye, and coho salmon released from hatcheries as yearling smolts do not have the same potential to residualize as steelhead (NMFS 2001). Standardization of the life history of these salmon species by producing yearling smolts differs from the variability in growth and advent of smoltification evident in wild fish populations. The hatchery production strategies designed to release uniform sized smolt groups limit the likelihood for residualization of the salmon released (NMFS 2001).

Residualization by LNFH yearling spring Chinook salmon, leading to the occurrence of precocious male spring Chinook, may be a risk factor for listed wild adult spring Chinook in the Wenatchee River Basin (NMFS 2001). The existence of non-migrating, precocious males is common and characteristic of hatchery and wild spring Chinook stocks in the region at low proportions (1% to 3% of yearling populations) (USFWS 1999). These precocious fish may contribute to reproduction in natural spring Chinook spawning areas, but the extent of any contribution is unknown. The risk of adverse effects may be reduced by an apparent higher mortality rate for these precocious fish relative to non-maturing juvenile fish, and a low stray rate to areas outside of the hatchery release location (NMFS 2001).

Transmission of Disease or Parasites:
The potential for LNFH fish to transmit diseases and parasites to listed salmonids is unknown, but thought to be low. Service fish health biologists routinely assess the health of spring Chinook propagated at LNFH. At least once per month, biologist's sub-sample ponds to determine Bacterial Kidney Disease (BKD) levels, overall fish health, parasites, and the possible occurrence of other viral or bacterial infections. Under Service fish health policy, fish at LNFH must be destroyed and their remains buried if they are diagnosed with viral diseases not endemic to the country or that threaten the continued existence of fish populations. Parasites are not prevalent among LNFH fish. All adults are tested at spawning time, and those showing high levels of BKD are discarded prior to egg incubation.

Migration Corridor:
Unlisted hatchery salmon smolts released from the Upper Columbia River hatcheries may

encounter listed Columbia and Snake river basin salmon and steelhead juveniles during migration in the mainstem Columbia River and the estuary (NMFS 2001). Spatial and temporal interaction between hatchery-released smolts and listed salmon and steelhead juveniles may lead to several types of adverse affects on the listed natural populations: predation, competition, behavioral alteration, and disease transmittal.

There is likely a low risk of predation by Upper Columbia River hatchery Chinook smolts on listed Chinook salmon, sockeye, and steelhead juveniles due to low spatial and temporal overlap with fish of a susceptible size in the migration corridor. Listed Lower Columbia River chum salmon may be susceptible to predation by yearling Chinook salmon in the lower Columbia River and estuary (NMFS 2001). SIWG (1984) indicated a high risk that predation by this species (and others) would have negative effects on the productivity of chum salmon. Chum are thought to emigrate predominately in March, which may separate them from Upper Columbia region hatchery Chinook, which are released in April. The duration of time that chum salmon inhabit the Columbia River estuary is unknown, as is the risk of predation on the commingled wild fish (NMFS 2001).

Potential impacts of competition on listed fish in the migration corridor likely diminish as hatchery smolts disperse from the hatchery release locations and become less concentrated. Food resource competition may continue to occur at an unknown, but likely lower level as smolts move downstream through the migration corridor (NMFS 2001). NMFS (1996) previously determined that no adverse competition effects on co-occurring listed salmon in the migration corridor would result from the release of hatchery smolts that begin migration immediately seaward after release. The release of migration-ready smolts limits the duration of interaction with wild salmonids in the migration corridor. Competition between Upper Columbia River hatchery-origin unlisted salmon and wild salmon and steelhead in the mainstem corridor should not significantly affect listed salmonids (NMFS 2001).

Release of only smolts from LNFH will minimize temporal overlap between unlisted hatchery-released salmon and listed fish in the Columbia River mainstem. Releases of hatchery salmon smolts coincident with managed releases of water from dams (water budget releases) will help accelerate migration of hatchery-released salmon, further reducing spatial and temporal overlaps with wild fish (NMFS 2001).

Additional compliance with fish disease control and minimization policies and guidelines (IHOT 1995), significantly decreases the likelihood for transfer of disease from hatchery salmon to listed wild salmonids during the seaward emigration period in the mainstem river (NMFS 2001).

Returning Adults
The possibility is thought to be low that adult spring Chinook salmon returning to LNFH will adversely impact listed salmonids. Potential for effect could occur in the ocean and in-river migration corridor or during broodstock collection, harvest, or straying of LNFH adults into the natural spawning areas.

Ocean Effects:
Little is known about individual stocks of Chinook salmon and steelhead between the time they leave the estuary as smolts and return as adults to spawn. Available information is inferred from Coded-Wire Tag (CWT) data taken from fish harvested at sea. These data, however, do not give us insight into fish behavior nor inter-specific interactions among stocks in the ocean. Since spring Chinook are harvested at an extremely low rate, LNFH fish are not an important factor in determining ocean harvest regulations and quotas that could effect listed species.

In-river Effects:
Adults returning to LNFH are trapped as volunteers to the hatchery from late May to mid-June. There is potential that listed natural-origin spring Chinook originating from other portions of the Wenatchee River watershed may also be trapped at the hatchery as volunteers. However, the number of listed spring Chinook adults that are likely to return to LNFH is low. Scale and CWT analysis of spring Chinook adults collected at LNFH indicates that very few wild spring Chinook stray into Icicle Creek or the hatchery (one was estimated to be taken in 1994). NMFS (2001) determined that the LNFH program is not likely to affect listed juvenile spring Chinook salmon due to the design and location of the broodstock collection actions.

Harvest:
Many adult salmon returning to LNFH are harvested in the terminal tribal and sport fisheries in Icicle Creek. This activity is directed by WDFW and the state must consult on these fisheries annually, prior to harvest. The YN, in cooperation with WDFW, set tribal fishing seasons and limits.

Straying and Spawning:
The chance that returning adults of LNFH origin may stray and spawn outside the hatchery or Icicle Creek is low. Current data indicates that the stray rate of LNFH adults into the natural spawning areas of the Wenatchee Basin is about 1.6% of the spawning population (see section 2.2.2). Mass marking at LNFH is now occurring and should help verify stray rates.

Sockeye Salmon:
A small number of sockeye salmon spawn in Icicle Creek below LNFH. These fish are probably strays from the Lake Wenatchee stock. The adults spawn in a small side-channel that enters below the hatchery pool. Effects on these from our smolt releases are unknown, but thought to be minimal.

Coho Salmon:
The coho stock found in the Wenatchee Basin is an experimental population. How the LNFH program effects this project is unknown. The YN has the program lead for this effort.

Westslope Cutthroat trout, Redband trout, and Mountain Whitefish:
Impacts of the LNFH program on these species are unknown, but they are subject to upstream blockage at the facility.

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.

The hatchery's water delivery system consists of three major components and conveyance systems: 1) the gravity intake on Icicle Creek, 2) the Snow Lake Supplementation Water Supply Project and, 3) the well system on hatchery property.

Table 9. LNFH permits/certificates to obtain and discharge water from Icicle Creek.

Certificate #	Source	Date	Amount
1824	Icicle Creek	1942	18,900 GPM
1825	Snow/Nada Lakes	1942	16,000 Acre Feet
3103-A	Groundwater	1957	1,200 GPM
016379	Groundwater	1940	900 GPM
016378	Groundwater	1939	700 GPM
G4-27115C	Groundwater	1980	3,900 GPM
WA-000190-2	**NPDES**		

The intake is located at rm 4.5, approximately 1.5 miles upstream of the hatchery. Water is conveyed to the hatchery through a buried 31-inch pipe system. This water enters a sand settling basin and on through two screen chambers prior to its arrival at the hatchery. The water intake structure consists of a diversion dam, fish ladder, wide bar trash rack (6 inch spacing) and another narrower bar trash rack (1 1/2 inch spacing) located in a building. This structure is currently not properly screened, but plans are underway to bring it into compliance. The intake structure is inspected daily as part of standard protocol for signs of fish and/or debris. At no time in the past year have any fish been observed on the rack at the intake.

The overflow channel leading away from the screen chamber periodically goes dry during low summer flows. When excess water becomes unavailable, the overflow channel is blocked just below the screen chamber. The area above the blockage is monitored daily for entrained fish. Prior to the channel going dry, staff walks the entire length of the channel where entrained fish are netted and transferred back to the river. No listed salmonid has been found during these salvage operations

Entrained fish in the system can return to the river several ways: 1) the Cascade irrigation diversion, which branches off the system below the intake, has a drum screen to divert fish into a sluiceway back to the river, 2) the overflow area at the sand-settling basin can pass fish back to the river via effluent and, 3) the two screen chambers. One is within a building and is equipped with 1/8 inch x 1/8 inch plastic coated screens which divert fish into a bypass pipe to the river. The other screen chamber is covered and is equipped with 3/32-inch round-holed screens, which divert fish into an overflow channel back to the river. From both screen chambers, water is delivered to the rearing ponds and back to the river. Both screen chambers meet the standards for screening criteria described in the *1994 Policies and Procedures for Columbia Basin*

Anadromous Salmonid Hatcheries developed by NMFS.
The sand-settling basin, on occasion, needs to be cleaned of material. The water is drawn down and any fish entrained are netted and transferred back to Icicle Creek. At no time have listed salmonids been found, nor have any mortalities been documented during this effort.

During construction of the hatchery, it was recognized that surface flow in Icicle Creek might at times be insufficient to meet production demands. A supplementary water supply project in Snow Lake and Nada Lake was therefore developed and a water right to 16,000 acre feet of Snow Lake was obtained. These lakes are located approximately 7 miles from the hatchery and about one-mile above it in elevation. A ½ mile tunnel was drilled and blasted through granite to the bottom of Snow Lake and a control valve was installed at the outlet of the tunnel. Operation of the control valve is determined by Icicle Creek flow and water temperature. The control valve is typically opened mid-July or as soon as the creek water consistently reaches 58°F (D. Davies pers. comm.). Water drained from Snow Lake enters Nada Lake, which drains into Snow Creek, a tributary to Icicle Creek that enters at rm 5.5. Thus, supplemental flows, ranging from 45 to 60 cfs from Snow Creek, enter Icicle Creek one-mile above LNFH's intake system.

During critical periods of the rearing cycle, well water is used to cool/warm stream water, and stream water to warm well water. Water quality data for Icicle Creek (WRWAP 1998) is in Attachment 1.

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.
As stated in the previous section, while the intake structure itself is currently not in compliance, the system as a whole is. Even so, USFWS is currently in the process of rebuilding and/or upgrading the entire system. Funding has been secured and a Biological Assessment has been prepared and submitted for the project (USFWS 2004).

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).
All 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.

After the adults are spawned and the ponds disinfected, a portion of the juveniles from the previous years brood are moved from the upper raceways into the large adult ponds. The juveniles remain there until their release the following April.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).
The adults transferred to Peshastin Creek, travel via a fish hauling truck supplied by the Yakama Nation. The 1,000 gallon capacity tank is baffled in the center, has four air-stones run by

compressed air, two circulation pumps, and is double insulated. No other live fish are moved off station. Adults exit the tank via a 10 to 12 inch diameter flexible pipe, directly into the receiving waters.

5.3) Broodstock holding and spawning facilities.
As stated in section 5.1, 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.

5.4) Incubation facilities.
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 buttoned-up stage.

5.5) Rearing facilities.
Rearing facilities include the aforementioned adult holding ponds, 45 – 8 x 80 raceways, 14 – 10 x 100 covered raceways, incubators, 108 starter tanks, plus 40 small and 22 large Foster-Lucas ponds (not used).

After the eggs hatch and reach the buttoned-up stage, they are moved from the troughs to the starter tanks and feeding commences. As density and flow indices increase to a certain point (indices are measured), the fry are moved outside to the raceways. As the juveniles grow, they are periodically "split" into other raceways to reduce densities. Excluding the juveniles moved to the adult ponds, the fish would remain in these raceways until release.

5.6) Acclimation/release facilities.
Yearlings (smolts) are forced released directly from the raceways. A drain plug is removed, and the smolts travel through an underground pipe system, which empties at the base of the collection ladder into Icicle Creek. The juveniles holding in the adult ponds are forced out through a large flexible drainpipe, which empties into the pool (Icicle Creek) below the hatchery.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.
In recent years, there has not been any significant loss of production fish at LNFH. Although not considered significant, the occasional disease out-break will heighten mortality. The forest fires in 1994, which burned a substantial portion of the Icicle Creek drainage, caused great concern. Because of the geology of the basin, there was concern that large amounts of silt/debris would descend downriver, and potentially into the hatchery. This scenario never transpired. During severe winters, there is potential for the water intake structure to freeze-up and stop flow to the hatchery. While the possibility exists for freeze-up, it has yet to cause mortality problems at the facility.

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.

The hatchery is staffed full-time during daylight hours, and personnel in residential quarters are on the hatchery grounds. Raceways and nursery tanks are equipped with a low-water alarm system. Although the alarm can be heard for a great distance, the system will also automatically phone staff to warn them of the problem. If power is lost to the facility, there is an emergency back-up system that automatically engages to restore power.

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.

Table 10. History of SCS egg/brood source at LNFH.

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

6.2) Supporting information.

6.2.1) History.

The original broodstock used to start the program were commingled, and destined for the upper Columbia Basin. These adults were trapped at Rock Island Dam and brought to the Leavenworth facility. McKenzie River and Eagle Creek are tributaries to the Willamette River (lower Columbia River), all in the state of Oregon. The Little White Salmon stock started in 1967, when fish of unknown origin returned to the LWS River. These adults were probably descendants of several different stocks, and it is unclear what their exact lineage was. The Carson NFH stock originated from a collection of commingled adults captured at Bonneville Dam.

6.2.2) Annual size.

Since LNFH only propagates an unlisted stock, no “natural” listed fish are used.

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

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).

6.2.4) Genetic or ecological differences.

Homing permits local adaptation in salmonids. If hatchery fish, such as Leavenworth fish with extensive Carson Hatchery background, strayed extensively into tributaries used by wild SCS, one might expect hybridization to occur with detectable consequences. No direct evidence exists that such hybridization has occurred in Wenatchee River tributaries used by wild Chinook in spite of similar allele frequencies of LNFH fish and wild stocks of the Chiwawa River and Nason Creek (Chapman et al. 1995). Within the Wenatchee River Basin, the only stock showing isolation is the White River stock. Chapman et al., 1995, made reference to limited data etc, when coming to this conclusion. Run and spawn timing appears to be similar between the wild stocks and those propagated at LNFH (Chapman et al. 1995).

6.2.5) Reasons for choosing.

Availability was probably the main factor when broodstock was selected. At that time, little was known about the potential effects of propagating a non-endemic stock.

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.

Currently, no measures are in place as no listed fish are targeted for broodstock and no listed stocks are found in Icicle Creek where collection occurs.

SECTION 7. BROODSTOCK COLLECTION

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

Adults only.

7.2) Collection or sampling design.

Broodstock is obtained entirely from adults volunteering to the hatchery's collection ladder. The ladder operates from mid-May to mid-July, which covers the full spectrum of the run. Excess adults are periodically donated to various tribes and non-profit groups. This occurs when large numbers of adults enter the ladder in a short period of time. Because we have two adult holding ponds, we are able to separate and retain fish throughout the run.

7.3) Identity.

Since only an unlisted spring Chinook stock is propagated at this facility and this tributary, it is a rare occurrence that a listed adult is captured at the hatchery or during the sport and tribal harvest.

7.4) Proposed number to be collected:

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

Approximately 1,000 adults are needed to secure production needs. Up to 500 additional adults are held for the Peshastin Creek re-introduction effort.

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

Table 11. Number of adults used for production, eggs taken, and juveniles released, 1988 to 1999.

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

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.

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.

7.6) Fish transportation and holding methods.
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.

7.7) Describe fish health maintenance and sanitation procedures applied.
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 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 likelihood of transmitting the 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.

7.8) Disposition of carcasses.
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. From 2000 to 2003, adult male carcasses were scatter-planted throughout the basin for nutrient replacement. Due to concerns expressed by WDFW (no associated monitoring program), this practice was halted in 2004.

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.
As previously mentioned, no listed fish are targeted for broodstock and no listed SCS stocks reside in Icicle Creek where the hatchery is located.

SECTION 8. MATING

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

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 and secondary males 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.

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 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:

9.1.1) Table 12. Number of eggs taken and survival rates to eye-up and/or ponding.

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 %

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.

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.

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.

9.1.5) Ponding.
Fry are removed from incubators when they are 99% buttoned-up. After a few days of acclimation and when all fish are on or near the surface, feeding commences. Commonly, newly buttoned-up fish are 1,250 to 1,350 fish/pound when they are moved to nursery tanks.

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.

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.

9.2) Rearing:

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

Table 13. Survival estimates for juvenile SCS, LNFH.

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

9.2.2) Density and loading criteria (goals and actual levels).
See 9.2.3 below

9.2.3) Fish rearing conditions
Table 14 describes monthly monitoring variables collected during the rearing of a single brood year of spring Chinook. Values are collected monthly from a random sample of separate rearing units unless otherwise indicated. The table presents approximate values that are indicative of a "normal" production year. The monitoring values of dissolved oxygen, carbon dioxide and total gas pressure are not indicated, however, reference to the exclusion of these variables is footnoted below in Table 14.

Density index and flow index are the criteria by which standard pond management procedures adhere. These criteria include efforts to remain below a density index of 0.2 and below a flow index of 0.6 while maintaining production goals.

Table 14. Leavenworth NFH temperature regime, water source/quantity profiles, flow index, and density index averages by month.

MONTH	Development Stage	Temp[1] ^{0}F Ave	Water Source[2] % Well	% River	Flow GPM[3]	Flow Index (lbs./in.* GPM)[4]	Density Index (lbs./in.*ft^3)[4]
August	Egg	NA	100%	0%	NA	NA	NA
September	Egg	NA	100%	0%	NA	NA	NA
October	Egg	NA	100%	0%	NA	NA	NA
November	Sac Fry	NA	100%	0%	NA	NA	NA
December	Fry	46.8	100%	0%	3,161	0.43	0.13
January	Fry	46.6	100%	0%	3,792	0.51	0.20
February	Fry	44.5	90%	10%	5,050	0.54	0.16
March	Fingerlings	44.4	90%	10%	6,035	0.59	0.09
April	Fingerlings	44.9	40%	60%	6,939	0.73	0.11
May	Fingerlings	45.0	40%	60%	8,007	0.78	0.06
June	Fingerlings	48.5	0%	100%	16,208	0.55	0.07
July	Fingerlings	56.0	0%	100%	16,624	0.71	0.09
August	Fingerlings	57.3	0%	100%	19,730	0.67	0.10
September	Fingerlings	52.0	0%	100%	21,237	0.69	0.11
October	Fingerlings	44.8	0%	100%	20,445	0.74	0.14
November	Yearling	38.0	0%	100%	19,935	0.77	0.14
December	Yearling	35.0	0%	100%	20,220	0.76	0.14
January	Yearling	34.2	0%	100%	25,768	0.60	0.15
February	Yearling	35.1	0%	100%	25,944	0.60	0.15
March	Yearling	38.1	0%	100%	23,644	0.69	0.16
April	Smolt	41.6	0%	100%	NA	NA	NA

Unless otherwise indicated all values are for end of the month totals or values obtained for the last ten days of the month.
Dissolved oxygen is measured during critical periods of disease, elevated temperatures, restricted flows, or fouled water. Minimum $d0_2$ standards for salmonids are 5 mg/L (Piper et al 1982)*. To date LNFH has not been below this value (D.Davies pers. comm.. 3/27/02).

[1]Temperature data is electronically measured every two hours and averaged for the month.

[2]Data indicates approximate water source usage. Actual usage depends on a variety of factors including disease and maintaining water temperatures (through well /river mixing) to minimize the formation of slush ice in winter and not to exceed 68^{0}F in summer.

[3]Estimated GPM used by brood including re-use. Calculated by dividing total weight (lbs.) by the average length (in.) X FI.

[4]Index averaged from Leavenworth NFH lot history records from brood years 1997 and 1998.

*Piper, R.G., I.B. McElwain, L.E. Orme, J.P. McCraren, L.G. Fowler, & J.R. Leonard. 1982. Fish Hatchery Management. US Department of Interior. Pp. 503. Washington DC.

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.

Table 15. Leavenworth NFH number, size, growth and condition values.

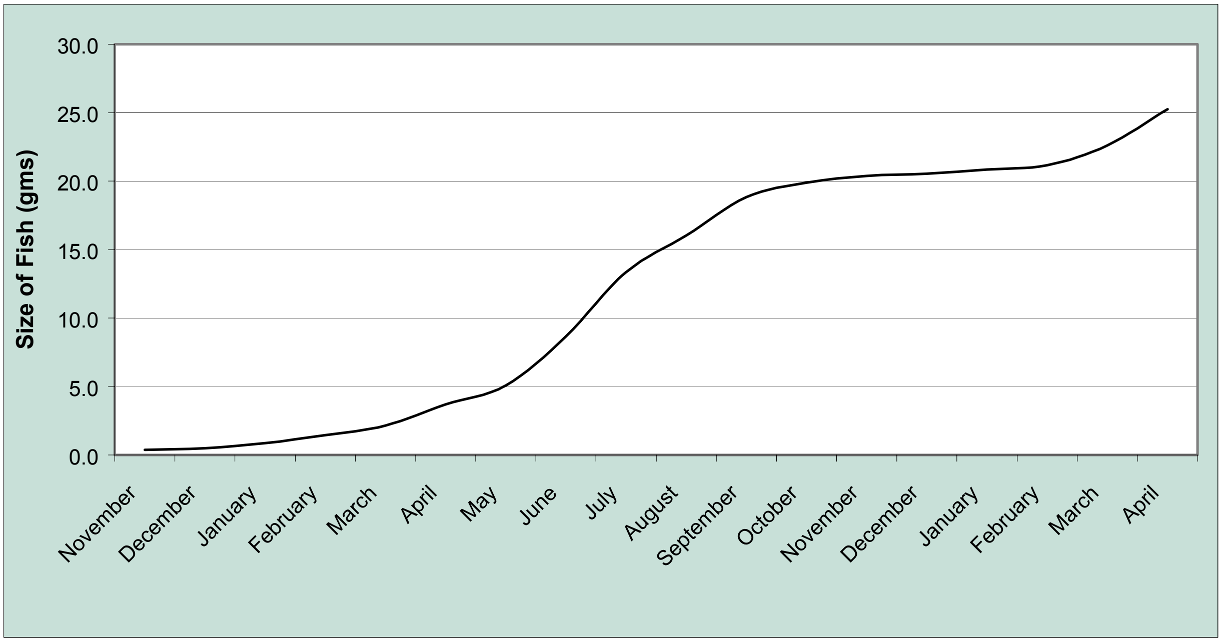
MONTH	Number on Hand	Total Weight (lbs.)	Ave Size (#/lb)	Ave Size (gms)	Length Ave (mm)	Length Ave (in)	Condition Factor ($K = gms/mm^3$)	Growth Rate (mm/mo.)	Growth Rate (gms/mo.)
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	1,724,000	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

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

Figure 1, (below) describes periods of growth at Leavenworth NFH. As indicated, 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. Additional measures of fish performance are described in Table 15 (above) and Table 16 (below).

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 is 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).

Table 16. Leavenworth NFH feed type, application rates, and food/length conversion rates for 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^{0}F from the average monthly temperature and length gain.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.
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 brood year of fish. The frequency of a treatment is determined by the severity and persistency of the problem.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.
Currently not conducted.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.
FWS is currently conducting a "natural" rearing study at Winthrop NFH. Data obtained from this effort may be applicable to other Complex hatcheries.

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.
No listed fish are reared at this station.

SECTION 10. RELEASE

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

10.1) Table 17. Proposed fish release levels. (Also see Attachment #1).

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	1,625,000	15 to 18 fpp	Mid-April	Icicle Creek
Adults	500		June - July	Peshastin and Ingalls creeks.

10.2) Specific location(s) of proposed release(s).
Stream, river, or watercourse: Icicle Creek
Release point: rm 2.7
Major watershed: Wenatchee River Basin (WRIA #45)
Basin or Region: Upper Columbia

Specific location(s) of proposed release(s).
Stream, river, or watercourse: Peshastin and Ingalls creeks
Release point: rm 7.2 and 3.8 (Peshastin Cr.), rm 1.0 on Ingalls Cr.

Major watershed: Wenatchee River Basin (WRIA #45)
Basin or Region: Upper Columbia

10.3) **Table 18**. Actual numbers and sizes of fish released by age class through the program.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size (fpp)	Fingerling	Avg size (fpp)	Yearling	Avg size (fpp)
1988			1,044,000	1200	96,000	238	2,207,292	16.1
			120,000	800	124,887	53		
			99,000	623	116,000	44.5		
			410,530	335				
1989			1,793,336	1200	219,000	264	2,109,923	20.6
					9,120	96	129,754	18.5
1990			310,000	886	400,000	122	2,251,503	18.1
			63,000	677.4	134,000	41	52,734	17.9
1991							2,258,034	20.7
1992					530,700	145	2,286,828	17.1
1993							1,757,931	17.2
1994							1,523,846	18.4
1995							1,740,424	17.5
1996							1,706,060	16.1
1997							919,025	16.7
1998							1,701,753	16.6
1999							1,638,902	17.2
Average							1,857,000	17.8

Data source: Hatchery records

Also, in 2001, 487 adults from LNFH were transferred to Peshastin and Ingalls creeks.

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

From 1997 to 2001, release dates ranged from April 17 to April 20. All juveniles were yearlings and were forced out of the ponds. It is important that we release this way to maximize the number of fish to the first downriver dam (Rock Island Dam). Rock Island Dam coordinates water-spill with other downriver projects to maximize migration survival and expedite fish through other projects.

10.5) Fish transportation procedures, if applicable.
Adults for the Peshastin Creek program are selected prior to antibiotic injections. We make an attempt to bring the sex ratio of the transferred adults as close to 50:50 as possible. No juveniles are taken off station (see Attachment #1).

10.6) Acclimation procedures.
Fish are reared for about 18 months in the hatchery, and released directly from the facility.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.
Since BY 2000, production is marked at 50% CWT and ad-clip combination with the remainder having an ad-clip only (total is 100%). This marking scenario is covered under the 2001 Draft Biological Opinion (BiOp) issued by NMFS covering unlisted hatchery production in the upper Columbia Basin.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.
Current release goals have never been exceeded. Egg numbers are adjusted prior to hatching so as to not exceed approved release goals.

10.9) Fish health certification procedures applied pre-release.
Pre-release certification procedures are selective grab samples of moribund fish in the population followed by non-selective grab samples to make up a minimum of 60 fish (to statistically satisfy the assumed pathogen prevalence level of 5%) of each production group of fish. Kidney and spleen samples from these fish are tested for the presence of reportable viruses and bacteria.

10.10) Emergency release procedures in response to flooding or water system failure.
Only under the most severe circumstance would fish be released early. If the problem causing the emergency cannot be remedied and catastrophic loses are eminent, part or all of production would be forced out into the river. It would be an unlikely event to release all production fish, but a partial or “thinning” release may occur. If an emergency release occurred, the appropriate contacts would be notified as per instructions in the BiOp.

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.
Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which reduces retention time in the streams after release. Listed stocks in this basin are well above Icicle Creek. Smolts released from LNFH may mix with these stocks in the much larger Wenatchee and Columbia Rivers, but specific impacts are unknown.

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.

Legal Mandates
Performance Indicators 1a and 1b:
- Estimate tribal and sport harvest in Icicle Creek.
- Estimate harvest contribution outside Wenatchee Basin through CWT recoveries.

Performance Indicator 2a:
- Ensure, when possible, that production numbers meet those negotiated through *U.S. v. Oregon.*
- Estimate LNFH's contribution to harvest through CWT recoveries.

Performance Indicator 3a:
- ESA consultations under section 7 and 10 have been submitted and accepted. Modifications to existing BA's are completed to cover any program changes.

Harvest
Performance Indicators 4a – 4e:
- Estimate number of fish released and associated harvest through CWT recoveries and creel surveys. Tribes supply their harvest estimates.
- Estimate number of non-target listed fish taken in the harvest through CWT recoveries, analysis of scales taken, and creel surveys.
- Estimate angler hours/days through creel surveys.

Performance Indicators 5a – 5c:
- Mark production sufficiently to obtain statistically valid evaluation data. Current marking of production is 50% CWT + ad-clip and the remainder (50%) with an ad-clip only. Listed stocks do not carry an ad-clip; therefore the unlisted stock is easily identified outside Icicle Creek.

Conservation of Wild/Naturally Spawning Populations
Performance Indicators 6a and 6b:
- See 5 above.

Life History Characteristics
Performance Indicators 7a – 7e:
- Release numbers do not exceed mitigated requirement, or level as stated in the

Hatchery BiOp.
- No juvenile releases occur outside Icicle Creek.
- Using historical data, ensure release dates coincide with wild fish migration timing.
- Smolts are released during or just prior to smoltification, which promotes a rapid migration.
- Estimate travel time and survival through the Columbia corridor using data obtained from PIT tag recoveries at mainstem hydroelectric dams.

Genetic Characteristics

Performance Indicators 8a – 8c:
- Juveniles are released directly from the hatchery to promote homing back to the facility.
- Mark juveniles sufficiently to obtain valid stray-rate estimates.
- Stray rates are calculated through CWT recoveries on the natural spawning grounds.

Performance Indicator 9a:
- Estimate optimal release time using historical emigration data and hatchery records.

Research Activities

Performance Indicators 10a, 11a and 11b:
- Promote and conduct experiments as stated in the 2001, NMFS Hatchery BiOp, when feasible. Study designs are peer reviewed when applicable.
- Annual reports are prepared covering bio-sampling of hatchery adults (broodstock), return estimates by broodyear, harvest, and straying rates.

Operation of Artificial Production Facilities

Performance Indicators 12a, 12b, 13a, 14a-c, 15a, 15b, 16a, 16b, and 17a:
- Produce annual reports indicating level of compliance with applicable standards and criteria.
- Effluent is monitored weekly to ensure compliance with NPDES guidelines.
- The hatchery barrier and general fish passage to areas above the hatchery is currently being addressed under the NEPA process. A FEIS has been prepared and distributed.
- A BA has been submitted covering the intake structure and water delivery system. Plans are being drafted to potentially upgrade, modify, or rebuild/relocate the system.
- Conduct monthly fish health monitoring and a pre-release examination. Adherence to regional fish health protocols is strictly maintained.
- Ensure rearing densities are within designed ranges.
- All male carcasses are deployed in basin tributaries. Permits for this activity were secured through WDFW and FWS. Annual reports are submitted.
- Release juveniles at size range as stated in IHOT, 1995.
- In the future, conduct size-at-release study to determine range most beneficial to both hatchery and wild populations.

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

Current funding fully supports the evaluation program as is. The BOR has been supportive of funding as necessary.

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.

None, as analysis of CWT data is the only current method for evaluation/monitoring.

SECTION 12. RESEARCH

Other than analysis of CWT recoveries, there is currently no research directed at LNFH production. Staff annually snorkel (study a) below the hatchery barrier to determine number of adults present after the collection ladder has been closed. This activity is covered under NMFS permit # 1119. The Peshastin Creek effort is denoted under (b). NMFS is conducting a transportation/passage study utilizing PIT tagged juveniles from LNFH. FWS has no involvement in the study design or analysis of collected data.

12.1) Objective or purpose.

a) Snorkel surveys are conducted to enumerate the hatchery adults remaining in the pool after collection efforts are complete.
b) The objective of the Peshastin Creek effort is to promote a spawning population in this Wenatchee River sub-basin. A proposal has been drafted and submitted for funding consideration (FY 03) to potentially estimate the productivity of the transferred adults.

12.2) Cooperating and funding agencies.

a) The BOR funds the evaluation and hatchery program.
b) The Peshastin Creek re-introduction effort is part of an agreement between USFWS, NMFS, WDFW, Yakama Nation, and CRITFC.

12.3) Principle investigator or project supervisor and staff.

a) Various staff, all experienced in snorkeling techniques.
b) Staff coordinating this effort are, Keely Murdoch (YN Fisheries Biologist), and David Carie (FWS Fisheries Biologist).

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

a) Only unlisted hatchery adults are present in Icicle Creek.
b) The last SCS redd located in Peshastin Creek was in 1997 (Mosey and Murphy, 2000). Whether this was formed by a "wild" or hatchery fish is unknown. The transferred stock is the unlisted "Carson" stock propagated at LNFH.

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

a) Visual observation and enumeration only.
b) All adults originate from the holding ponds at LNFH. Adults are crowded, netted, sex determined, opercle punched, and taken straight to the hauling truck. All transferred adults are opercle-punched so they can be identified if found outside the Peshastin drainage.

12.6) Dates or time period in which research activity occurs.
a) Annually in August and September.
b) Adults are transferred in July.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.
a) Not applicable
b) Adults are hauled via 1,000 gallon fish hauling truck. Transportation time is about 15 minutes.

12.8) Expected type and effects of take and potential for injury or mortality.
a) No take, injury or mortality is expected.
b) No take, injury or mortality is expected.

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). None

12.10) Alternative methods to achieve project objectives.
None

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.
None

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.
a) None
b) Peshastin Creek was chosen because there are no listed SCS in this drainage, and steelhead are not common or abundant.

SECTION 13. ATTACHMENTS AND CITATIONS

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USFWS. 1999. Section 7 biological assessment, U.S. Fish and Wildlife Service, Entiat, Leavenworth, and Winthrop National Fish Hatcheries 1999-2003. Department of Interior. Mid-Columbia River Fishery Resource Office. Leavenworth, WA.

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USFWS, 2004. Biological Assessment for LNFH's Hatchery Water Supply System Rehabilitation Project. Prepared by Malenna M.J. Cappellini. Mid-Columbia River Fishery Resource Office, Leavenworth, WA (dated 12/01/04).

WDF (Washington Department of Fisheries), Confederated Tribes and Bands of the Yakama Indian Nation, Confederated Tribes of the Colville Reservation, and Washington Department of

Wildlife. 1990. Columbia Basin system planning salmon and steelhead production, Wenatchee River Subbasin. Northwest Power Planning Council, Portland, OR.

WRWAP (Wenatchee River Watershed Action Plan). 1998. Chelan County Conservation District. Wenatchee, WA.

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.

Name, Title, and Signature of Applicant:

Certified by_____________________________ Date:_____________

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

Listed Species Affected: Spring Chinook	**ESU/Population:** Upper Columbia Spring Chinook			
Location of hatchery activity: Leavenworth NFH	**Dates of activity:** May – July **Hatchery Program Operator:** USFWS			
Type of Take	**Annual Take of Listed Fish by Life Stage *Number of Fish***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass[1]				
Collect for transport[2]				
Capture, handle, and release[3]				
Capture, handle, tag/mark/tissue sample, and release[4]				
Removal (e.g. broodstock)[5]			1	
Intentional lethal take[6]				
Unintentional lethal take[7]			1	
Other Take (specify)[8]				

[1] Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
[2] Take associated with weir or trapping operations where listed fish are captured and transported for release.
[3] Take associated with weir or trapping operations where listed fish are captured, handled and released up or downstream.
[4] Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
[5] Listed fish removed from the wild and collected for use as broodstock.
[6] Intentional mortality of listed fish, usually as a result of spawning as broodstock.
[7] Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
[8] Other takes not identified above as a category.

Table 2. Estimated listed salmonid take levels of by hatchery activity.

Listed Species Affected: Summer Steelhead	**ESU/Population:** Upper Columbia Summer Steelhead			
Location of hatchery activity: Leavenworth NFH	**Dates of activity:** April – May **Hatchery Program Operator:** USFWS			
Type of Take	**Annual Take of Listed Fish by Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass[1]				
Collect for transport[1]			All that enter ladder	
Capture, handle, and release[1]			All that enter ladder	
Capture, handle, tag/mark/tissue sample, and release[1]				
Removal (e.g. broodstock)[1]			0	
Intentional lethal take[1]				
Unintentional lethal take[1]			1	
Other Take (specify)[1]				

Attachment 1. Water quality data for Icicle Creek, above and below the facility.

East Leavenworth Road (about 1/4 mile below hatchery effluent)

Sample NO. (Time)	Date	D.O. mg/L	COND. uSiemens	T.D.S. g/L	pH	Water Temp Deg. C
1 (2:15)	08/30/95	7.9	68.8	34.8	6.88	13.4
2 (12:45)	09/27/95	8.2	70.4	35.2	7.36	10.6
3 (12:45)	10/31/95	11.3	46.1	23.2	7.11	1.7
4 (3:00)	11/27/95	10.6	40.3	19.9	6.46	3.3
5 (2:30)	12/20/95	11.3	54.8	27.4	6.77	2.6
6 (12:45)	02/07/96	13.2	48.2	24.2	8.04	0.4
7 (1:45)	02/28/96	unavailable	53.9	27.0	7.76	0.5
8 (1:30)	03/27/96	11.9	57.2	28.5	7.55	2.3
9 (3:00)	05/08/96	11.1	49.1	24.5	7.95	6.2
10 (12:15)	05/28/96	10.0	36.0	18.0	6.85	5.8
11 (11:45)	06/24/96	11.0	37.2	18.6	6.78	7.1
12 (11:45)	07/29/96	9.1	38.4	19.2	6.62	15.3
Min.		**7.9**	**36.0**	**18.0**	**6.46**	**0.4**
Max.		**13.2**	**70.4**	**35.2**	**8.04**	**15.3**
Ave. (median)		**10.51**	**50.03**	**25.04**	**(7.00)**	**5.77**

Icicle Creek at Bridge Creek (about 3-miles above LNFH intake)

State Standards **above 9.5** **6.5-8.5** **below 16**

Sample NO. (Time)	Date	D.O. mg/L	COND. uSiemens	T.D.S. g/L	pH	Water Temp Deg. C
1 (1:15)	08/30/95	8.6	54.4	27.6	6.86	13.9
2 (12:00)	09/27/95	9.3	40.1	20.1	7.33	10.6
3 (12:00)	10/31/95	11.6	47.9	23.9	7.12	2.6
4 (3:30)	11/27/95	10.9	42.6	21.3	6.41	3.9
5 (3:00)	12/20/95	11.4	58.8	29.5	6.84	2.8
6 (1:30)	02/07/96	13.7	53.5	26.8	8.43	0.4
7 (2:30)	02/28/96	unavailable	59.4	29.7	7.83	1.2
8 (1:15)	03/28/96	11.7	63.5	31.7	7.57	4.3
9 (4:00)	05/08/96	12.5	51.7	25.8	7.97	7.5
10 (11:45)	05/28/96	10.5	36.8	18.4	6.96	7.0
11 (11:15)	06/24/96	11.3	36.7	18.4	6.78	8.7
12 (12:30)	07/29/96	9.4	36.7	18.4	6.71	17.3
Min.		**8.6**	**36.7**	**18.4**	**6.41**	**0.4**
Max.		**13.7**	**63.5**	**31.7**	**8.43**	**17.3**
Ave. (median)		**10.99**	**48.51**	**24.30**	**(7.12)**	**6.68**

ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2)

15.1) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

1. FWS # 1-9-99-I-112 (bull trout).
2. FWS # MCFRO – 4 (bull trout, research).
3. FWS # 05-0153
4. FWS # 02-F-E-0081
5. NMFS # 1119 (steelhead and spring Chinook salmon, research).
6. NMFS – NOAA Fisheries, 10/22/03 BiOp for production of unlisted salmonid species.

15.2) Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Endangered:

Gray Wolf (*Canis lupus*)

Status:
The gray wolf was listed as endangered in 1978. Gray wolves originally occupied much of the continental Unites States, but currently occupy a small portion of their former range (Laufer and Jenkins 1989). In 1930, it was believed that breeding populations of wolves in Washington were extinct because of fur trading pressure in the 1800's followed by the establishment of bounties on all predators in 1871 in the Washington Territory (Young and Goldman 1944). The last reported wolf shot in the North cascades was in 1975 (WDW 1975, as reported in Almack *et al.* 1993). Recent observations indicate that wolves exist in Washington, likely in small numbers, and mostly as individuals. However, several family units have been documented, indicating that some level of reproduction has occurred recently (Almack and Fitkin 1998).

Range:
The probable range of gray wolves in Washington is in the Cascade Mountains and northeastern Washington (Almack and Fitkin 1998). In northeastern Washington, the majority of the reported wolf activity is in the eastern half of the Colville National Forest and Colville Indian Reservation and also adjacent private and public lands (Hansen 1986).

Habitat Requirements:
The habitat of the gray wolf is listed as open tundra and forests (Whitaker 1980). However, gray wolves can use a variety of habitats as long as cover and a food supply are available (Stevens and Lofts 1988). They tend to focus on areas that are free from human disturbance and harassment, have low road densities and which support large numbers of prey species (deer, elk, goat, moose, and beaver). While they may consume some small mammals, most of their diet consists of deer (Peterson 1986).

Wolves follow the movements of ungulate herds (deer, elk, moose) across openings and through forested areas. The major tree species in this area include white pine, lodge pole pine, Douglas fir, larch, subalpine fir, grand fir, and a number of less common species including ponderosa pine, whitebark pine, spruce, hemlock, and red cedar (Hansen 1986). Wolves have territories ranging from 70-800 square miles. Wolves generally live in packs made up of 2 to 12 or more family members and individuals, lead by a dominant male and female. In other locations, denning by wolves generally occurs between April and June. Den sites are often characterized by having forested cover nearby and by being distant from human activity. The pups remain at the denning site for the first six to eight weeks, then move to a rendezvous site until they are large enough to accompany the adults on a hunt (Peterson 1986). Once the pups are large enough to go hunting, the pack travels throughout its territory.

Icicle Creek Gray Wolf:
LNFH lies within habitat for gray wolves in the conterminous (lower 48) states, in Washington State. There have been no confirmed sightings of gray wolves in the program area, however habitat is available for the wolf and its prey. In 1992, a solicited howling response of an individual was confirmed as a Class I sighting in the Alpine Lakes Wilderness, approximately 15 miles from the program area (Gaines *et al.* 1995). There are no known denning or rendezvous sites present in the program area. There are potential denning sites available less than 1 mile to the southwest of the program area, in the boulder fields at the base of Wedge Mountain, and 4.5 miles to the southwest in the Alpine Lakes Wilderness, which may also provide potential rendezvous sites.

Prey base for gray wolf includes deer and elk and smaller mammals including beaver and marmot, which are found readily throughout the program area and surrounding landscape. Deer use the wetlands in the historic channel as fawning grounds. There is a small resident deer population, but the area is mainly used as transitional habitat in the spring and fall between summer and winter habitats. No elk calving is known to occur in the program area and there are no known resident populations of elk. Elk use this area for transition habitat between winter and summer ranges. Wolves are also affected by human disturbances such as roads and habitation.

Wenatchee Mountain checker-mallow *(Sidalcea oregana var. calva*)
Status:
The Wenatchee Mountain checker-mallow is listed as endangered under the Endangered Species Act.

Range:
Although the species of *Sidalcea oregana* (Oregon checker-mallow) occurs throughout the western United States, *S. oregana var. calva* is known only in the Wenatchee Mountains of central Washington. Five known populations, totaling 3,300 plants, occur in the Icicle Creek and Peshastin Creek Watersheds and on the Camas Lands in Chelan County. The primary threats to this species include alterations of hydrology, rural residential development and associated activities, competition from native and alien plants, recreation, fire suppression, and activities associated with fire suppression. To a lesser extent, threats include livestock grazing, road construction, and timber harvesting and associated impacts including changes in surface runoff in the small watersheds in which the plant occurs (USDI 1997).

Habitat Requirements:
The Wenatchee Mountain checker-mallow is most abundant in moist meadows that have surface water or saturated upper soil profiles during spring and early summer. It may also occur in open conifer stands dominated by *Pinus ponderosa* and *Pseudotsuga menziesii* and on the margins of shrub and hardwood thickets. Populations are found at elevations ranging from 1,900 to 4,000 feet. Soils are typically clay-loam and silt-loams with low moisture permeability. The Wenatchee

Mountain checker mallow is a perennial plant with a stout taproot that branches at the root crown and gives rise to several stems that are 20 to 150 centimeters in length. Pink flowers begin to appear in middle June and peaks in the middle to end of July. Fruits are ripe by August (USDI 1997).

Icicle Creek Wenatchee Mountain Checker-Mallow:
Review of the Washington Natural Heritage Database and field surveys in 1999 resulted in no Wenatchee Mountain checker-mallow's occurring within the program area.

Showy stickseed *(Hackela venusta)*
Showy stickseed is a perennial, herbaceous plant in the Borage family (Boraginaceae). The plant is a short, moderately stout species, 8 to 16 inches in height, and forms 5-lobed, white flowers. Showy stickweed grows on sparsely vegetated, granitic scree on unstable, steep slopes on the east slope of the central Cascade Mountains of Washington. The species has always been restricted in its distribution, the one population is found entirely on USDA Forest Service land.

The only known population of Showy stickseed in the world, occurs on less than 2.5 acres, located in Tumwater Canyon (< 10 miles from LNFH). The major threats to the species are collection, physical disturbance to the habitat, intense wildfire, and changes to the composition of the plant community brought on by fire suppression. In addition, highway maintenance activities, low seed production, poor germination, competition from native trees and shrubs, and non-native noxious weeds that encroach upon the habitat of Showy stickseed threaten the species.

No Showy stickseed is found on hatchery grounds, or in the immediate area surrounding the facility.

Threatened:

Bald Eagle *(Haliaeetus leucocephalus)*

Status:
In 1978, the bald eagle was federally listed throughout the lower 48 States as endangered except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was designated as threatened (USDI 1978). In July 1995, the USFWS reclassified the bald eagle to threatened throughout the lower 48 states. In 1999, the bald eagle was proposed for de-listing, recovered throughout the lower 48 States. This proposal is currently under review (USFWS July 1999). Eagles are further protected under the Bald and Golden Eagle Protection Act (BGEPA 1940) and the Migratory Bird Treaty Act of 1918 (MBTA 1918). Bald eagle populations have increased in number and expanded their range. The improvement is a direct result of recovery efforts including habitat protection and the banning of DDT and other persistent organochlorines. The 1996 information provided by the Washington Department of Fish and Wildlife (WDFW unpub. data) indicates that 589 nests were known to be occupied and 0.93 young/nest were produced. This is well above the recovery goal of 276 pairs for Washington, but below the recovery criteria of an average of 1.00 young/nest..

Habitat loss continues to be a long-term threat to the bald eagle in the Pacific Recovery Area of Washington, Idaho, Nevada, California, Oregon, Montana, and Wyoming. Urban and recreational development, logging, mineral exploration and extraction, and other forms of human activities are adversely affecting the suitability of breeding, wintering, and foraging areas.

Range:
The bald eagle is found throughout North America. The largest breeding populations in the contiguous United States occur in the Pacific Northwest states, the Great Lake states, Chesapeake Bay and Florida. The bald eagle winters over most of the breeding range, but is most concentrated from southern Alaska and southern Canada southward. Most nesting territories in Washington are located on the San Juan Islands, the Olympic Peninsula coastline, and along the Strait of Juan De Fuca, Puget Sound, Hood Canal, and the Columbia River. In addition, bald eagle nesting territories are found within southwestern Washington, the Cascade Mountains, and in the eastern part of the state where adequate sources of prey are available. Most bald eagles winter on river systems in the Puget Trough and the Olympic Peninsula, along the outer coast and Strait of Juan De Fuca, or in the Columbia River Basin.

Habitat Requirements:
In Washington, bald eagles are most common along the coasts, major rivers, lakes and reservoirs (USFWS 1986). Bald eagles require accessible prey and trees for suitable nesting and roosting habitat (Stalmaster 1987). Food availability, such as aggregations of waterfowl or salmon runs, is a primary factor attracting bald eagles to wintering areas and influences the distribution of nests and territories (Stalmaster 1987; Keister *et al.* 1987).

Bald eagle nests in the Pacific Recovery Area are usually located in uneven aged stands of coniferous trees with old growth forest components that are located within one mile of large bodies of water. Factors such as relative tree height, diameter, species, form, position on the surrounding topography, distance from the water, and distance from disturbance appear to influence nest site selection. Nests are most commonly constructed in Douglas fir or Sitka spruce trees, with average heights of 116 feet and size of 50 inches dbh (Anthony *et al.* 1982 in Stalmaster 1987). Bald eagles usually nest in the same territories each year and often use the same nest repeatedly. Availability of suitable trees for nesting and perching is critical for maintaining bald eagle populations. The average territory radius ranges from 1.55 miles in western Washington to 4.41 miles along the lower Columbia River (Grubb 1976, Garrett *et al.* 1988). In Washington, courtship and nest building activities normally begin in January, with eaglets hatching in mid-April or early May. Eaglets usually fledge in mid-July (Anderson *et al.* 1986).

A number of habitat features are desirable for wintering bald eagles. During the winter months bald eagles are known to band together in large aggregations where food is most easily acquired. The quality of wintering habitat is tied to food sources and characteristics of the area that promote bald eagle foraging. Key contributing factors are available fish spawning habitat with exposed gravel bars in areas close to bald eagle perching habitat. Bald eagles select perches that provide a good view of the surrounding territory, typically the tallest perch tree available within close proximity to a feeding area (Stalmaster 1987). Tree species commonly used as perches are black cottonwood, big leaf maple, or Sitka spruce (Stalmaster and Newman 1979).

Wintering bald eagles may roost communally in single trees or large forest stands of uneven ages that have some old growth forest characteristics (Anthony *et al.* 1982 in Stalmaster 1987). Some bald eagles may remain at their daytime perches through the night but bald eagles often gather at large communal roosts during the evening. Communal night roosting sites are traditionally used year after year and are characterized by more favorable microclimatic conditions. Roost trees are usually the most dominant trees of the site and provide unobstructed views of the surrounding landscape (Anthony *et al.* 1982 in Stalmaster 1987). They are often in ravines or draws that offer shelter from inclement weather (Hansen *et al.* 1980; Keister *et al.*1987). A communal night roost can consist of two birds together in one tree, or more than 500 in a large stand of trees. Roosts can be located near a river, lake, or seashore and are normally within a few miles of day use areas but can be located as far away from water as 17 miles or more. Prey sources may be available in the general vicinity, but close proximity to food is not as critical as the need for shelter that a roost affords (Stalmaster 1987).

Bald eagles utilize a wide variety of prey items, although they primarily feed on fish, birds and mammals. Diet can vary seasonally, depending on prey availability. Given a choice of food, however, they typically select fish. Many species of fish are eaten, but they tend to be species that are easily captured or available as carrion. In the Pacific Northwest, salmon form an important food supply, particularly in the winter and fall. Birds taken for food are associated with aquatic habitats. Ducks, gulls and seabirds are typically of greatest importance in coastal environments. Mammals are less preferred than birds and fish, but form an important part of the diet in some areas. Deer and elk carcasses are scavenged, and in coastal areas, eagles feed on whale, seal, sea lion and porpoise carcasses (Stalmaster 1987).

Icicle Creek Bald Eagle:

The program area is part of the Pacific States Recovery Plan for bald eagle (USFWS 1986). A species management guide has been developed for the Wenatchee National Forest (Rees 1989) that identifies potential recovery territories for nesting bald eagles. The program area was not included as a recovery territory; the nearest recovery area is in the Tumwater Canyon less than five miles from the LNFH.

Bald eagles are frequent users of the upper Wenatchee Valley and have been seen in the forests and riparian areas within and adjacent to the program area. Foraging occurs along the Wenatchee River and the flat water of lower Icicle Creek, including the program area. Nest sites in Chelan County are typically in areas with little human disturbance (H. Murphy USFS pers. comm. 2001). Known nests in Chelan County are located near Fish Lake and Lake Wenatchee, 20-21 miles from the program area, above the Columbia River north of the town of Entiat, and on the Stehekin River at Lake Chelan. No nesting sites have been found within 1 mile of the hatchery, though there is a winter roost site less than 1 mile upstream from the project area (H. Murphy pers. comm.). Bald eagles winter along the lower Wenatchee River (from Leavenworth to Wenatchee) and the Columbia River. Near the program area, bald eagles winter in the Mountain Home/Boundary Butte and Wedge Mountain/North Basin areas. It is possible that the Lake Wenatchee area eagles winter along the Wenatchee River including Icicle Creek, however since these birds are not banded, radio tagged, or otherwise definitively marked, it is not known for certain.

Currently, LNFH and adjoining waterways provide adequate fisheries, important to bald eagles and other fish eating birds, such as osprey, kingfisher, great blue heron, and turkey vulture. The cottonwood trees at the confluence of the historic channel and canal provide a peninsula of undisturbed habitat for perching and feeding. The conifers lining the historic channel also provide perching habitat, though currently, fish are not readily available along this stretch of the creek, as few get past Structure 5.

Grizzly Bear (*Ursus arctos*)

Status:

The grizzly bear was listed as a threatened species in the conterminous United States in 1975. Livestock depredation control, habitat deterioration, commercial trapping, unregulated hunting, and protection of human life were leading causes of the decline of grizzly bears (USFWS 1993). Two of the six ecosystems identified in the grizzly bear recovery plan (USFWS 1993) include areas in Washington, the Northern Cascades and the Selkirks. Almack *et al.* (1993) estimated the 1991 grizzly bear population in the North Cascades recovery area at less than 50, and perhaps as low as 5 to 20. Wielgus *et al.* (1994) estimated a density of one bear per 27 mi^2 (71 km^2) for the U.S. portion of the Selkirks Ecosystem and one per 17 mi^2 (43 km^2) for the Canadian portion of the Selkirks Ecosystem.

Range:

In Washington, the grizzly's range is limited to the Northern Cascades and the Selkirk mountains.

Habitat Requirements:

Grizzly bear habitat use is determined by isolation from human disturbance, food distribution and availability, and denning security. In general, grizzly bears move seasonally, using low elevation riparian areas and meadows in the spring, higher elevations during the summer and fall months, and high isolated areas for winter denning.

Little is known about the grizzly bears residing in the North Cascades. It is suspected that their habits are similar to bears from other areas, but telemetry studies are needed. Information presented here is from studies in the Selkirk Mountains and other areas. Denning occurs most commonly on north-facing slopes above 6000 feet elevation in areas where snow drifts and remains through warm spells (USFS 1994b). Grizzly bears leave their den sites after the cubs are born in February. They move quickly down to low elevation areas and feed on winterkilled ungulates and new growth. Grizzly bears generally feed on emerging grasses, forbs, and budding shrubs in the spring. As green-up moves up-slope, the bears follow, foraging above 3000 feet in the summer. Grizzly bears breed on their summer range between May and July. In late summer and fall, bears forage on berries such as huckleberry, serviceberry, rose, and strawberry. In September or October bears move to high elevations and denning sites. Grizzly bears may concentrate their use in mixed shrub fields, snow chutes, old burns, meadows, and cutting units.

Human disturbance, usually increased with road access into grizzly habitat, is known to affect bear use of seasonal habitat components. Habituation or avoidance may result. In general, roads increase the probability of bear-human encounters and human-induced mortality (USFS 1994b).

Icicle Creek Grizzly Bear:

Historically, grizzly bears were found throughout the Wenatchee National Forest. Research has confirmed the presence of a small, reproducing, and well-distributed number of grizzly bears within the North Cascades Grizzly Bear Ecosystem (NCGBE) (Almack *et al.* 1993); the program area lies within this recovery area. No estimates of density or total populations of grizzly bears have been made for this ecosystem.

No grizzly bears have been observed in the program area, though the nearest known occurrence was an autumn track observation in forested habitat less than three miles south (USFS 1991). Because this species is wide-ranging, the Peshastin and Icicle Bear Management Units (BMUs) should be considered occupied in the larger scale. However, it is unlikely that grizzly bears occupy the program area, with the possible rare exception of feeding on salmon carcasses.

There are no known grizzly bear denning sites in the project area. The hatchery grounds have food sources for grizzly bear including fawning habitat, spring emergence vegetation, and spawning salmon.

The program area does not have any core habitat, areas with no motorized roads or trails, and no high use non-motorized roads or trails within 0.3 miles. The program area is on the edge of a developed resort area and other human habitations.

Northern Spotted Owl (*Strix occidentalis caurina*)

Status:

The northern spotted owl was listed as federally threatened in June 1990. The Northern Spotted Owl Recovery Team reported a total of about 3,602 known pairs of spotted owls in Washington, Oregon, and California; with 671 pairs in Washington (USDI 1992b). Based on two sets of assumptions to develop estimates, Holthausen *et al.* (1994 in WDNR 1997) estimated 282 or 321 pairs of spotted owls on the Olympic Peninsula, which was higher than previous estimates.

A demographic analysis of results from 5 sites distributed throughout the spotted owls range indicated that female territorial spotted owls were declining between 6 to 16 percent per year (an average of 10 percent) at individual study sites (Anderson and Burnham 1992 in WDNR 1997). Burnham *et al.* (1994 in WDNR 1997) estimated an annual loss of 3-8 percent of the resident female owls on the Olympic Peninsula using unadjusted estimates of juvenile survival. Using an adjusted estimate of juvenile survival, they estimated an annual loss of 1 percent of the resident females. Threats to existing populations of spotted owls include declining habitat, low populations, limited and highly fragmented habitat, isolation of populations, predation and competition (USDI 1992b).

Range:
The northern spotted owl is one of three subspecies (northern, California, and Mexican) and occurs from British Columbia to northern California. The northern spotted owl is associated with late successional and old growth forest habitats. The owl also occurs in some younger forest types where the structural attributes of old growth forests are present (WDNR 1997). The present range of the northern spotted owl is similar to the limits of its historic range (USDI 1992a).

Habitat requirements:
Detailed accounts of the taxonomy, range, and habitat requirements of northern spotted owls may be found in the 1990 Fish and Wildlife Service status review (USFWS 1990); the 1987 and 1989 status review supplements (USFWS 1987, 1989), and the Interagency Scientific Committee Report (Thomas *et al.* 1990).

Spotted owls nest, roost, and feed in a wide variety of habitat types and forest stand conditions throughout their distribution, with most observations in areas having a component of old growth and mature forests. Owls in managed forests usually occupy areas with structural diversity and a high degree of canopy closure, containing large diameter or residual old trees, in stands more than 60 years old (USDI 1992b).

Nesting habitat is generally found in mature and old growth stands and contains a high degree of structural complexity (WDNR 1997). Cavities or broken-top trees are more frequently selected in older forests and platforms (mistle toe brooms, abandoned raptor and gray squirrel nests, and debris accumulations) tend to be selected more frequently in younger forests (Foresman *et al.* 1984, LaHaye *et al.* 1992). Roosting habitat has characteristics similar to nesting habitat, i.e., high canopy closure, a multi-layered canopy, and large diameter trees (WDNR 1997). Spotted owls roost in shady spots near streams in the summer (WDNR 1997). Spotted owls begin their annual breeding cycle in late winter (February or March) and dispersal of juvenile owls begins in early fall (USDI 1992b).

Feeding habitat appears to be the most variable of the major habitat categories (Thomas *et al.* 1990); however it is characterized by high canopy closure and complex structure (USDI 1992b). Spotted owls feed on a variety of small forest mammals, birds, and insects. Spotted owls on the Olympic Peninsula depend primarily on flying squirrels (Carey *et al.* 1992).

Although habitat that allows spotted owls to disperse may be unsuitable for nesting, roosting, or foraging, it provides an important linkage among blocks of nesting habitat both locally and over the range of the northern spotted owl. This linkage is essential to the conservation of the spotted owl. Dispersal habitat, at minimum, consists of forest stands with adequate tree size and canopy closure to protect spotted owls from avian predators and to allow the owls to forage at least occasionally (USDI 1995).

Icicle Creek Northern Spotted Owl:
The program area lies within the range of the northern spotted owl. One half mile to the south of the program area on National Forest lands, lies the Boundary Butte Late Successional Reserve (LSR). This LSR was burned over in the 1994 Rat Creek Fire, though it is still managed to protect and enhance conditions of late-successional forest ecosystems and related species. Prior to the 1994 fires, there were three spotted owl activity centers within a 2 mile radius of LNFH; there is

now only one activity center within two miles of the project area, SO-717 (Lower Mill Creek). The 1994 fires burned the activity centers and home ranges of SO-728 (Wedge/Icicle), SO-716 (Upper Mill Creek), and SO-717 (Lower Mill Creek). SO-728 (T24, R17, S34) overlapped the program area and was last located in 1994. SO-716 (T23 R17 S3) was last located in 1987. After consultation with USFWS (J. Bush 1995) these sites are no longer considered activity centers.

The Lower Mill Owl, SO-717 (T23 R17 S1) was last located in 1995, however, it is still considered an activity center and is still being monitored. The activity center for SO-717 is just over 1.8 miles from the program area. A nesting spotted owl pair (Wedge-Allen) was detected on Wedge Mountain in T23 R17 S10 NE ¼ in May 2001, approximately 3 miles S-SW of the program area (R. Larson pers. comm.). Surveys are still being conducted to determine reproductive status for this pair.

Most of the hatchery grounds are currently non-habitat for spotted owls. In the program area, some suitable (nesting/roosting/foraging) and dispersal habitat remains adjacent to the forested portion of the historic channel. Dispersal habitat is also found between the historic channel and the canal at the south end of the program area. Northern spotted owl surveys were conducted to protocol (USFS 1992) in habitat within one mile of the program area and no spotted owls were detected. The forested lands adjacent to the historic channel provides connectivity for spotted owls moving across the landscape from the Swauk and Boundary Butte LSRs to the Icicle and Deadhorse LSRs.

Designated Critical Habitat for Northern Spotted Owl (*Strix occidentalis caurina*)

On January 15, 1992, approximately 6.88 million acres (2.8 million hectares) was designated as critical habitat for the northern spotted owl in Washington, Oregon, and California. These critical habitat areas included most of the Habitat Conservation Areas defined in the Interagency Scientific Committee Report (Thomas *et al.* 1990) and added areas around and between them. Fifty-three critical habitat units were identified in Washington.

The USFWS's primary objective in designating critical habitat was to identify existing spotted owl habitat and to highlight specific areas where management consideration should be given highest priority (USDI 1992a). To assist in these determinations, the USFWS relied on the following principles identified in Thomas *et al.* (1990): 1) develop and maintain large contiguous blocks of habitat to support multiple reproducing pairs of owls; 2) minimize fragmentation and edge effect to improve habitat quality; 3) minimize distance to facilitate dispersal among blocks of breeding habitat; and 4) maintain range-wide distribution of habitat to facilitate recovery (USDI 1992a).

The following qualitative criteria were considered when determining whether to select specific areas as critical: 1) presently suitable habitat emphasized; 2) large contiguous blocks of habitat emphasized; 3) quality of habitat; 4) dispersal distances minimized; 5) occupied habitat emphasized; 6) maintain range wide distribution; 7) need for special management or protection; and 8) adequacy of existing regulatory mechanisms (USDI 1992a).

Icicle Creek Critical Habitat for Northern Spotted Owl:
There is no spotted owl critical habitat within the project area. The nearest northern spotted owl Critical Habitat Unit (WA-11) is one half mile to the south, outside of the program area.

Canada Lynx (*Lynx canadensis*)

Status:
The Canada lynx was proposed for threatened status in the contiguous United States in 1998. Human alteration of forest landscapes is the most important factor in the decline of lynx populations. In particular, the alteration of species composition, successional stages, distribution and abundance, and connectivity of forests.

Timber harvest and associated activities are the primary land uses affecting lynx habitat. Lynx were over harvested during the 1970's and 1980's. The over harvest has resulted in lynx populations which are insufficient to recolonize areas with suitable habitat. Current lynx populations in Washington are estimated between 96 and 191 individuals (WDW 1993).

Range:
Historically and currently, lynx were present in Alaska and Canada from the Yukon and Northwest Territories south to the U.S. border and east to Nova Scotia and New Brunswick. Lynx historically were found in sixteen states in the contiguous United States. They were present in the northeast in Maine, New Hampshire, Vermont, New York, Pennsylvania, and Massachusetts; in the western Great Lakes region in Minnesota, Wisconsin, and Michigan; in the Rocky Mountains in Oregon, Idaho, and Montana on into Utah and Colorado; and in the Cascade Mountain Range of Oregon and Washington (McCord and Cardoza 1982, Quinn and Parker 1987).

Habitat Requirements:
Canada lynx occur primarily in boreal forests throughout their range (Ruggiero *et al.* 1994). At the southern extent of their range, they are typically found at high elevations which have habitats similar to the boreal forests of Alaska and Canada. Canada lynx are specialized predators and their distribution is linked to that of the snowshoe hare. Snowshoe hares use dense, early successional forests with woody seedlings and shrubs which provide food and cover, and escape from predators and extreme weather (Wolfe *et al.* 1982, Monthey 1986, Koehler and Aubry 1994). Lynx usually select habitats with an abundance of snowshoe hares for foraging. They use the abundant cover to stalk and lie in wait for hares (Ruggiero et al. 1994). Lynx require late-successional forests that contain cover for kittens (especially deadfalls) and for denning (Koehler and Brittell 1990). Breeding occurs in late March to early April with young born in late May or early June (Koehler and Aubry 1994). Lynx populations in Alaska and Canada exhibit a cyclic oscillation in population with lynx lagging several years behind snowshoe hare population trends. This relationship does not appear to exist in the contiguous United States due to lower snowshoe hare populations resulting from patchier habitat and the presence of additional competitors and predators not present in the northern regions (Dolbeer and Clark 1975; Wolff 1980, 1982).

Icicle Creek Canada Lynx:
The nearest sighting of a lynx, to the program area, was made in 1998 when a single animal was seen at higher elevations, less than 13 miles southeast of the program area. No reports have been made in the program area. The program area is at 1100 feet in elevation and is shrub-steppe and mesic-dry forest type. Neither lodge pole pine nor subalpine fir forested habitats are present in the program area, which are habitat necessary for lynx and its prey. The program area is outside of any Lynx Analysis Unit (LAU). This area of the Icicle Valley does not provide connectivity between lynx habitats or LAUs.

Ute Ladies'tresses (*Spiranthes diluvialis*)
Status:
The Ute Ladies' tresses was federally listed as threatened in 1992. The main factors cited were loss and modification of habitat, and modification of the hydrology of existing and potential habitat. The orchids pattern of distribution as small, scattered groups, its restricted habitat, and low reproductive rate under natural conditions make it vulnerable to both natural and human caused disturbances (USFWS 1995). These life history and demographic features make the species more vulnerable to the combined impacts of localized extirpations, diminishing potential habitat, increasing distance between populations, and decreasing population sizes (Belovsky *et al.* 1994; USFWS 1995).
Range:
In the state of Washington, Ute Ladies' tresses is located in Okanogan County.

Habitat Requirements:
Ute ladies' tresses is a perennial, terrestrial orchid that is endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams (USFWS 1995). Observations by Jennings (1990) and Coyner (1989 and 1990) indicate that the Ute ladies'-tresses requires soil moisture to be at or near the surface throughout the growing season, indicating a close affinity with the floodplain. These observations were corroborated by Martin and Wagner (1992) with monitoring research at the Dinosaur National Monument. However, Riedel (1992) reported that once established it appears to be tolerant of somewhat drier conditions, but loses vigor and may gradually die out if the groundwater table begins to consistently drop during late summer (Riedel 1992; Arft 1994 pers. comm. *in* USFWS 1995).

Ute ladies' tresses were originally reported to occur at elevations between 4,300 and 7,000 feet in eastern Utah and Colorado (Stone 1993). However, recent discoveries of small populations in the Snake River Basin (1996; southeastern Idaho) and in Okanogan County, Washington (1997) indicates that orchids are found at lower elevations (1,500-4,000 feet) in the more western part of their range (USFWS 1995). Ute ladies'-tresses are found in a variety of soil types ranging from fine slit/sand to gravels and cobbles (USFWS 1995). They have also been found in areas that are highly organic or consist of peaty soils. Ute ladies'-tresses are not found in heavy or tight clay soils or in extremely saline or alkaline soils (pH>8.0; USFWS 1995).

Ute ladies' tresses occur primarily in areas where vegetation is relatively open and not overly dense or overgrown (Coyner 1989 and 1990; Jennings 1989 and 1990) . A few populations have been found in riparian woodlands of eastern Utah and Colorado (USFWS 1995). However, the orchid is generally intolerant of shade, preferring open, grass and forb dominated sites (USFWS 1995).

The associated plant community composition and structure is frequently a good indicator across the range of the orchid (USFWS 1995). For example, beaked spikerush (*Eleocharis rostellata*) appears to dominate the plant community in areas occupied by the orchid (Washington State). In Idaho, Ute ladies'-tresses occupies areas dominated by silverleaf (*Elaeagnus commutata*) and creeping bentgrass (*Agrostis stolonifera*). The USFWS (1995) reported that species most commonly associated with Ute ladies'-tresses throughout its range include creeping bentgrass, baltic rush (*Juncus balticus*), long-styled rush (*J. longistylis*), scouring rush (*Equisetum laevigatum*), and bog orchid (*Habenaria hyperborea*). Coyote willow (*Salix exigua*) and yellow willow (*S. lutea*) are commonly present in small numbers as saplings and small shrubs (USFWS 1995). The USFWS (1995) reported that other species commonly associated with the Ute ladies'-tresses throughout its range include paint-brush (*Castilleja* spp.), thinleaf alder saplings (*Alnus incana*), narrowleaf cottonwood saplings (*Populus angustifolia*), sweet clover (*Melilotus* spp.), sedges (*Carex* spp.), red clover (*Trifolium pratense*), and western goldenrod (*Solidago occidentalis*).
The Ute ladies' tresses appear to be tolerant and well adapted to disturbances, especially those caused by water movement through floodplains over time (Riedel 1994 pers. comm. *in* USFWS 1995). Habitat alteration resulting from agricultural use (grazing, mowing, and burning) may be beneficial, neutral, or detrimental (McClaren and Sundt 1992). USFWS (1995) reported that grazing and mowing seem to promote flowering, presumably by opening the canopy to admit more light. However, these management practices may impede fruit set by directly removing flowering stalks, enhancing conditions for herbivory by small mammals and altering habitat required by bumble bees, the primary pollinator (USFWS 1995; Arft 1993).

Ute Ladies' tresses flower from mid-July to mid-August. Fruits mature and dehisce from mid-August into September. Plants may remain dormant for one or more growing seasons without producing above ground shoots. Orchids generally require symbiotic associations with mycorrhizal fungi for seed germination.

Icicle Creek Ute Ladies' tresses:
Review of the Washington Natural Heritage Database and field surveys in 1999 resulted in no Ute Ladies' tresses occurring within the program area. However,

potential habitat for this species does occur in the area.

<u>Bull Trout (*Salvelinus confluentus*)</u>

Status:

Bull trout are divided into five distinct population segments (DPSs). All five DPSs are listed as threatened: Columbia River and Klamath River DPSs, June 10, 1998; Jarbidge River DPS, April 8, 1999; Coastal-Puget Sound and St. Mary-Belly River DPSs, December 1, 1999. Bull trout are threatened by habitat degradation and fragmentation from past and ongoing land management activities such as mining, road construction and maintenance, timber harvest, hydropower, water diversions/withdrawals, agriculture, and grazing. Bull trout are also threatened by interactions with introduced non-native fish such as brook trout (*S. fontinalis*) and lake trout (*S. namaycush*).

Bull trout are estimated to have occupied about 60% of the Columbia River Basin, and presently occur in 45% of the estimated historical range (Quigley and Arbelbide 1997). Bull trout have declined in overall range and numbers of fish. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin. Although some strongholds still exist, bull trout generally occur as isolated subpopulations in headwater lakes or tributaries where migratory fish have been lost.

Range:

Bull trout, members of the family Salmonidae, are char native to the Pacific Northwest and western Canada. Bull trout historically occurred in major river drainages in the Pacific Northwest from about 41^0 N to 60^0 N latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to the headwaters of the Yukon River in Northwest Territories, Canada (Cavender 1978; Bond 1992). To the west, bull trout range includes Puget Sound, various coastal rivers of Washington, British Columbia, and southeast Alaska (Bond 1992; McPhail and Carveth 1992; Leary and Allendorf 1997). Bull trout are wide-spread throughout tributaries of the Columbia River basin in Washington, Oregon, and Idaho, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and the MacKenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997).

Habitat Requirements:

Bull trout exhibit resident and migratory life history strategies through much of their current range (Rieman and McIntyre 1993). Resident bull trout complete their life cycle in tributary streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear from one to four years before migrating to either a lake (adfluvial); river (fluvial), or in certain coastal areas, to saltwater (anadromous), where maturity is reached in one of the three habitats (Fraley and Shepard 1989; Goetz 1989).

Bull trout have relatively specific habitat requirements compared to other salmonids (Rieman and McIntyre 1993). Habitat components that appear to influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (Oliver 1979; Pratt 1984, 1992; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the necessary habitat requirements for bull trout to successfully spawn and rear and that the characteristics are not necessarily ubiquitous throughout watersheds in which bull trout occur. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), they should not be expected to simultaneously occupy all available habitats (Rieman *et al.* 1997).

Bull trout are found primarily in colder streams, although individual fish are often found in larger river systems. (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman *et al.* 1997). Water temperatures above 15^{o} C (59^{o} F) limit bull trout distribution, which partially explains their generally patchy distribution within a watershed (Fraley and Shepard 1989; Rieman and McIntyre 1995). Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Rieman *et al.* 1997).

All life history stages of bull trout are closely associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Oliver 1979; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Pratt 1992; Thomas 1992; Rich 1996; Sexauer and James 1997; Watson and Hillman 1997). Jakober (1995) observed bull trout overwintering in deep beaver ponds or pools containing complex large woody debris in the Bitterroot River drainage, Montana, and suggested that suitable winter habitat may be more restrictive than summer habitat. Maintaining bull trout populations requires high stream channel stability and relatively stable stream flows (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit complex cover associated with side channels, stream margins, and pools (Sexauer and James 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989; Pratt1992; Pratt and Huston 1993).

Preferred spawning habitat consists of low gradient streams with loose, clean gravel (Fraley and Shepard 1989) and water temperatures of 5 to 9^{o} C (41 to 48^{o} F) in late summer to early fall (Goetz 1989). Pratt (1992) summarized information indicating that increases in fine sediments are related to reduced egg survival and emergence. High juvenile densities were observed in Swan River, Montana, and tributaries with diverse cobble substrate and low percentage of fine sediments (Shepard *et al.* 1984). Juvenile bull trout in four streams in central Washington occupied slow moving water less than 0.5 m/sec (1.6 ft/sec) over a variety of sand to boulder size substrates (Sexauer and James 1997).

The size and age of maturity for bull trout is variable depending upon life history strategy. Growth of resident fish is generally slower than migratory fish and resident fish tend to be smaller at maturity and less fecund (Fraley and Shepard 1989; Goetz 1989). Individuals normally reach sexual maturity in four to seven years and are known to live as long as 12 years. Repeat and alternate year spawning has been reported, although repeat spawning frequency and post-spawning mortality are not well known (Leathe and Graham 1982; Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1995).

Bull trout typically spawn from August to November during periods of decreasing water temperatures. However, adult migratory bull trout frequently begin spawning migrations as early as April, and have been known to move upstream as far as 250 kilometers (km) (155 miles (mi)) to spawning grounds (Fraley and Shepard 1989). In the Blackfoot River, Montana, bull trout migrate to spawning areas in response to increasing temperatures (Swanberg 1997). Temperatures during spawning generally range from 4 to 10^{o} C (39 to 51^{o} F), with redds often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989; Pratt 1992; Rieman and McIntyre 1995). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992) and after hatching juveniles remain in the substrate. Time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May depending upon water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Growth varies depending upon life-history strategy. Resident adults range from 150 to 300 millimeters (mm) (6 to 12 inches (in.)) total length and migratory adults commonly reach 600 mm (24 in.) or more (Pratt 1984; Goetz 1989).

Bull trout are opportunistic feeders with food habits primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro zooplankton, amphipods, mysids, crayfish, and small fish (Wyman 1975; Rieman and Lukens 1979 in Rieman and McIntyre 1993; Boag 1987; Goetz 1989; Donald and Alger 1993). Adult migratory bull trout are primarily piscivorous, known to feed on various trout (*Salmo spp*.), salmon (*Oncorhynchus spp*.), whitefish (*Prosopium spp*.), yellow perch (*Perca flavescens*), and sculpin (*Cottus spp*.) (Fraley and Shepard 1989; Donald and Alger 1993).

Icicle Creek Bull Trout:
The Icicle Creek bull trout population is one of ten stocks in the Wenatchee River watershed. All bull trout in the Wenatchee River watershed are native. No hatchery introduction of bull trout has occurred (WDFW 1997). The Icicle Creek population is a native and distinct stock that is isolated from other stocks mainly by water temperature and the LNFH spillway dam (rm 2.8). Stock status is unknown (WDFW 1997). Resident and potentially migratory life histories exist in this population. Resident fish are isolated above the LNFH dam. Adult fluvial bull trout return to the base of the dam and may be recruits from resident fish above the dam or adults holding or straying from the Wenatchee River (WDFW 1997). Bull trout have entered the LNFH fish ladder and adult holding ponds. All bull trout that enter the hatchery facility are carefully netted and returned to Icicle Creek below the spillway dam. No bull trout mortality has

occurred due to their temporary entrainment in the holding ponds.

Key factors affecting Icicle Creek's bull trout population are thermal isolation, isolation due to fish barriers, irrigation withdrawals (screened and unscreened), high water temperatures, extensive human and natural impacts in the watershed, and competition and hybridization with introduced fish species (WDFW 1997). Eastern brook trout, rainbow trout (*Oncorhynchus mykiss*), and lake trout have been planted in the Icicle Creek drainage. A single brook trout introduction was done in 1956 but it is unclear if they were introduced above or below the falls at river mile 24. However, brook trout seem to be located above and below the falls. The falls at river mile 24 is reported as the historical barrier to anadromy (Lomax *et al.* 1981). Twenty-four brook trout were observed in Icicle Creek in a USFWS 1994/95 snorkel survey (USFWS 1997). Ten brook trout were also reported in Trapper Creek, a tributary that enters Icicle Creek at river mile 29 (USFWS 1997). Rainbow trout fry were stocked annually from 1937 to 1940 in Leland Creek, a tributary (river mile 27.4). Over 97% of the fish observed in Icicle Creek and three of its tributaries (Trout, river mile 16.8; Jack, river mile 17.2; and Trapper Creek river mile 29) during snorkel surveys were rainbow trout (USFWS 1997). Also, lake trout have been reported in Eightmile Lake. Eightmile Creek flows from the lake and enters Icicle Creek at river mile 9.0.

Snorkel surveys conducted by USFWS staff revealed eight bull trout in 1996, six bull trout in 1997, 40 in 1998, seven in 1999, 40 in 2000, and 100 in 2001 in the pool below the hatchery spillway dam. Seven bull trout in upper Icicle Creek and four bull trout in Jack Creek were also reported (USFWS 1997). In 1938, twelve Dolly Varden (bull trout) were collected in the bypass trap of the Icicle irrigation ditch at river mile 5.7. (Brennan 1938).
The potential for Leavenworth NFH operations to impact Columbia River bull trout can be incorporated into three categories: 1) the physical, chemical, and micro-biological effects associated with hatchery operations, 2) direct and indirect effects associated with juvenile salmonids released from the hatchery, and 3) direct and indirect effects associated with returning adults.

Physical, chemical, and micro-biological effects

Water Withdrawal:

Leavenworth NFH periodically withdraws up to 100% of its water (up to 42 cubic feet per second (cfs)) from Icicle Creek. This figure represents 6.7% of the mean annual flow of 625 cfs (Mullan et al. 1992a). This water then returns to Icicle Creek approximately 1600m downstream of area of withdraw. The 1600m section (area between withdraw and return) is above the dam at Leavenworth NFH. Impact is unknown, but considered minimal as area from hatchery intake to effluent outfall is not a known spawning or rearing area (RM 2.8 to 3.8). The hatchery intake is in an area that has been inaccessible to anadromous fish for almost 60 years and currently is not properly screened. Under current design, it would not be feasible to use the proper screen mesh size. Due to the distance from the hatchery to the structure (about one mile), coupled with the severity of the winter climate in this area, it would be very time intensive to keep the structure ice-free during the winter months. The size of screening mesh required to prohibit fry from entering the structure would undoubtedly freeze up and severely restrict or stop water flow to the hatchery. Also, during periods of high runoff, huge quantities of debris are present in the system and this would present another blockage problem. The BOR is currently discussing plans to modify this structure to bring it into compliance. This water intake structure consists of a diversion dam, fish ladder, wide bar trash rack and another narrower bar trash rack located in a building. An irrigation company is a joint user of water from Icicle Creek, which takes up to 12 cfs from our pipeline, May through October. The hatchery water is delivered via 33" pipeline until the irrigation diversion, about 1/4 mile below the intake. The hatchery pipeline continues, via 30" pipe, to the sand-settling basin which is about 1¼ miles down from the irrigation diversion. Entrained fish in the system can return to the river in several ways: 1) the irrigation diversion has a drum screen diverting fish into a sluiceway back to the river, 2) the overflow area at the sand settling basin can pass fish back to the river and, 3) a short distance from the sand settling basin are two screen chambers. One is enclosed in a building which is equipped with 1/8" X 1/8" plastic coated screens which divert fish into a bypass pipe to the river. The other screen chamber is covered with a pole building and is equipped with 1/8" X 1" slotted screens which divert fish into an overflow channel back to the river. From both screen chambers, water is delivered to the rearing ponds and back to the river.

As previously mentioned, the entire water delivery system is being addressed under a separate process. Current plans include a modification/rebuild of the system. All permits will be secured prior to any work being started.

Hatchery Effluent:
Effluent from Leavenworth NFH is monitored at least weekly to ensure compliance with NPDS standards and state point source discharge criteria. Leavenworth NFH has consistently remained below designated standards for settleable solids. Considering that the effluent produced from Leavenworth NFH complies with EPA standards, coupled with the low percentage of effluent to discharge (dilution factor), there is a low possibility that effluent produced at Leavenworth NFH will negatively affect bull trout in this area.

Transmission of Disease or Parasites
The potential for Leavenworth NFH fish to transmit diseases and parasites to bull trout is low. Service fish health biologists routinely assess the health of salmonids produced at Leavenworth NFH. At least once per month, biologists' sub-sample ponds to determine bacterial kidney disease (BKD) levels using the ELISA technique, overall health, parasites, and the possible occurrence of other viral or bacterial infections. Under Service fish health policy, fish at federal hatcheries must be destroyed and their remains buried if they are diagnosed with viral diseases not endemic to the country or that threaten the continued existence of fish populations. Parasites are not prevalent among Leavenworth NFH fish. The only disease that recurs among salmonid juveniles reared at Leavenworth NFH is infections of BKD. This bacterial disease is common among salmonids in the Columbia River Basin. BKD is found in low to moderate severity in adult chinook salmon returning to Leavenworth NFH. At Leavenworth NFH, up to 80% of the returning adults have been diagnosed with the infectious hematopoietic necrosis virus (IHNV); however, no adults have died of the virus and the disease has never been isolated in subsequent progeny. To further reduce the potential of disease transmission, it is policy to bury all adult carcasses, mortalities among ponded juveniles, and dead or fungous eggs.

Twenty-eight of 30 bull trout sampled from the Deschutes River basin were tested for BKD. This area has had no hatchery stock influence for about 10 years. Twenty-seven of the 28 bull trout tested positive for BKD (M. Engelking, ODFW, pers. comm. 1999). During 1992-1994, naturally-produced spring/summer chinook salmon parr were sampled from 25 sites in the Snake River basin in Idaho and Oregon, including rearing areas in the Salmon River, the Imnaha River, the Grand Ronde River and tributaries. *Renibacterium salmoninarum* (the causative agent for BKD) antigen was detected in fish from all populations sampled, including those remote from hatchery influence. Overall prevalence of this antigen ranged from 44% for fish in the Salmon River system in 1993 to 92% for fish in the Imnaha River in 1992. Prevalence of *R. salmoninarum* antigen ranged from 39% to 60% in hatchery fish and from 61% to 92% in wild fish, with prevalences consistently higher in wild fish than in hatchery fish at a given dam during a given year. Their results indicate that the prevalence and levels of *R. salmoninarum* are not higher in hatchery fish than in wild fish in the Snake River basin (Elliot, D. G. and R. J. Pascho 1997).

Physical Barriers

Leavenworth NFH was built in 1939 - 40. At that time the hatchery dam on Icicle Creek became a barrier to anadromous fish. Historically, anadromous salmonids had access to River Mile 24.0, or about 170 acres of Icicle Creek rather than the 32 acres now available downstream of the hatchery. We know that resident bull trout populations exist above and fluvial populations below the barrier dam through snorkel surveys conducted by our staff. Fluvial bull trout in Icicle Creek are restricted in movement by the barrier dam, but the effect on the population is unknown. USFWS recently crafted an EIS covering alternatives to the present barrier. The selected alternative will supply passage for bull trout and other fish species.

Effects Associated with Released Juveniles

Production goals for Leavenworth NFH are 1,625,000 yearlings annually at a size of 15 fish/lb.

Competition, Predation, Residuals and Behavior

Direct competition for food and space between hatchery and natural fish may occur in spawning/or rearing areas and the migration corridor, but often more intensely between individuals of the same species. These impacts are assumed to be greatest in the spawning and nursery areas and at points of highest fish density (release areas) and to diminish as hatchery smolts disperse (MCMCP 1997). Release of hatchery smolts that are physiologically ready to migrate is expected to minimize competitive interactions as they should quickly migrate out of the spawning and rearing areas (NMFS 1995). Competition continues to occur at some unknown, but probably lower level as smolts move downstream through the migration corridor (MCMCP 1997).

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which reduces retention time in the streams after release (Bugert et al. 1991). Witty et al. (1995) state they did not find any literature or data to demonstrate functional relationship between numbers of juvenile migrants moving through reservoirs and impacts on smolt survival attributable to competition.

Hatchery fish may prey upon natural fish. There is currently no evidence that hatchery releases prey on bull trout and it is likely that hatchery fish may provide a substantial prey base for bull trout. Due to their location, size, and time of emergence, newly emerged chinook salmon fry are likely to be the most vulnerable to predation by hatchery released fish (USFWS 1994). Emigration out of hatchery release areas and foraging inefficiency of newly released hatchery smolts may minimize the degree of predation (USFWS 1994).

Witty et al. (1995) conclude that the potential impact of hatchery salmonid predation on natural salmonids in the mainstem corridor is not a significant factor. Steward and Bjornn (1990) state that large concentrations of hatchery fish may adversely affect wild juveniles by stimulating functional responses from bird and non-salmonid fish predators. On the other hand, a mass of fish moving through an area may confuse or distract predators and may provide a beneficial effect (MCMCP 1997).

Hatchery-reared salmon and steelhead released into spawning and rearing areas of natural species may fail to emigrate (residualize), and may negatively interact with natural fish (MCMCP 1997). Releases from Leavenworth NFH are timed to mimic the out-migration of naturally produced salmon to further reduce potential residuals. Precocious maturation of male stream-type (spring chinook) chinook salmon is common, suggesting that it is a characteristic of this behavioral form (Mullan et al. 1992b). They also indicate that precocious maturation of male spring chinook salmon is common in the mid-Columbia Basin and is characteristic of both hatchery and wild stocks. Examination of 3,443 juveniles from the Lemhi River, Idaho, showed that precocious development existed in 2.6% of the sample (Gebhards 1960). Precocious males constituted about 1% of 20,000 wild chinook salmon examined in tributary streams of the mid-Columbia River 1983 - 1988 (Mullan et al. 1992b). Precocious males tend to have a higher mortality rate than non-maturing juveniles (Chapman et al. 1995). Mullan et al. (1992b) found that precocious males made up a greater percentage of the fish that died at Leavenworth NFH. Precocious males also tend to be less nomadic than other juveniles. In Icicle Creek, Mullan et al. (1992b) report that males generally remained in the test area, while female migrated.

The extent that precocious males contribute to reproduction is unknown. In the mid-Columbia Basin, males that mature in freshwater during their first or second summer may contribute to reproduction, and may contribute more than jacks under certain conditions (Chapman et al. 1995). They also believe that precocious males may play a significant role in reproduction in the mid-Columbia Basin, spawning successfully not only as "sneakers" in the presence of older males, but as the sole male present in some areas and in some years when spawner numbers are very low. All this said, the data indicates that residualism is a natural trait in spring Chinook, but the extent (from Complex hatcheries) on the natural population is unknown.

Effects Associated with Returning Adults

The possibility is extremely low that adult spring Chinook salmon returning to Leavenworth NFH will adversely impact bull trout. Potential for effect could occur in the migration corridor or during broodstock collection and harvest.

<u>In-river Effects</u>

There is no evidence to suggest that the collection and management of spring Chinook salmon broodstock at Leavenworth NFH will adversely affect bull trout stocks. All broodstock for Leavenworth NFH are salmon adults entering the fish ladder. At the time bull trout are spawning, Leavenworth NFH is not collecting adults. Prior to the fish ladder being closed, any stray bull trout entering the ladder are released back into Icicle Creek.

<u>Harvest</u>

Portions of the adult salmon returning to Leavenworth NFH are harvested in the terminal tribal and sport fisheries in Icicle Creek. We know of no bull trout incidentally caught during these activities, although harvest is not closely monitored.

Candidate:

<u>Yellow-Billed Cuckoo (*Coccyzus americanus occidentalis)*</u>

The yellow-billed cuckoo in the western United States was accorded candidate status in July 2001. The western yellow-billed cuckoo includes all members of the species found in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas and Washington.

Historically, the yellow-billed cuckoo bred throughout much of North America. Available data suggests that within the last 50 years the species' distribution west of the Rocky Mountains has declined substantially. Loss of streamside habitat is regarded as the primary reason for the population decline. In Washington, the last confirmed breeding records were in the 1930s. The cuckoo may now be extirpated from Washington.

Western yellow-billed cuckoos breed in dense willow and cottonwood stands in river floodplains.

The yellow-billed cuckoo is a medium sized brown bird, about 12 inches long and weighing about 2 ounces. The birds' most notable physical features are a long boldly patterned black and white tail and an elongated down-curved bill which is yellow on the bottom. Yellow-billed cuckoos are migratory; historically cuckoos arrived in Oregon in mid-May and flew south to their wintering grounds in September. Although many species of cuckoos are brood parasites (laying their eggs in other birds' nests), the yellow-billed cuckoo usually builds its own nest and raises its own young. The yellow-billed cuckoo is sometimes called the raincrow or stormcrow, because it often calls before a rainstorm.

The bird primarily eats large insects including caterpillars and cicadas as well as the occasional small frog or lizards. Breeding coincides with the emergence of cicadas and tent caterpillar.

Available data suggests that the yellow-billed cuckoo's range and population numbers have declined substantially across much of the western United States over the last 50 years. The greatest threat to the species has been reported to be loss of riparian habitat. It has been estimated that 90% of the cuckoo's streamside habitat has been lost. Habitat loss in the west is attributed to agriculture, dams and river flow management, overgrazing and competition from exotic plants such as tamarisk.
No known yellow-billed cuckoo's reside in the program area, and are thought to be extirpated from Washington State.

15.3) <u>Analyze effects</u>

<u>Gray Wolf:</u>
Although LNFH lies within habitat for Gray Wolves, there have been no confirmed sightings in the program area. Therefore, in considering affects of the hatchery program and operation of the facility on the status of Gray Wolves, we feel that no effect will occur.

<u>Wenatchee Mountain checker-mallow (WMCM):</u>
Although populations of WMCM are known to exist in the Icicle Creek drainage, a review of the Washington Natural Heritage Database and field surveys conducted in 1999, resulted in no WMCM's occurring in the program area. Therefore, in considering affects of the hatchery program and operation of the facility on the status of the WMCM, we feel that no effect will occur.

<u>Showy Stickseed:</u>
The only known population of Showy Stickseed is located outside the Icicle Creek Basin, upstream of the confluence of Icicle Creek and the Wenatchee River.

Therefore, in considering affects of the hatchery program and operation of the facility on the status of the Showy Stickseed, we feel that no effect will occur.

Bald Eagle:
The program area is part of the Pacific States Recovery Plan for bald eagles. A species management guide has been developed for the Wenatchee National Forest that identifies potential recovery territories for nesting bald eagles. The program area was not included as a recovery area; the nearest recovery area is about five miles from LNFH.

No nesting sites have been found within one mile of the hatchery, though there is a winter roost site less than one mile upstream of the facility. Currently, LNFH and adjoining waterways provide adequate fisheries important to the bald eagle. Hatchery produced fish probably play an important role in the eagles diet. Therefore, in considering affects of the hatchery program and operation of the facility on the status of the bald eagle, we feel that no effect will occur.

Grizzly Bear:
No grizzly bears have been observed in the program area, though the nearest known occurrence was an autumn track observation in forested habitat less than three miles south (USFS 1991). It is unlikely that grizzly bears occupy the program area, with the possible rare exception of feeding on salmon carcasses.

There are no known grizzly bear denning sites in the program area. The hatchery grounds have food sources for grizzly bear including fawning habitat, spring emergence vegetation, and spawning salmon.

The program area does not have any core habitat, areas with no motorized roads or trails, and no high use non-motorized roads or trails within 0.3 miles. The program area is on the edge of a developed resort area and other human habitations.

Therefore, in considering affects of the hatchery program and operation of the facility on the status of the grizzly bear, we feel that no effect will occur.

Northern Spotted Owl:
Although the program area lies within the range of the northern spotted owl, forest fires in 1994 burned over most of the area. Prior to the 1994 fires, there were three spotted owl activity centers within a two mile radius of LNFH; there is now only one activity center within two miles of the facility.

Most of the hatchery grounds are currently non-habitat for spotted owls. Northern spotted owl surveys were conducted to protocol (USFS 1992) in habitat within one mile of the hatchery area and no spotted owls were detected.

Therefore, in considering affects of the hatchery program and operation of the facility on the status of the northern spotted owl, we feel that no effect will occur.

Canada Lynx:
The nearest sighting of a Lynx, to the program area, was made in 1998 when a single animal was seen at higher elevation, less than three miles southeast of the program area. No reports have been made in the program area. The hatchery sits at 1,00 feet in elevation and is shrub-steppe and mesic-dry forest type. Neither lodge pole pine nor sub-alpine fir are present in the program area, which are necessary for lynx and its prey. The program area is outside of any Lynx Analysis

Unit (LAU), and this area of the Icicle Valley does not provide connectivity between lynx habitats and LAU's.

Therefore, in considering affects of the hatchery program and operation of the facility on the status of the Canada Lynx, we feel that no effect will occur.

Bull Trout:
As previously mentioned, plans are underway to modify/rebuild the water delivery system. An alternative has been selected which will provide passage for bull trout (among others) to areas above the hatchery barrier.

From the presented data, we feel that the operation of LNFH may affect, but is not likely to adversely affect Columbia River or Icicle Creek bull trout.

Yellow-Billed Cuckoo:
Since no known yellow-billed cuckoo's reside in the program area, and are believed to be extirpated from Washington State, we feel that the operation of the hatchery (including production) will have no effect on the status of the yellow-billed cuckoo.

15.4 Actions taken to minimize potential effects:

For non-routine operations and maintenance activities, Biological Assessments and/or other appropriate documents, will be submitted to obtain the appropriate permits as needed.

The potential effects of hatchery operations/production on the *Gray Wolf, Showy stickseed, Grizzly Bear, Canada Lynx, and the Yellow-billed cuckoo*, is felt to be minimal to non-existent. None of these species have ever been documented on hatchery grounds. Therefore, no actions are deemed necessary or planned. In the future, if any negative effects to these species are known or imminent, we will consult with the appropriate agencies.

Bald Eagle and Northern Spotted Owl:
Although neither species are known to roost or nest in the program area, their presence would be documented and responded to. FWS does not harvest any trees on hatchery grounds, particularly those that provide habitat. As previously mentioned, any non-routine maintenance activity, including grounds management and herbicide/pesticide use, will be consulted on and permitted prior to implementation of the activity.

Wenatchee Mountain Checked-mallow and the Ute Ladies' tresses:
Although these species of plants are not found on hatchery grounds, potential habitat for them does exist. Any type of ground-breaking activities would be consulted on, if necessary, prior to the activity. If either of these species are located on hatchery grounds, the appropriate protective measures will be applied.

Bull trout:
Current protective measures being applied for bull trout are the aforementioned water delivery system upgrade and providing passage above the hatchery barrier. Any bull trout that enters the collection ponds, will be released back to the river unharmed. Hatchery effluent is routinely monitored and currently meets NPDES standards. Prior to smolt releases, fish health exams are conducted to ensure that disease levels meet all applicable criteria.

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