Bonneville Power Administration

Idaho Department of Fish and Game Captive Rearing Initiative for Salmon River Chinook Salmon

Final Environmental Assessment

DOE/EA-1301

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ACRONYMS

BPA – Bonneville Power Administration.

CEQ – Council on Environmental Quality.

EA – Environmental Assessment.

EIS – Environmental Impact Statement.

ESA – Endangered Species Act of 1973.

FONSI – Finding of No Significant Impact.

IDFG – Idaho Department of Fish and Game.

IHOT – Integrated Hatchery Operations Team.

NEPA – National Environmental Policy Act of 1969.

NMFS – National Marine Fisheries Service.

SIWG – Species Interaction Work Group.

TOC – Technical Oversight Team.

USFS – United States Forest Service.

USFWS - United States Fish and Wildlife Service.

WDFW - Washington Department of Fish and Wildlife.

1. NEED AND PURPOSE FOR ACTION

1.1. INTRODUCTION

Development, operation, and management of Columbia River Basin Federal **hydroelectric**[1] facilities have had far-reaching effects on many species of fish and wildlife within the basin. The Bonneville Power Administration (BPA) is responsible for protecting, **mitigating,** and enhancing these affected species and their **habitats** (see Pacific Northwest Electric Power Planning and Conservation Act of 1980 [Northwest Power Act][2], 16 U.S.C. 839 et seq., Section 4 (h)(10)(A)). Additionally, under the **Endangered Species Act** of 1973 (ESA) as amended, 16 U.S.C. 1531 et seq., BPA shares responsibility for protecting and conserving **listed threatened and endangered species.**

One measure that may help mitigate for the loss of **anadromous** fish **populations** is the <u>Idaho Department of Fish and Game (IDFG) Captive Rearing Initiative for Salmon River Chinook Salmon Program</u> (IDFG Program). The proposed **captive rearing** initiative is a research program designed to assist the **recovery** of Salmon River spring/summer[3] chinook salmon. By extension, the IDFG Program may contribute to the overall health of the Snake River spring/summer chinook salmon Evolutionarily Significant Unit (ESU)[4].

This Environmental Assessment (EA) analyzes alternatives for achieving IDFG Program goals and objectives.

1.2. NEED FOR ACTION

In 1995, the IDFG applied for an emergency permit from the National Marine Fisheries Service (NMFS) to recover Salmon River spring/summer chinook salmon. In particular,

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[1] Words highlighted in **boldface** appear in the glossary at the end of this document. Some explanation or definition may appear in footnotes as well.

[2] Under the Northwest Power Act, mitigation refers to varying measures such as: a) not taking a certain action or parts of an action, b) limiting the degree or magnitude of an action and its implementation, c) repairing, rehabilitating, or restoring the affected environment, d) preservation and maintenance operations during the life of the action, and/or e) replacing or providing substitute resources or environments.

[3] Spring and summer chinook are considered together in the Snake River Basin Evolutionarily Significant Unit because there is overlap in the spawning areas between the two groups, as well as overlap in run-timing (NMFS 1999).

[4] *Evolutionarily Significant Unit* (ESU) is an Endangered Species Act (ESA) designation that groups local populations of fish in an area into a larger group. The grouping is based on similar ranges, genetic make up, and life histories. The local populations that make up the ESU are known as *subpopulations* of the ESU. The ESU is the ***metapopulation*** that is made up of the *subpopulations.* The extent of the similarity among subpopulations, and the relationship of each population to the health of the ESU, is a topic of debate. However, the ESU designation assumes that the groups are so related; and it assumes that they are more closely related to one another within the ESU than they are related to groups outside of the ESU. Finally, the designation assumes that the ESU is significant to the survival of the species as a whole, and should be preserved. The designation exists to help program managers target population recovery efforts efficiently. Of the 38 identified subpopulations that make up the Snake River spring/summer chinook salmon ESU, 28 are in the Salmon River drainage (NMFS 1995).

they identified high-priority[5] at-risk populations in the East Fork Salmon River, West Fork Yankee Fork Salmon River, and Lemhi River.

By funding ongoing IDFG Program activities, BPA addresses its need to mitigate for losses of anadromous fish and fish habitat due to operation of the hydrosystem. The IDFG Program presents the opportunity to monitor, evaluate, and refine captive rearing and **propagation** tools, as required under the Northwest Power Planning Council's (**Council**) Fish and Wildlife Plan. Relevant measures of the Fish and Wildlife Program include 7.4d.1, which calls for **scoping** to identify captive **broodstock** research needs; 7.4d.2, which calls for funding captive broodstock **demonstration programs**, and 7.4e, which authorizes **cryopreservation** of **gametes** from depleted stocks (freezing or "banking" gametes).

1.3. PURPOSES (DECISION FACTORS)

BPA identifies the following purposes for participating in this project. These purposes define the decision factors on which BPA decides among alternatives.

1.3.1. Technical Factors

- The Proposed Action is consistent with the Council's 1987 Fish and Wildlife Program, and 1995 Program Amendments.
- The Proposed Action complements activities of fish and wildlife agencies and appropriate tribes.
- The Proposed Action is consistent with the legal rights of the appropriate tribes in the region.
- The Proposed Action develops and transfers information/technology.

1.3.2. Economic Factors

- The Proposed Action is administratively efficient and cost-effective.

1.3.3. Environmental Factors

- The Proposed Action avoids or minimizes adverse environmental impacts.
- The Proposed Action has the best potential to achieve biological objectives, including:
  1. **supplementation** of **natural spawning populations** of Salmon River spring/summer chinook salmon in target streams; and
  2. preservation of unique **genetic** heritage of target populations.

[5] *High-priority* is defined as having an annual escapement of less than 20 fish, poor resiliency from the last bottleneck (1979 through 1984), and adequate habitat for successful spawning and rearing in case of recovery. Populations for hatchery preservation actions are prioritized based on assumed relative importance to the Snake River spring/summer chinook salmon ESU, assumed retention of native population characteristics, estimated imminent extirpation risk, and risk of exposure to experimental techniques (Fleming and Gross 1992, 1993; Joyce, Martin and Thrower 1993; Flagg and Mahnken 1995).

1.4. RELATED DOCUMENTS

- IDFG. 1999. The IDFG Snake River Chinook Salmon Captive Rearing Program. 1998 Annual Report (BPA project #s 9700100 and 9801002). Boise, Idaho.
- IDFG. 2000. The IDFG Captive Rearing Initiative for Salmon River Chinook Salmon. IDFG Annual Report #99-03 (BPA project #s 9700100 and 9801002). Boise, Idaho.
- Bowles, E., and E. Leitzinger. 1991. Salmon Artificial Rearing Studies in Idaho Rivers (Idaho Artificial Rearing Studies), Experimental Design. U.S. Department of Energy/BPA. Project No. 89-098. Contract No. DE-B179-89BP01466. Portland, Oregon.
- Integrated Hatchery Operations Team (IHOT). 1995. Policies and Procedures from Columbia River Basin Anadromous Salmonid Hatcheries. BPA Report 92-043. Portland, Oregon.

The IDFG documents report IDFG Program results for Fiscal Years 1998 and 1999. Bowles and Leitzinger detail the IDFG Program research plan used for monitoring and evaluating artificial rearing. The IHOT (1995) document details IDFG Program rearing procedures.

1.5. RELATIONSHIP TO OTHER PROJECTS

- The IDFG Program operates in association with the BPA-funded (Lower Snake River Compensation Plan) Sawtooth Fish Hatchery in Stanley, Idaho. The Sawtooth Fish Hatchery would act as the initial rearing facility for IDFG Program fish.
- Eagle Fish Hatchery - a facility presently in use to develop sockeye salmon captive broodstocks–would be the site of IDFG Program freshwater captive rearing. Although managed as separate projects, program responsibilities overlap and complement each other.
- Saltwater captive rearing would be carried out at the NMFS Manchester Marine Experimental Station site. The Manchester Marine Experimental Station would also be an integral component of the overall IDFG Program cooperative fish **culture** activities conducted by NMFS.
- NMFS provides guidance for the refinement and use of captive propagation technology for Pacific salmon. It also brings together information on fish husbandry techniques, genetic risks, **physiology**, nutrition, and pathology affecting captive stocks. Finally, NMFS conducts genetic investigations of Idaho and regional salmon populations. This provides essential genetic baseline information to the IDFG Program on target subpopulations.

1.6. DECISIONS TO BE MADE

<u>BPA Decision</u>: In compliance with the Northwest Power Act, the Council recommends fish and wildlife projects to BPA for funding. BPA reviews the Council's recommendations for impacts to the environment (human and biological) in an EA. If the information in the EA indicates that the project will not cause significant impacts, BPA issues a Finding of No Significant Impact (FONSI). If, on the other hand, the information indicates that there would be significant impacts to the environment—or that significant scientific uncertainty surrounds the information in the EA—BPA initiates further study and reporting through the Environmental Impact Statement (EIS) process. Thus:

- BPA must decide whether the IDFG Program meets its fish and wildlife policy needs and internal contracting requirements sufficiently to continue funding.
- BPA must decide whether information developed for this EA is sufficient to issue a FONSI, or whether the information indicates the need for an EIS.

IDFG Decision: Should BPA not issue a FONSI based on this EA, the IDFG must decide whether to continue the Proposed Action as written through alternate funding sources, modify the Proposed Action for further review, or withdraw the Proposed Action from further consideration.

Council Decision: The Council requires that each artificial **production** project go through a 3-Step Review Process. Step 2 of the process requires, among other things, that project managers document potential impacts to the environment. Such documentation—usually an EA or an EIS—complies with the requirements of the **National Environmental Policy Act** (NEPA).

The Council must decide whether this EA satisfies its Step 2 NEPA compliance requirements.

1.7. THE ORGANIZATION OF THE ENVIRONMENTAL ASSESSMENT

Chapter 1 states the purpose and need for the IDFG Program, and defines the factors that determine whether BPA will participate.

Chapter 2 describes the Proposed Action and reasonable alternatives, including a No Action Alternative.

Chapter 3 details human and environmental resources that will be analyzed (or not analyzed) for impacts from the alternatives. This chapter then describes the resources as they currently exist in the project areas.

Chapter 4 analyzes expected short-term, long-term, and cumulative impacts of the alternatives to the resources.

Chapter 5 is a table describing potential mitigation for IDFG Program measures.

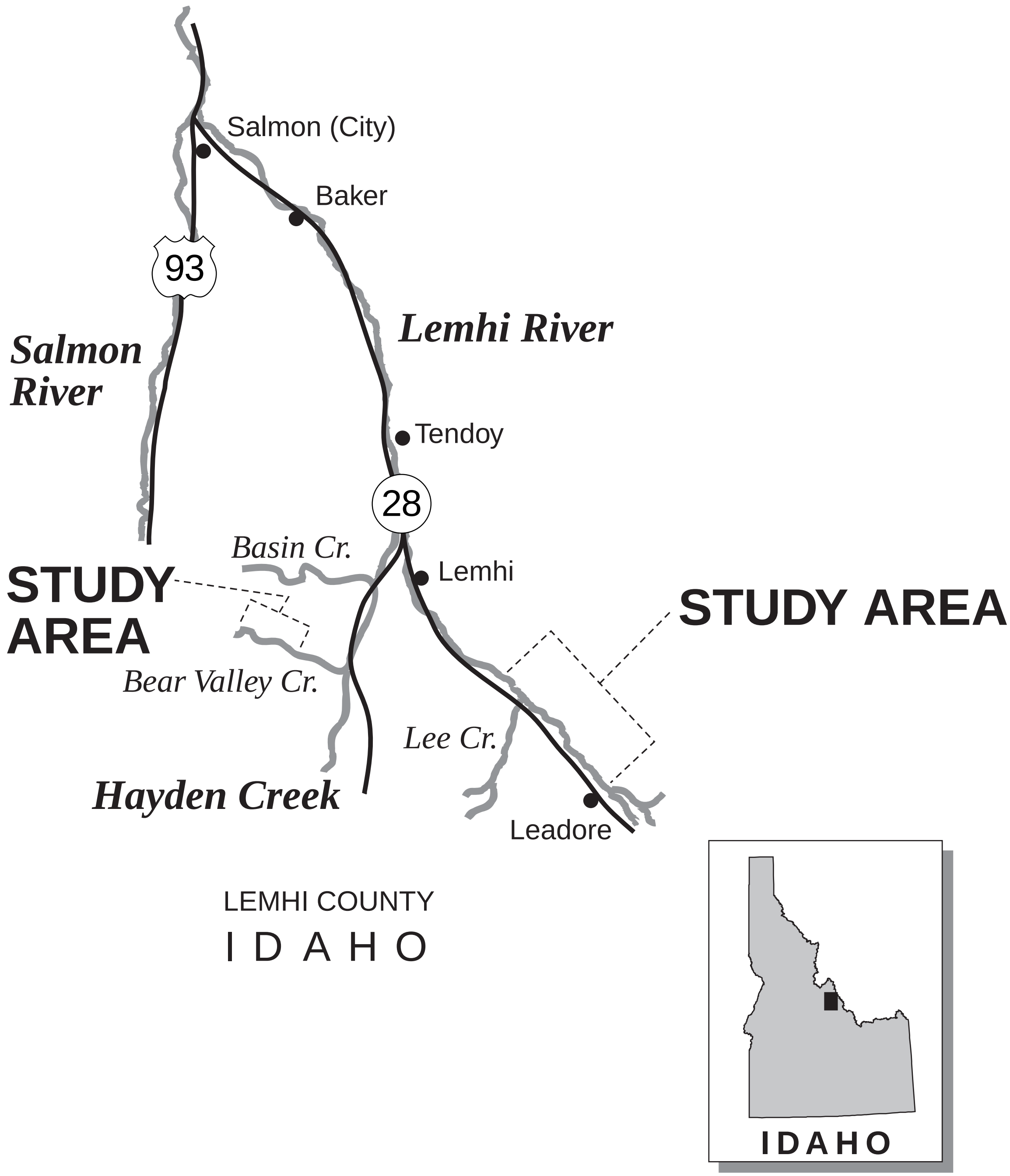

Figure 1-1. Map of Lemhi River Project Area

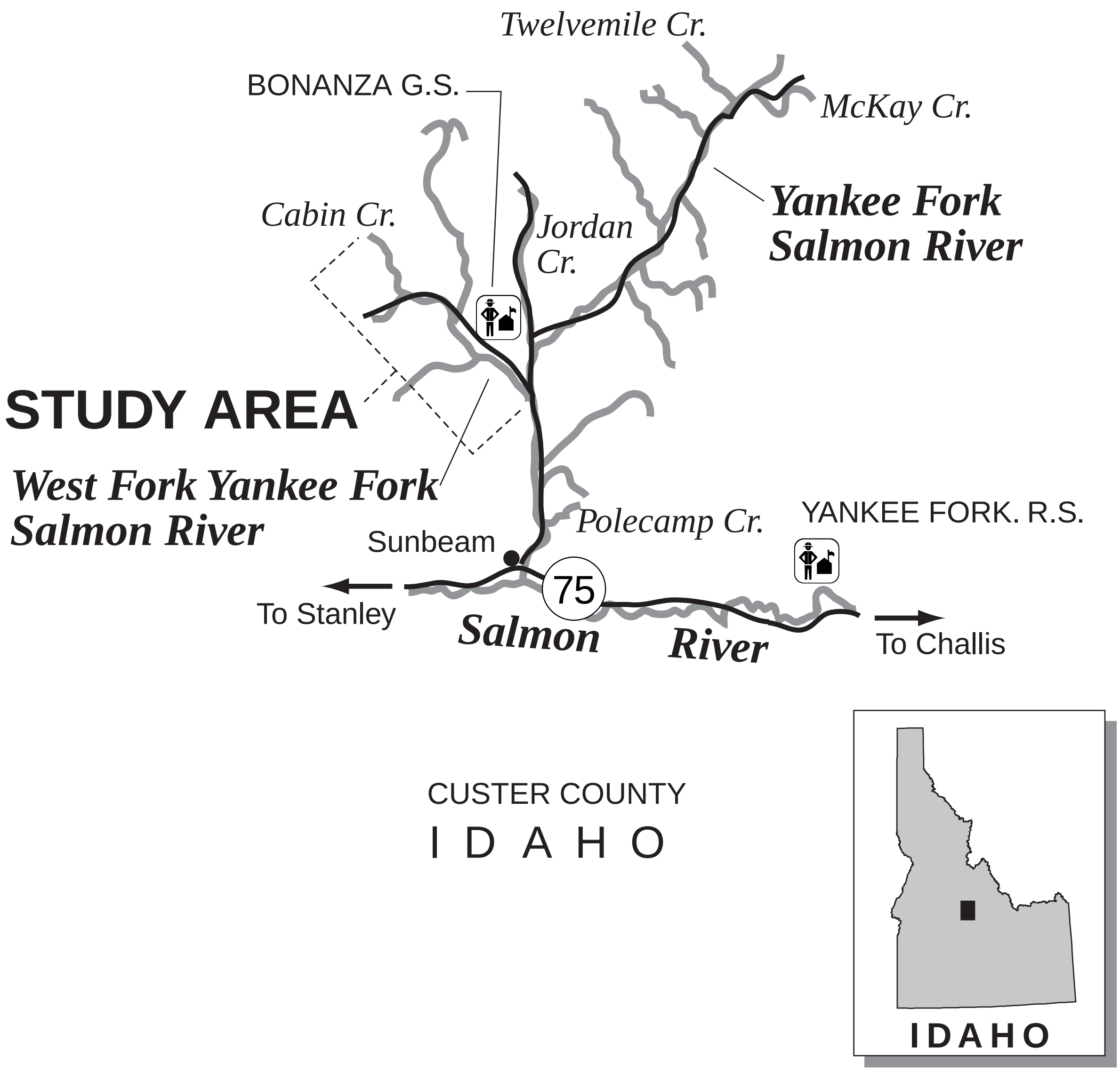

Figure 1-2. Map of West Fork Yankee Fork Salmon River Project Area

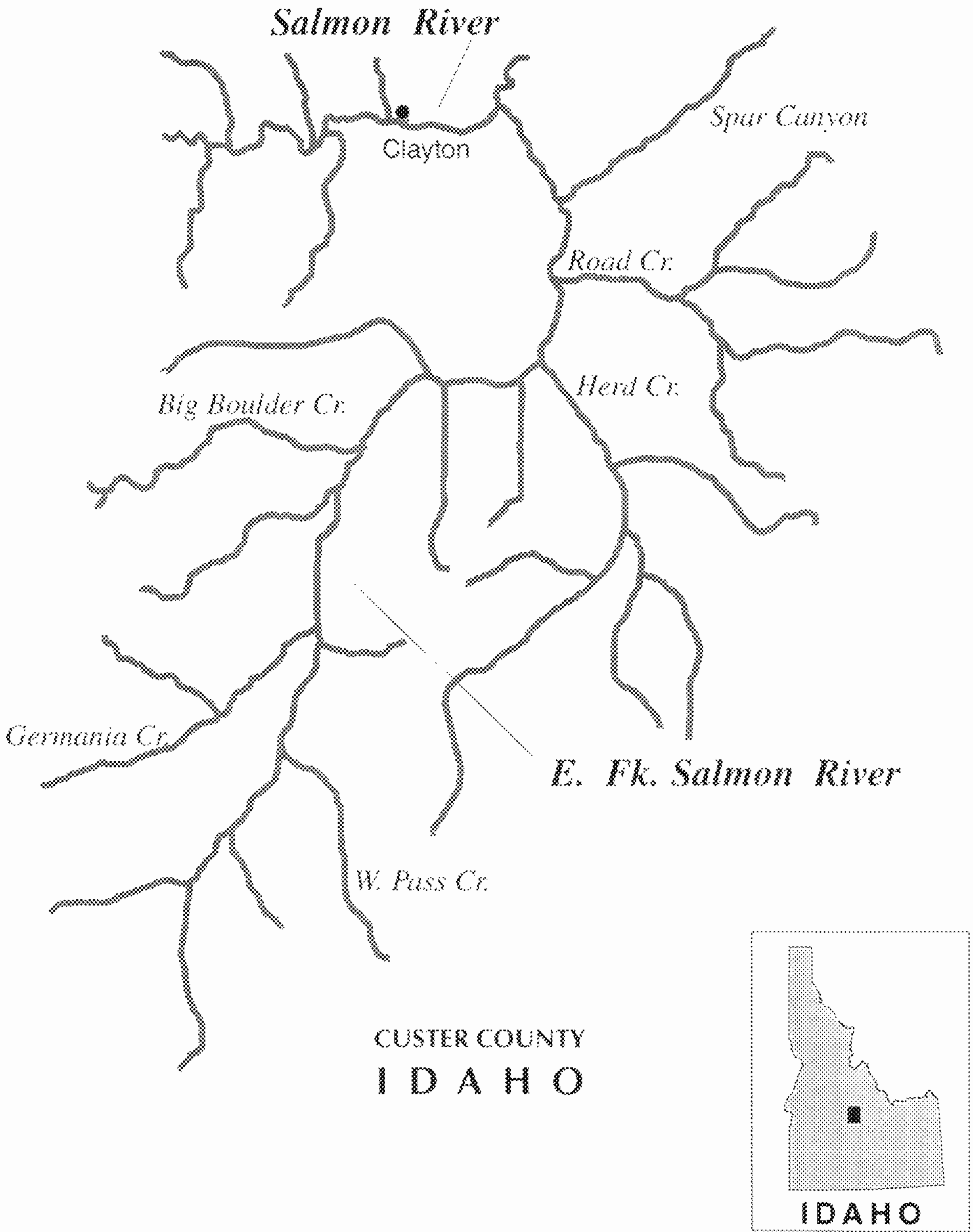

Figure 1-3. Map of East Fork Salmon River Project Area

2. ALTERNATIVES

The IDFG Program has been in operation since 1995. For complete background on past planning, operation, monitoring, and evaluation, consult IDFG Program annual reports for 1998 and 1999 (IDFG 1999, 2000).

This chapter describes three action alternatives for accomplishing ongoing IDFG Program goals: a Proposed Action; a **Parr** Collection Alternative; and an Alternative Adult **Release** Site. The chapter also describes a No Action Alternative, which would not accomplish the IDFG Program goals.

The Proposed Action and the Parr Collection Alternative are similar, except that the Parr Collection Alternative proposes collecting broodstock at parr stage (approximately 8 months), while the Proposed Action would collect broodstock at **eyed-egg** stage. Rearing and release **protocols** would be much the same. The Alternative Adult Release Site is identical to the Proposed Action except that it proposes releasing sexually mature adults to Big Springs Creek in the Lemhi River drainage, rather than Bear Valley Creek.

All action alternatives may include hatchery spawning and eyed-egg **outplanting**, depending on **forecasted adult returns** and the availability of IDFG Program hatchery broodstock per **broodyear** and stream *(see Section 2.3: Hatchery Spawning and Eyed-Egg Outplanting).*

2.1. BACKGROUND

2.1.1. IDFG Program Goals/Assumptions/Objectives

IDFG Program managers believe that the low number of adult fish returning to IDFG Program-targeted streams ranks high as a contributing factor to the decline of local Salmon River spring/summer chinook populations. The estimated 20 adult fish returning annually to each target stream are not likely to produce sufficient offspring to either sustain current adult population numbers, or to retain **vital genetic diversity/variability** within the populations.

Therefore, the recovery goals of IDFG Program captive rearing activities focus on increasing the natural spawning populations within target streams.

IDFG Program managers assume that collecting **naturally spawned** broodstock, rearing them in the hatchery (captive rearing), and releasing them back to their streams of origin to mate with returning adults would increase spawning opportunities. This, in turn, would produce more offspring. Eventually, increased offspring would lead to (all other natural **escapement** factors being equal) an ongoing increase in the natural spawning population.

Three objectives are designed to accomplish the goal:

1. collect natural offspring from target populations for use as broodstock;
2. rear these offspring in-hatchery to sexual maturity; and

3. release the sexually mature offspring back to the streams from which they were collected.

2.1.2. IDFG Program Hypotheses

The research phase of the IDFG Program is designed to test corollary hypotheses:

- Hatchery rearing natural broodstock to adult stage would provide juvenile-to-adult survival benefits, increasing the pool of pre-spawn adults available to the respective **native populations**; and
- Collecting broodstock in the wild, rearing them in captivity, and then releasing them to spawn with their naturally rearing cohorts[6], would avoid or mitigate some genetic and adaptive impacts associated with conventional artificial production protocols and methods *(see Sections 4.2.1: Direct Impacts to Anadromous Salmonids, and 4.2.2: Indirect Impacts to Anadromous Salmonids).*

By reducing or eliminating these impacts, the production of offspring among hatchery reared and naturally reared cohorts in target streams is expected to increase. These offspring are expected to be better suited physically, **morphologically**, and **behaviorally** to compete in the wild at each life stage and reproduce. The ongoing capacity among future generations to reproduce is known as the productivity of the population. Production and productivity are the values that would be tested.

2.1.3. IDFG Program Uncertainties

There are two major uncertainties associated with captive rearing: 1) does hatchery rearing affect the number and viability of the gametes produced; and 2) do hatchery broodstock spawn successfully with their naturally reared cohort in the wild. The first question has been monitored and evaluated intensively since 1995, and the results are encouraging (IDFG 1999, 2000). Monitoring and evaluation emphasis is now on the second question.

2.2. PROPOSED ACTION

Under the Proposed Action, IDFG Program broodstock would be collected at eyed-egg stage from the three target streams. Following incubation and initial rearing at Eagle Fish Hatchery in Idaho, **smolts** would be transferred to the NMFS Manchester Marine Experimental Station for saltwater rearing (80 percent of the sample), or remain at Eagle Fish Hatchery for freshwater rearing (20 percent of the sample). As fish mature, they would be sorted for sexual maturity, and released back to their respective streams of origin. All activities would be monitored and evaluated.

[6] *Cohort* refers to fish of the same population, produced during the same broodyear. Specifically, in the IDFG Program case, there are fish of a population collected for hatchery rearing (the sample), and fish of the same population left to rear naturally; the sample fish and the naturally rearing fish of the same broodyear are cohorts of one another.

Broodstock would be spawned in the hatchery to conduct gamete evaluations or to conserve populations if forecasted natural adult returns are zero. *(See Section 2.3: Hatchery Spawning and Eyed-Egg Outplanting).* **Eyed eggs** from these fish would be outplanted to incubation **hatchboxes** at selected sites within the project area. These activities would be monitored and evaluated.

2.2.1. Eyed-Egg Collection

In the last several years, natural spawning populations have produced fewer than 20 **redds** in each of the target streams. Natural spawning populations are expected to produce similar or diminishing redd numbers for the next several years (IDFG 2000).

Objectives: IDFG personnel would collect eyed eggs from the project areas. No more than six redds would be sampled in each stream. Fifty eyed eggs would be collected from each of the six redds per stream. Assuming a hatchery egg-to-adult survival rate of approximately 0.8, eyed-egg collection should yield approximately 240 adult broodstock per target stream. This number of broodstock could encompass 95 percent of the genetic diversity/variability of each population (Stanley Basin Sockeye Technical Oversight Committee, personal communication).

Protocols: Prior to spawning, personnel would survey redds weekly, changing to daily surveys during spawning. Individual redds would be located and accurately marked in study streams. The last day of egg deposition for each redd would be recorded to monitor egg development. Personnel would place temperature monitors in each stream at various locations, providing data relating stream temperature to eyed-egg development.

Hydraulic sampling procedures[7] would begin below egg pockets in the tail spill of the redd. Crews work progressively upstream until they encounter eggs. The work probe is designed with an air intake that creates a venturi effect, introducing both water and air into the redd. The discharge is relatively gentle, lifting eggs and small substrate up into the water column. Once the eggs are safely dislodged, they are recovered in the collection net.

The collected eggs are transported to the Eagle Fish Hatchery according to IHOT (1995) protocols.

Lemhi River redds are typically distributed between Leadore and Cottam Lane, a distance of approximately 11.2 kilometers (km) (7 miles). Spawning is usually initiated in early August, and continues throughout the month.

Redd surveys would begin in the first week of August. There is road access along both sides of the stream over the entire spawning area. All access to the stream is across private property. Regional personnel would coordinate access with private landowners.

[7] Personnel would carry equipment on backpack frames to each site, composed of three major elements: a hydraulic pump with 3.75 centimeter (1-1/2 inch) discharge and intake ports; intake and discharge hoses (3.75-centimeter diameter) fitted with cam-lock fittings; and catch baskets/nets, egg recovery, and egg transportation equipment.

Two or three sample days would be required to collect the eggs. Travel time from the Lemhi River to Eagle Fish Hatchery is about 6.5 hours.

West Fork Yankee Fork Salmon River redds are typically distributed from the mouth of the West Fork Yankee Fork upstream approximately 12 km (10 miles). Most spawning occurs from late July through early August. Redd surveys would begin in the third week of July.

Limited road access is available only near the mouth of the stream. The upper 9.6 km (8 miles) of the redd distribution is accessed via United States Forest Service (USFS)-maintained trail on USFS property. Because of trail-only access, two or three days would be required to collect the eggs. Travel time to Eagle Fish Hatchery is approximately 4 hours from the West Fork Yankee Fork Salmon River.

East Fork Salmon River redds may be distributed upstream of the hatchery satellite facility, a distance of approximately 15.6 km (13 miles). Spawning occurs from mid-August through mid-September.

Redd surveys would begin in the first week of August. There is road access along the entire spawning area. Access to the stream is across private and USFS property. Regional personnel would coordinate access with private landowners. Two or three sample days would be required to collect eggs. Transit of eggs from the East Fork Salmon River to Eagle Fish Hatchery takes about 6 hours.

2.2.2. Rearing Protocols

Eyed eggs would be transported to Eagle Fish Hatchery for incubation. Following **swim up**, hatchlings would be transferred to indoor rearing ponds, and reared on a growth program.

At age 1+, 80 percent of juveniles would be transported to NMFS Manchester Marine Experimental Station for saltwater rearing. The remaining 20 percent would remain at Eagle Fish Hatchery for freshwater rearing. Freshwater and saltwater rearing densities would not exceed 0.22 kilograms (kg)/0.03 cubic meters (0.5 pound/cubic foot).

Natural water temperature regimes would be maintained year-round, and natural photoperiod would be maintained. Strict **quarantine** practices would be maintained at all facilities. Fish would be monitored, treated, and medicated for disease as needed.

As IDFG Program data and regional research indicates, rearing protocols and physical facilities would be adapted for more natural rearing conditions (Maynard et al 1997).

2.2.3. Adult Outplant Design and Protocols

Outplant protocols are determined each year by the IDFG Program Technical Oversight Committee. The size of the release is based on forecasts of natural adult returns to each target stream and the availability of hatchery-reared mature adults.

Once adult hatchery broodstock were selected for release, IDFG or cooperating personnel would transport them to release locations. Release generally would occur throughout the month of August, depending on adult return timing to each target stream. The vehicles used are equipped to provide the appropriate conditions for safe transfers.

Hatchery broodstock would be released into enclosures or other barriers, as appropriate, to prevent them from straying out of spawning areas. These structures would be carefully monitored several times per day. The West Fork Yankee Fork Salmon River and East Fork Salmon River enclosures would be constructed on one side of the stream to provide easy passage around them. Because of the relatively small stream channel, partial channel enclosures at the Bear Valley Creek release site would not be suitable. Broodstock would be enclosed between a weir blocking downstream straying and a natural, partial barrier upstream. This structure would include a trap to allow **wild fish** (natural chinook salmon and bull trout) to pass the structure. Migrating chinook salmon, steelhead, and bull trout (if any individuals are present) would be collected and passed unharmed.

Release sites are selected for the presence of pools or slow-water resting areas, escape areas with cover, and suitable spawning substrate. Fish would be released into eddies and along stream margins to minimize initial energy expenditure.

The proposed release site for ***Lemhi River*** drainage broodstock is a two-mile section of Bear Valley Creek, a tributary to Hayden Creek (in the Lemhi drainage). The IDFG Program proposes no releases of sexually mature broodstock into Bear Valley Creek in Fiscal Year 2000, since the IDFG forecasts fewer than two returning natural adults. Mature hatchery-reared adults would be spawned in-hatchery *(see Section 2.3: Hatchery Spawning and Eyed-Egg Outplanting).* Eyed eggs would be outplanted.

No mature adults would be released into the ***West Fork Yankee Fork Salmon River*** in Fiscal Year 2000 due to forecasted low adult returns (less than 2 fish). The program has fewer than 10 mature hatchery-reared West Fork Yankee Fork adults, which would be spawned in-hatchery. Eyed eggs would be outplanted. Future West Fork Yankee Fork hatchery brood would be released to the West Fork Yankee Fork at a site 1.2 km (.75 miles) upstream of the confluence of the West Fork Yankee Fork and the Yankee Fork Salmon River.

No mature adults would be released into the mainstem ***East Fork Salmon River*** in Fiscal Year 2000 due to forecasted low adult returns. Mature hatchery-reared adults would be spawned in-hatchery. Eyed eggs would be outplanted.

2.2.4. Monitoring and Evaluation of Adult Outplants

IDFG Program managers monitor and evaluate IDFG Program protocols and procedures by reference to the values of “production” and “productivity.” Production refers to the numbers of offspring produced by each target population in a given year. Productivity refers to the ongoing capacity of a population to produce offspring.

It can be difficult to measure these two values directly, since the natural populations do not stay put for counting exercises. Therefore, the two value measures are measured indirectly, by evaluating certain population responses that can be more reliably tracked. For instance, tracking how a population is developing at critical life stages indicates whether the population will likely continue to reproduce over generations (productivity). Such indicators would be such things as the age structure of the maturing captive population, the spawning ratio of supplemented and unsupplemented adults, parr distribution and growth, etc. If these indicators are good, the population would seem to be developing well, and likely to be productive.

A list of these response variables evaluated by the IDFG Program is given below.

Production Response Variables

- number of redds constructed
- mid-summer parr production from spawners
- fall and spring emigrant (**pre-smolt** and **smolt**) production
- total smolt production
- adult escapement resulting from adult outplants

Productivity Response Variables

- survival (egg-to-parr, parr-to-smolt, smolt-to-adult or redd counts)
- **fecundity**
- age structure of the maturing captive population
- spawning ratio (supplemented and unsupplemented adults)
- parr distribution and growth
- emigration timing

(For more, see the Bowles and Leitzinger [1991] research plan for monitoring and evaluating artificial rearing programs.)

2.3. HATCHERY SPAWNING AND EYED-EGG OUTPLANTING

Each year, IDFG Program personnel forecast the number of adult spring/summer chinook salmon expected to return to each target stream. Based on these forecasts and the recommendations of the Technical Oversight Team (TOC), they then schedule adult hatchery releases. If few adults are forecasted to return to a target stream, hatchery adult releases may be reduced to zero. This strategy creates a “safety-net,” so that hatchery broodstock genetic material is not lost if no natural mates return.

In this case, broodstock would be spawned in the hatchery. Some of the spawn would be used to conduct gamete evaluations; some would be cryopreserved for eventual spawn crossing to ensure the continued existence of a spawning cohort. Most would be immediately spawned-crossed. Offspring of these spawn crosses would be outplanted at the eyed-egg stage to target streams. Once outplanted, the offspring incubate in hatchboxes, release volitionally into the wild, and rear naturally.

Spawning: For hatchery spawning, the genetic make-up of individual fish would be identified. A dissimilarity **spawning matrix** would be used to maintain genetic variability. Using individual genetic identities, the matrix would prioritize specific crosses by **genotype** and **haplotype**. Hatchery spawning also includes protocols for bridged-generation breeding, e.g., 3-year olds mated with 4-year olds, 5-year-olds mated with 4-year-olds, etc.

Transporting: Eyed-eggs are transferred from the Eagle Fish Hatchery to field outplanting sites in perforated shipping tubes. Tubes are wrapped in water-saturated cheesecloth and packed in small, insulated coolers. Ice chips are added to provide proper temperature maintenance. Prior to loading hatchery incubators, eggs are disinfected in 100 parts per million iodophore for 30 minutes. Eggs are transported in standard pickup trucks.

Incubation: A single incubation system, or a combination of instream and streamside incubation systems, may be employed at any IDFG Program site, depending on the recommendation of the TOC.

Whitlock-Vibert streamside hatchboxes are small baffled boxes nested in a 78-centimeter (cm) x 78-cm x 1.68-m (2.6-foot x 2.6-foot x 5.6-foot) commercially available, top-loading freezer unit with its door removed. Units are located next to a water source (usually a spring). Water from the spring is gravity fed via polyvinyl-chloride pipe into the larger unit and over the eggs, then routed back to the spring channel.

Each freezer has a capacity of approximately 100,000 eggs. The number of eggs outplanted per year has been approximately 10,000 or less per site (IDFG 1999, 2000), suggesting that one freezer per site would accommodate eyed-egg outplanting. Following fry swim up, juveniles volitionally emigrate via a standing overflow pipe into the spring channel, and eventually into the stream reach. Very little site preparation is required. The Whitlock-Vibert streamside system—if used—would be used at sites with road access, since they require the heavy freezer unit.

Jordan-Scotty hatchboxes would be carried into the remote sites. Instream Jordan-Scotty hatchboxes are approximately 50 cm x 5 cm (20 inches x 20 inches). They are anchored by rebar to a depth of 360 cm to 1,080 cm (1 to 3 feet) in box-sized depressions. These depressions are excavated by IDFG Program personnel in suitable gravel substrate in the midline of the streambed. Eggs are housed in individual spaces on a rack, and there are several racks per box. Streamflow through the hatchboxes would be a minimum of 1 cubic foot per second (cfs) to 3 cfs.

Outplanting Locations: Eyed-egg production from ***Lemhi River*** spawn crosses would be transferred to a site adjacent to Hayden Creek, a tributary to the Lemhi River. The incubation site is located approximately 7 km (4.3 miles) upstream of the confluence of Hayden Creek and the Lemhi River, near the Hayden Creek Hatchery site.

Eyed-egg production from ***West Fork Yankee Fork*** spawn crosses would be transferred to a site located approximately 3 km (1.9 miles) upstream of its confluence with the mainstem Yankee Fork.

Egg production from ***East Fork Salmon River*** spawn crosses would be transferred to a site approximately 31 km (19 miles) upstream of the confluence of the East Fork Salmon River and the mainstem Salmon River.

Outplanting locations could change in the future, based on results achieved at the proposed locations.

2.4. PARR COLLECTION ALTERNATIVE

As an alternative to collecting Salmon River spring/summer chinook salmon broodstock at the eyed-egg stage, the IDFG Program proposes to collect parr. NMFS Section 10 Permit FR 43230 permits the IDFG Program to collect a maximum of 200 parr for broodstock per target stream, or a maximum of 25 percent of the parr population per target stream.

Under this alternative, parr would be collected in the fall over a broad range of each stream using rotary screw traps (EG Solutions, Corvallis, Oregon) and beach seines[8]. When collecting parr, seine crews work cooperatively with snorkel crews. Following location of parr, seine crew personnel would position the seine downstream of the targeted fish. Non-target species of concern (steelhead and bull trout) captured during efforts to collect juvenile chinook salmon would be released unharmed.

Collected parr would be temporarily held in streamside live boxes. Within a few hours of collection, parr would be transported to Sawtooth Fish Hatchery for initial holding. All rearing and release measures for this alternative are identical to the Proposed Alternative.

2.5. ALTERNATIVE ADULT RELEASE SITE (BIG SPRINGS CREEK)

As an alternative to releasing Lemhi River hatchery adults to Bear Valley Creek, the IDFG Program proposes releasing them at Big Springs Creek. In the past, seasonal water withdrawals from Bear Valley Creek have dewatered sections of the stream, which has led to a wider concern for water quantity at this site. While these withdrawals have been halted, IDFG Program managers believe that Big Springs Creek provides more reliable water quantity.

A weir would segregate sample fish in the upper section of the stream. A trap box situated midstream in the weir would be checked daily, and resident and anadromous fish passed upstream and downstream.

All other IDFG Program measures and protocols for this alternative would be identical to the Proposed Action.

2.6. NO ACTION ALTERNATIVE

Under the No Action Alternative, BPA would not fund ongoing program activities. Activities could proceed under a different funding source. However, no other funding sources have been identified.

[8] Rotary screw traps are passive capture devices generally positioned in the midline of the streambed. Streamflow rotates the trap drum, which in turn funnels fish safely to a live well for temporary holding.

2.7. COMPARATIVE RESPONSE OF ALTERNATIVES TO DECISION FACTORS

The following table compares the responses of the alternatives to required decision factors *(see also Section 1.3: Purposes (Decision Factors)).*

Table 1: Responses of Alternatives to Decision Factors

Decision Factor	Proposed Action	Parr Collection Alternative	Alternative Adult Release Site (Big Springs Creek)	No Action
Technical Performance The alternative : 1. is consistent with the Council's 1987 Fish and Wildlife IDFG Program, and 1995 IDFG Program Amendments; 2. complements activities of fish and wildlife agencies and appropriate tribes; 3. is consistent with the legal rights of the appropriate tribes in the region; 4. develops and transfers information and technology.	1. Mitigates in a manner consistent with the Council's Fish and Wildlife Plan, and NMFS' Draft Recovery Plan for Snake River Salmon. Consistent with Council's Measure 7.3B for anadromous fish, and consistent with Task 4.1b of the Recovery Plan, as well as with the Biological Opinion for hatchery operations; 2. Complements other activities *(see 1.5: Relationship to Other Projects)*; 3. Is Consistent with legal rights of tribes; 4. Develops and transfers technology.	Same as the Proposed Action for all decision factors.	Same as the Proposed Action for all decision factors.	1. Would not mitigate for anadromous fish losses; 2. Bears no relationship with other recovery activities; 3. Neither consistent nor inconsistent. (BPA has no affirmative legal responsibility to the tribes to fund any particular recovery project); 4. Would not develop or transfer information and technology.

Table 1 continued

Decision Factor	Proposed Action	Parr Collection Alternative	Alternative Adult Release Site (Big Springs Creek)	No Action
Economic Performance The alternative is administratively efficient and cost-effective.	Meets the biological objectives with reasonable cost. Proposed Action may increase costs over Parr Collection Alternative, reflecting increased cost of incubation and rearing from eyed eggs.	Meets the biological objectives with reasonable cost. Cost associated with rearing captive broodstock from eyed egg would be absent. However, this could be offset by costs associated with rearing broodstock from parr (e.g., cost of enhanced disease control, etc.).	Same as the Proposed Action for all decision factors.	No cost or administrative impacts.
Environmental Performance The alternative: 1. avoids or minimizes adverse environmental impacts; 2. has the best potential to achieve biological objectives, including: • supplementation of wild spawning population; • preservation of unique genetic heritage of target population.	1. Proposed Action should have minimal impacts on human and/or environmental resources; 2. Proposed Action, if successful, would accomplish the biological objectives.	Alternative minimizes adverse environmental impacts and accomplishes biological objectives. However, assumed lower juvenile-to-adult survival ratio for hatchery parr may reduce IDFG Program effectiveness relative to broodstock collected as eyed eggs.	Same as the Proposed Action.	1. Has no impact on environmental resources; 2. By not supplementing natural populations, no action would not slow or stop trend toward extirpation.

3. AFFECTED ENVIRONMENT

This chapter describes the existing resources in the project areas, presenting baseline conditions for analysis of the alternatives' impacts to them.

An introduction opens the chapter by listing the resources that will be analyzed for impacts, as well as resources that will not be analyzed. For those resources not analyzed, brief reasons are given as to why no impacts are expected. The introduction then goes on to describe environments that interrelate with IDFG Program measures, while not necessarily relating on the level of impact analysis (general descriptions of project areas, hatcheries, etc.). Affected environments follow the introduction.

3.1. INTRODUCTION

Of all these resources that could possibly be affected—both human and environmental—some clearly will be affected, and some just as clearly will not be affected. Only those resources affected by the alternatives are described in this chapter. They will be analyzed for impacts in the following chapter.

3.1.1. Resources Included and Excluded from the Analysis

Table 2: Resources Analyzed and Not Analyzed in the EA

Resource	Analyzed	Not Analyzed	Reasons
Biological	• ESA-listed spring/summer chinook salmon • ESA-listed summer steelhead • ESA-listed bull trout	1. Other anadromous species 2. Other Threatened and Endangered plant/fish/wildlife species 3. Resident fish 4. Wildlife	1. No other anadromous species are in the project areas. 2. Section 7 consultation identifies the bald eagle (*Haliaeetus leucocephalus*) as endangered (50 CFR 17.11) and present in the affected area. Low-impact, short-term IDFG Program measures would create very minor disturbance to this species' habitat. 3. IDFG Program activities in project areas are confined to developed roads and/or maintained trails. Work periods are short term, and installed equipment

Resource	Analyzed	Not Analyzed	Reasons
			is temporary. There would be only minor, temporary disturbance to resident fish and/or wildlife.
Physical/Environmental	• Floodplains and wetlands • Water quantity/quality • Visual quality	1. Soils 2. Air quality	IDFG Program activities in project areas are low impact and short term, and would not affect soils or air quality.
Human	• Cultural and historic resources • Social and economic *(cumulative impacts only; see Reasons, Human, #1)*	1. Land use 2. Social and economic	1. Small-scale project work would have no widespread, deep, or lasting short-term impact on local social or economic patterns. 2. Brief IDFG Program work periods and temporary installed equipment would not disturb land-use patterns on public or private lands.

3.1.2. IDFG Project Areas

The Salmon River is a major tributary to the Snake River, watering central Idaho. The East Fork Salmon River, the West Fork Yankee Fork, and the Lemhi River are tributary to the Salmon River. These rivers compose the project area for the proposed IDFG Program *(see Figures 1-1, 1-2, and 1-3, following page 4).*

The East Fork Salmon River is located 552 river kilometers (RK) (345 river miles [RM]) upstream from the mouth of the Salmon River, which has its confluence with the East Fork Salmon River near the town of Clayton. The East Fork Salmon River drains granitic parent material, and is generally less productive than the Lemhi River system.

The IDFG once operated a velocity barrier weir on the East Fork Salmon River (it has not been operated in recent years). The study area ranges from the velocity barrier weir site upstream to the headwaters of the East Fork Salmon River.

The West Fork Yankee Fork Salmon River is located 591 RK (369 RM) upstream from the mouth of the Salmon River. The confluence of the West Fork Yankee Fork and Yankee Fork is located 11 RK (6.8 RM) upstream of the mouth of the Yankee Fork near the one-time mining community of Bonanza. The West Fork Yankee Fork drains granitic parent material adjacent to the Frank Church Wilderness. The majority of chinook salmon spawning occurs between the tributaries of Lightening and Cabin Creeks.

The Lemhi River confluence with the Salmon River is located 416 RK (260 RM) upstream from the mouth of the Salmon River near the town of Salmon. The mouth of Hayden Creek is located approximately 32 RK (20 RM) upstream from the mouth of the Lemhi River. The confluence of Bear Valley Creek is an additional 12 RK (7.5 RM) upstream on Hayden Creek. The Lemhi River drains productive basaltic parent material resulting in rapid fish growth. The primary study area for evaluations of captive release spawning is in ***Bear Valley Creek*** where the fish would be restricted to a meandering meadow of approximately 2.5 RK (1.5 RM) in length.

Alternative adult release site: Big Springs Creek: ***Big Springs Creek*** originates from a series of springs a short distance north of Leadore. It flows north for 4.8 to 8 km (3 to 5 miles), paralleling the Lemhi River. Geophysically and topographically, the area resembles the Lemhi River.

3.1.3. Hatchery Facilities

IDFG Program managers would use three existing artificial propagation and rearing facilities. The Sawtooth Fish Hatchery located on the Salmon River in the Stanley Basin, Idaho, would provide facilities for initial holding of eyed eggs (or parr). Eyed eggs or parr would then be transferred for freshwater rearing at Eagle Fish Hatchery, near Boise, Idaho (approximately 20 percent of the sample), or to the NMFS Manchester Marine Experimental Station (Puget Sound, Washington) for saltwater rearing (approximately 80 percent of the sample).

3.1.4. In-stream Fish Species Profile

Anadromous fish include natural and hatchery-produced spring/summer chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*).

Resident fish include bull trout (*Salvelinus confluentus*), cutthroat trout (*O. clarki*), northern squawfish (*Ptychocheilus oregonensis*), redside shiner (*Richardsonius balteatus*), sculpin (*Cottus spp*.), dace (*Rhinichthys spp*.), suckers (*Catostomus spp*.), rainbow trout (*O. mykiss*), mountain whitefish (*Prosopium williamsoni*), and brook trout (*S. fontinalis*).

3.2. ANADROMOUS SALMONIDS

3.2.1. Salmon River Spring/Summer Chinook Salmon (*O. tshawytscha*)

The Salmon River is the single most important spring/summer chinook salmon spawning stream in the Snake River Basin (Mallet 1974). Historically, 50 percent of Idaho’s summer chinook salmon redds were identified in the Salmon River, and currently, 28 of the 38 local spawning populations in the Snake River ESU exist in the Salmon River drainage.

Important Salmon River spawning areas are located over 1,440 km (900 miles) inland, typically at elevations around 1,212 meters (4,000 feet) above sea level. Few chinook salmon within the entire range of the species spawn farther from the ocean, and none spawn at higher elevations. Most spring/summer chinook salmon enter individual subbasins from May through September. Hatchlings emerge from the spawning gravels from June through February (Perry and Bjornn 1991). Typically, after rearing in their nursery streams for about one year, smolts begin migrating seaward in April and May (Bugert et al. 1990; Cannamela 1992). After reaching the mouth of the Columbia River, spring/summer chinook salmon probably inhabit nearshore areas before beginning their northeast Pacific Ocean migration, which lasts 2 to 3 years.

3.2.2. Snake River Basin Steelhead (*O. mykiss*)

Of two identified races of steelhead (summer steelhead and winter steelhead), only summer steelhead inhabit the Snake River Basin. Two distinct stocks of summer steelhead are identified as A-run and B-run steelhead. A-run and B-run are defined based on timing of their respective adult migrations, ocean age, and size at maturity. Four phases of **life history** characterize all races and stocks of steelhead: freshwater spawning and rearing; juvenile migration to the ocean; ocean residence; and adult upriver migration.

Snake River Basin steelhead enter fresh water from June to October and spawn in the following spring from March to May. Summer steelhead in the Snake River Basin typically spawn high in the upper mainstems of the larger rivers and in small tributaries. Steelhead will spawn in smaller and higher gradient tributaries than chinook generally choose. Also, as spring spawners, they spawn when streamflows are generally higher and smaller streams are more accessible (NMFS 1999).

A-run females lay an average of 3,500 eggs in small to medium gravel. After emerging from the redds in April to June, juveniles remain in streams and rivers. Juvenile steelhead have a variety of migration patterns that vary with local conditions. Control mechanisms range from mostly genetic to mostly environmental (Behnke 1992). Following 1 to 2 years’ rearing instream, A-run steelhead migrate to the ocean during March to June (Bell 1986). A-run steelhead generally remain in the ocean 1 year before returning to spawn (IDFG 1994). They are a smaller, earlier-returning stock than B-run steelhead, which generally return following 2 years.

A-run steelhead are found in all study areas and are the species of concern due to possible species interactions with target spring/summer chinook populations. The East Fork Salmon River also has a small population of B-run steelhead, which was introduced several years ago and is now established. Snake River and Upper and Lower Columbia Rivers steelhead populations were listed as threatened by NMFS on August 18, 1997 (62 FR 43937).

3.2.3. Snake River Basin Bull Trout (*Salvelinus confluentus*)

Bull trout spawn from late August through late September, typically at elevations of around 1,818 meters (6,000 feet). Hatching may occur in winter or early spring, but

alevins may stay in the gravel for an extended period after yolk absorption (United States Fish and Wildlife Service [USFWS] 1998). Juvenile fish rear from 1 to 4 years before migrating to a river where they mature. Resident and migratory forms are sometimes found together, and individual bull trout may give rise to offspring exhibiting either resident or migratory behavior.

The USFWS designated Columbia River distinct population segments of bull trout as threatened, effective July 10, 1998. No critical habitat has been designated for this species (USFWS 1998). All project areas, including the adult release alternative (Big Springs Creek), contain bull trout.

3.3. FLOODPLAINS AND WETLANDS

The East Fork Salmon River and the West Fork Yankee Fork Salmon River are both free-flowing streams transitioning from mountain foothills to river bottom in the project areas. Upper elevations are bounded by steep-sided canyons, with streamside vegetation characterized by evergreen. Lower elevations flatten out, presenting willow-type streamside vegetation, with seasonal wetlands within reach of the floodplain.

The Bear Valley Creek tributary of the Lemhi River was an historic salmon and steelhead spawning area. Sections of the stream on reduced gradients are riverbottom-like with willow-type riparian zones. Large beaver-created wetlands were historically present in some stretches. The beaver were trapped out in the late 1970s, leading to degradation of the wetlands (Bruce Smith, biologist, USFS, Salmon-Challis National Forest, personal communication, May 31, 2000).

The alternative adult release site at Big Springs Creek originates just north of the town of Leadore, within the Lemhi Valley. The Lemhi Valley is relatively broad and flat at this point. Big Springs Creek is bounded by agricultural areas. There are seasonal wetlands within the alluvial plain. Due to cattle grazing, riparian vegetation is sparse downstream.

3.4. WATER QUALITY AND QUANTITY

Water quality within all project areas is typically pristine in the higher elevations. Within alluvial plains, water quality is degraded by agriculture and grazing, which create some sedimentation. Water quantity is adequate at all sites, although irrigation water withdrawals at Bear Valley Creek have, in the past, dewatered parts of the stream. These withdrawals have ceased.

3.5. VISUAL QUALITY

Visually, floodplains present open vistas containing either cultivated areas on private lands or alluvial plains and associated vegetation on USFS-owned and -managed land. At the higher elevations, streams are free flowing through foothills transitioning to pristine, forested canyons. Visual Quality Standards on USFS-managed lands are “partial retention,” meaning that foreground views of project areas should be preserved.

3.6. CULTURAL AND HISTORIC RESOURCES

The Salmon-Challis National Forest, parts of which contain project areas, is in the process of being surveyed for cultural and historic resources. The East Fork Salmon River and West Fork Yankee Fork Salmon River likely contain prehistoric camps and fishing sites, as well as historic mining sites.

Traditional prehistoric fishing sites are known to exist along the Bear Valley Creek tributary to the Lemhi River, with prehistoric campsites on the terraces above the river. Historic USFS trails follow the creek along each bank (Steve Matz, archeologist, USFS, Salmon-Challis National Forest, personal communication, May 31, 2000).

4. ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

This chapter discusses the potential impacts to affected environments from the alternatives. Sections of the chapter are organized by affected environments, i.e., ESA-listed Anadromous Fish; Floodplains and Wetlands; Water Quantity and Quality; Visual Quality; and Cultural Resources. The chapter also describes impacts from the No Action Alternative, and cumulative impacts from the alternatives.

4.1. SUMMARY OF POTENTIAL IMPACTS FROM THE ALTERNATIVES

Table 3: Summary Table - Comparison of Potential Impacts

Resource	Existing Conditions	Impacts of Proposed Action	Impacts of Alternative One: Parr Collection	Impacts of Alternative Two: Big Springs Creek Adult Release	Impacts of No Action Alternative
Anadromous Fish 1. Spring/summer chinook salmon 2. Summer steelhead 3. Bull Trout	1. Listed. High-priority local populations in project areas. 2. Listed. Present in project areas. 3. Listed. Present in project areas.	1. IDFG Program activities would remove broodstock from local populations. If the IDFG Program works, it will return more sexually mature adults than it removes, having a net positive impact on at-risk populations. If the IDFG Program does not work, it could hasten extirpation.	1. Overall, this alternative would have a net positive impact, should the IDFG Program work *(see previous column).* If not, could hasten extirpation of target populations. This alternative may impair overall effectiveness of	Same as the Proposed Action for all anadromous species.	1. No action would most likely result -in– although not cause– extirpation of target spring/summer chinook salmon local populations. 2. No impacts. 3. No impacts.

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Resource	Existing Conditions	Impacts of Proposed Action	Impacts of Alternative One: Parr Collection	Impacts of Alternative Two: Big Springs Creek Adult Release	Impacts of No Action Alternative
		Assuming the IDFG Program works, increased outplanted adults would likely improve genetic variability. Low numbers of hatchbox releases are not likely to create any density-dependent impacts (competition, predation, etc.) on natural juveniles, since stream carrying capacities are underutilized. Domestication effects are likely to have slight to nonexistent impacts on genetic variability/fitness of naturally rearing cohort. 2. Possibility of temporary, short-term impacts from collection activities. 3. Possibility of temporary, short-term impacts from collection activities.	the IDFG Program, should broodstock collected as parr survive at lower rates than those collected as eyed eggs (due to disease), or should age-to-size anomalies of collected parr broodstock impede their ability to compete for mates. 2. Same as Proposed Action. 3. Same as Proposed Action.		

Table 3 continued

Resource	**Existing Conditions**	**Impacts of Proposed Action**	**Impacts of Alternative One: Parr Collection**	**Impacts of Alternative Two: Big Springs Creek Adult Release**	**Impacts of No Action Alternative**
Floodplains and Wetlands	Seasonal wetlands within project areas.	All access is via road or developed trails. No ground disturbances and/or erection of structures. No significant impacts are expected. Placement of streamside hatchboxes may have temporary (Nov. through Apr.), short-term impacts to streamside vegetation.	Same as the Proposed Action.	Same as the Proposed Action.	The No Action Alternative would have no impact one way or the other on floodplains and wetlands.
Water	Water quality is generally pristine in the project areas. Quantity is determined by streamflow, and is sufficient to IDFG Program needs.	Temporary, short-term turbidity from eyed-egg collection, placement of hatchboxes, and erection of enclosures. There would be no consumptive use of water, or water withdrawal. No significant impacts to water quantity.	Same as the Proposed Action.	Same as the Proposed Action.	The No Action Alternative would avoid the temporary short-term impacts to water quality from the alternatives.

Resource	Existing Conditions	Impacts of Proposed Action	Impacts of Alternative One: Parr Collection	Impacts of Alternative Two: Big Springs Creek Adult Release	Impacts of No Action Alternative
Visual Quality	Farmland on private lands. Public lands are undeveloped floodplains, transitioning to foothills and mountains.	Streamside egg boxes are temporary during low traffic months (Nov. through Apr.). Enclosures are temporary and non-intrusive. No expected significant impacts.	Operation of screw traps and weirs would be short term and temporary. No significant impacts to visual quality.	Same as the Proposed Action.	The No Action Alternative would avoid the temporary short-term impacts to visual quality from the alternatives.
Cultural and Historic Resources	Likely prehistoric and historic resources within project areas. Salmon are an important cultural resource for tribes.	All access is via road and/or developed trail. No ground disturbances and/or erection of structures. No impacts are expected to cultural resources. Recovery of salmon would restore an important cultural resource to the tribes.	Same as the Proposed Action.	Same as the Proposed Action.	Rather widespread cultural resources are thought to exist within the project areas. The No Action Alternative would avoid impacts to these cultural resources that might occur, should IDFG Program activities inadvertently disturb them. If the No Action Alternative leads to extirpation, ceremonial and spiritual use of salmon by the tribes would be negatively impacted.

4.2. IMPACTS FROM THE PROPOSED ACTION

4.2.1. Direct Impacts to Anadromous Salmonids

4.2.1.1 Broodstock (Eyed-Egg) Collection

Impacts to Migrating Juveniles and Adults: IDFG Program managers do not expect long-term impacts to any listed anadromous species from eyed-egg collections. Wading, snorkeling, and collection activities would take no longer than 3 days per target stream (usually less). Later-returning spring/summer chinook salmon could potentially encounter collection activities. Effects from the activity could induce confusion and stress that might lead to delayed and/or unsuccessful spawning. However, managers assume that later-returning chinook salmon spawn below the areas of earlier-returning fish and would not be affected. In any case, activities are limited and short term, and would be temporarily postponed in the presence of returning adults.

Steelhead young of the year rear at higher elevations during collection, and no impacts are expected. Migrating pre-smolts would not be significantly impacted by short-term, low-impact collection activities.

Approximately 600 meters (1,800 feet) elevation gradient separates bull trout spawning areas from spring/summer chinook spawning areas. Adult bull trout would likely be spawning above egg-collection sites at the time of collection. Fry do not emerge typically until December, well after collection activities. Rearing bull trout usually spend from 1 to 4 years at higher elevations before emigrating for final rearing; thus, rearing bull trout migrating through project areas would likely be developed enough to withstand temporary turbidity during collection. No impacts are expected.

Direct Impacts to Spring/Summer Eggs/Juveniles: Should collection create short-term (within the incubation period) mortalities to the eggs themselves, it would represent a reduction in potential natural escapement. Uncertainty surrounds potential impacts to eggs from collection and transport. Uncertainty also surrounds potential impacts from these activities to eggs left behind in the redds. Loss of hatchery or **natural production** potential due to egg loss, however, would likely be offset by increased hatchery egg-to-adult survival (IDFG 1999, 2000).

While IDFG Program managers are uncertain as to the magnitude of direct mortality to collected and uncollected eggs from snorkeling, wading, and venturi effects, eggs are highly resistant to mortality at the eyed stage. Hatcheries routinely shock, sort, count, and transport eggs without inducing high mortalities. Eyed eggs are much easier to transport than juveniles, and transportation of eyed eggs is a commonly accepted hatchery practice. IDFG Program managers expect only slight impacts to collected and uncollected eggs. However, managers recognize the need for further study, which is an objective of IDFG Program monitoring and evaluation.

4.2.1.2 Rearing

Domestication Effects: Artificial-rearing protocols and procedures may create characteristics in hatchery fish that are different from those in natural fish, such as different coloring, size-to-age ratios, etc. The name that has been given to these characteristics is **domestication effects**. Exactly how and to what extent domestication effects impact the fishes' suitability for life in the wild is uncertain.

Theorized domestication effects are too numerous to list. A few examples might be: hatchery fish are automatically fed, and may be less suited to seeking out food in the wild; hatchery fish are reared in high densities, and may have age-to-size ratios that differ from their wild cohort; hatchery fish may differ in coloration and/or shape from wild fish because of dietary regimes; and fish reared in protected environments may be unsuccessful recognizing and avoiding predators.

While the domestication effects are incompletely understood, the policy of NMFS (1999) and the Council (2000) is that fish produced by artificial rearing should morphologically, physiologically, and behaviorally resemble naturally rearing fish to the extent possible. This has led to a number of experimental artificial rearing protocols to produce such fish. Like domestication effects themselves, these protocols are too numerous to list.

The IDFG Program expects impacts to broodstock from domestication effects, to the extent that they exist and are understood. IDFG Program monitoring and evaluation data has already led to adapted protocols, including introducing feeding regimens that produce more natural coloration, and rearing a higher percentage of broodstock in saltwater to improve fin quality. The IDFG Program monitors and evaluates hatchery broodstock for domestication effects, and would continue to adapt IDFG Program protocols as effects become apparent.

The duration of hatchery rearing may multiply the impacts of domestication, although the relation of duration is poorly understood. While clearly some effects are mitigated by shortened hatchery rearing, other effects seem duration-neutral. In the case of age-to-size ratios, ratios seem to improve in broodstock raised from eyed eggs rather than parr, because hatchlings tend to begin feeding immediately, while collected parr do not.

Preliminary IDFG Program data (IDFG 1999, 2000) indicate that outplanted adults are building and defending redds and otherwise exhibiting behaviors adapted to the wild, thus fulfilling production objectives.

<u>Disease</u>: Both hatcheries and streams contain disease-causing **pathogens**. High rearing densities associated with artificial rearing promote contagion (spread) of these pathogens. At the same time, hatchery fish stressed by rearing protocols may be more prone to infection.

Mostly, this is considered to be a problem when infected hatchery releases transmit pathogens into the natural environment. IDFG Program broodstock, on the other hand, are collected from the natural environments and bring pathogens into the hatchery environment. Disease brought into the hatchery by IDFG Program parr has reduced IDFG Program effectiveness (IDFG 1999, 2000*)*. IDFG Program managers hypothesize that rearing broodstock from eyed eggs rather than parr will reduce these impacts.

Since all IDFG Program broodstock are required to be disease-free, there should be little or no disease transmission impacts back to natural habitats. In any case, little evidence suggests that diseases are routinely transmitted from hatchery to natural fish (Steward and Bjornn 1990).

Chapman et al (1994) concluded that disease transmission from hatchery to wild populations is probably not a major factor negatively affecting wild steelhead in the Columbia River Basin. The same is assumed to be true for bull trout. No impacts from disease transmission to natural anadromous salmonids are expected.

4.2.1.3 Adult Enclosures

The IDFG Program would construct temporary, short-term enclosures in early August to prevent IDFG Program adults from straying outside their stream of origin. These would remain in place throughout the spawning season (end of September). IDFG Program managers expect no impacts to listed anadromous species from the construction or operation of enclosures. At the time of construction, vulnerable young-of-the-year steelhead and/or bull trout inhabit higher elevations. Returning adult spring/summer chinook salmon, and rearing steelhead and/or bull trout juveniles encountering construction may become slightly confused for the short term.

All enclosures are manned daily by IDFG Program personnel, and checked frequently. Any fish inadvertently caught in weirs or traps (Bear Valley Creek) would be removed and released.

4.2.2. Indirect Impacts to Anadromous Salmonids

Some actual and/or theorized effects from artificial rearing relate to the impacts to natural population from interactions with hatchery releases.

4.2.2.1 Delayed Impacts from Eyed-Egg Collection

The stress of collection on collected eggs and eggs left in the redds could indirectly affect long-term survival of individual fish. IDFG Program managers are unaware of any studies analyzing long-term indirect impacts of eyed-egg collections to spring/summer chinook salmon. Developing such information is an IDFG Program monitoring and evaluation objective.

4.2.2.2 Predation

Released hatchery adults are not in a feeding mode, and should not pose a threat to any anadromous species.

The small size of the release is not expected to draw more large predators. However, this is a continued area of study. If true, as theory has it, that hatchery rearing reduces predator recognition and avoidance, then the hatchery fish would be at increased risk to predators. To date, IDFG Program personnel have observed spawned-out carcasses bearing evidence of predation, although this may have occurred post-mortem.

Increased natural and/or hatchbox juvenile outmigration sometimes produces increased **inter-specific** and **intra-specific** predation. Ultimately, the trend toward increased predation of any kind is density-dependent. All project streams are **underseeded**, however, and natural production gains would not change that in the short term. Hatchbox juveniles volitionally release, and so would not present a mass to predatory birds, fish, pinnipeds, etc.

Larger spring/summer chinook salmon smolts may eat smaller fish, but recent information indicates that fish are an insignificant fraction of the food consumed by migrating chinook salmon in the Snake and Columbia Rivers (Muir and Coley 1995). The Species Interaction Work Group (SIWG 1984) reported that there is an unknown risk of predation by artificially reared chinook on wild steelhead juveniles where they interact in freshwater migrational areas.

4.2.2.3 Competition

Released hatchery adults are expected to compete with their natural cohort by defending redds and competing for mates. This is normal and desirable behavior since, presumably, the best-adapted fish should attract mates. No other types of competition (for food) are expected, since pre-spawn adults are not in a feeding mode. The same is true for competition with listed steelhead and bull trout.

Large numbers of artificially reared fish are known to disrupt spawning behaviors in naturally reared fish. However, IDFG Program hatchery release sizes are indexed to forecasted numbers of returning adults, and would be reduced (to zero, if necessary) if few returning adults were forecasted. While this is not expected to be a problem, such impacts are under IDFG Program study.

Increased natural production and/or hatchbox juvenile outmigration: Increased natural production from IDFG Program measures should not increase competition with existing anadromous populations, since such increased production would be small in the short term. Competition correlates to the **carrying capacity** of the streams, which are severely underseeded.

Once outplanted eyed eggs hatch and swim up as fry, direct competition for food and space may occur. Impacts from competition are assumed to be greatest in the spawning and nursery areas and at the points of highest density (release areas), and to diminish as hatchery smolts disperse (USFWS 1994). Competition continues to occur at some unknown—but probably lower—level as smolts move downstream through the migration corridor. Again, however, since the carrying capacity of all target streams is severely underutilized, impacts to existing anadromous species are expected to be minimal.

Juvenile salmon have been shown to behaviorally dominate juvenile steelhead. However, where inter-specific populations have evolved **sympatrically**, chinook and steelhead have evolved slight differences in habitat use patterns that minimize their interactions. Segregation of species appears to be both actively maintained and adaptive (Nilsson 1967). Juvenile spring/summer chinook salmon and bull trout are separated by elevation, and would not compete.

4.2.2.4 Genetic Diversity/Variability and Fitness

IDFG Program broodstock share the genetic make-up of the receiving population, since they were collected in the wild from that population. Therefore, the introduction of non-native **alleles** into the receiving population (introgression) would not factor into genetic diversity/variability and fitness. Nor would be the loss of unique alleles factor in, since the higher rate of hatchery egg-to-adult survival would presumably preserve a higher percentage of these unique alleles.

Domestication Selection Effects: Some individual genetic make-ups are theorized to produce traits in fish favored by the hatchery ("domestic") environment. For example, perhaps a combination of alleles determines or contributes to an age-to-size ratio that is small for a natural fish of the same age. This smaller hatchery fish might thrive within the higher rearing densities of the hatchery. This tendency of the hatchery environment to favor the survival of fish with beneficial **phenotypes** is called "domestication selection."

When (and if) these genotypic/phenotypic types survive in higher proportion to others because they are better adapted to the hatchery, this is "disproportionate survival" (of their genotype, relative to other genotypes in their population). When released—since they have survived disproportionately—they stand a better chance of passing their heritage on to the rest of the population. Future generations, being smaller, may then be less fit to compete at all life stages, leading to a depression in the population.

Whatever the extent that these theories prove true, IDFG Program managers assume that the hatchery environment, like all environments, selects for phenotypes/genotypes suited to survival within it. However, since approximately 80 percent of broodstock survive to outplanting—even if true that certain alleles produce domestic traits that are selected for—these genotypes would not likely be over-represented.

Inbreeding and outbreeding depression: The term "inbreeding" refers to breeding among members of a local **breeding unit**. The term "outbreeding" refers to breeding among members of different breeding units. Either of these conditions can be beneficial or deleterious to a population. In large and healthy populations, inbreeding sustains the unique genetic heritage of the population without necessarily compromising genetic diversity/variability; outbreeding increases genetic diversity/variability without compromising the unique heritage.

In declining populations, however, inbreeding can cause "depressions" (long-term reduction of population). Inbreeding can efficiently pass destructive genes or gene complexes within the small number of breeders. Outbreeding, meanwhile, may introduce destructive genes into a population too small for adaptive pressures to select them out over time. Impacts from inbreeding and outbreeding are dependent on population size, which in turn functions to modify duration and intensity of the introgression.

The objective is to increase the size of the spawning population, thus widening the gene pool. Therefore, inbreeding risks should be reduced by IDFG Program measures.

The major cause of outbreeding is straying: returning pre-spawn adults from one distinct breeding unit straying into the territory of another. Managers of the IDFG Program expect no impacts from outbreeding. While they have observed "wandering" among hatchery fish (wandering within their stream system where they encounter genetically similar receiving individuals), only one fish has been observed to “stray” outside its own watershed (IDFG 1999, 2000).

Hatchbox offspring: Hatchery spawning has the highest potential to produce a genetically divergent hatchery population, if spawning protocols are inadequate. The IDFG Program follows IHOT (1995) spawning protocols *(see Section 2.3)*. Collection of eyed eggs for use as broodstock should give managers enhanced control over gender ratios and family representation of broodstock, which would add to the effectiveness of the dissimilarity matrix when breeding surplus fish in-hatchery. Impacts are expected to genetic fitness/variability from in-hatchery spawning and outplanting in the same measure as from any prudently managed supplementation program.

4.2.3. Floodplains and Wetlands

Work crews would be passing on developed trails through floodplains and seasonal wetlands for egg collection, erection of in-stream enclosures, placement of egg boxes, and monitoring activities. No ground-disturbing activities would take place. No permanent structures would be erected on any floodplain or wetland. No impacts are expected to floodplains or wetlands from these activities.

Streamside units containing Whitlock-Vibert hatchboxes are heavy and large (commercially available freezers) and would impact early-emerging vegetation in relation to the size of the units. However, no more than one or two would be placed streamside. These units would be temporary, until swim up and volitional release of pre-smolts (June through February). Flooding is unusual during periods of operation. Impacts to small areas of early-emerging vegetation would be slight. No impacts are expected to floodplains.

4.2.4. Water Quality/Quantity

There would be no consumptive use of water or water withdrawal from project streams during egg collection, placement of enclosures for adult outplants, placement and/or operation of instream egg boxes, and/or monitoring and evaluation. Thus, there would be no impacts to water quantity.

All these activities, however, are likely to lead to short-term increased turbidity. No significant changes to water quality are expected from adult and/or hatchbox outplants, due to small size of the releases and the underutilized stream-carrying capacities. Positive impacts to the nutrient loads could be expected from spawned-out carcasses.

4.2.5. Visual Quality

Egg collection and adult release (construction and/or operation) would affect visual quality at all sites. These effects would be short term, temporary, and minor. Visual quality on private lands is already affected by land-use practices, such as agriculture and grazing, and would not be greatly compromised. Nor would activities and/or enclosures violate visual quality objectives on USFS-owned land (USFS objectives for affected areas are for “partial retention” of foreground areas).

4.2.6. Cultural and Historic Resources

Historic and prehistoric cultural resources are known to exist in project areas, although not all sites have been surveyed. No ground-disturbing activities would take place. No permanent structures would be erected. Therefore, no impacts are expected. Should any historic or prehistoric resources be observed, work would stop immediately and the Idaho State Historic Preservation Office would be contacted, as well as local tribal cultural resources officers.

4.3. IMPACTS OF THE ALTERNATIVES

Below, potential impacts from the Parr Collection Alternative, the Alternative Adult Release Site, and the No Action Alternative are presented. Cumulative effects are also discussed.

Other than for the activities specified below, action alternatives are identical with the Proposed Action. Thus, effects for such measures as hatchery spawning and eyed-egg outplanting can be found in the analysis of the Proposed Action.

4.3.1. Parr Collection Alternative

4.3.1.1 Anadromous Salmonids

The IDFG Program has used broodstock reared from parr since its inception in 1995. In terms of meeting the broad objective of increasing natural spawning opportunities, parr have succeeded. However, IDFG Program monitoring and evaluation indicates that hatchery parr may not survive at the rate of broodstock collected as eyed eggs. Particularly problematic is disease transmission among hatchery parr. Thus, while meeting objectives, parr are not thought to meet them as efficiently as eyed eggs. Therefore, IDFG Program managers believe that the Parr Collection Alternative is reasonable, but not preferable to the Proposed Action.

Direct Effects – Erection and Operation of Weirs and Traps: Erection and operation of weirs and traps could have a direct impact on anadromous salmonids in project streams. Juvenile spring/summer chinook salmon are outmigrating at this time, and steelhead fry have been observed on the fringes of work areas (IDFG 1999). Temporary, short-term activity might cause instream turbidity, which could lead to short-term confusion among migrating juvenile spring/summer chinook salmon, and/or juvenile steelhead. (Juvenile bull trout would likely be well above the work areas.) These short-term impacts to juvenile anadromous salmonids are expected to be minor.

Weirs and traps are continuously manned by IDFG Program personnel during operation, and checked several times a day. Non-target fish caught in them would be passed along. Slight impacts could result in delayed spawning.

Direct Effects - Disease and Fish Size: IDFG Program managers believe that broodstock raised from parr are susceptible to instream pathogens, which they bring into the hatchery from collection sites. Bacterial Kidney Disease (BKD – *Renibacterium salmoninarum*) has caused the loss of approximately 36 percent of the Broodyear (BY) 1996 West Fork Yankee Fork sample, for instance. Whirling disease

(*Myxobolus cerebralis*) has been present in 38 percent of rearing groups from four IDFG Program years, and *Salmincola californiensis* has been found in parr collected from the Lemhi River. No viral disease agents have been detected in IDFG Program fish.

Collected parr tend to begin feeding later than hatched fry, affecting their size. Artificial rearing programs that collect eggs (e.g., Washington Department of Fish and Wildlife [WDFW] Spring Chinook Captive Broodstock Program) routinely produce 3- to 4-kg (6.6- to 8.8-pound [lb]) fish at age three; 5- to 7-kg (11- to 15.4-lb) fish at age four; and 8- to 10-kg (17.6- to 22-lb) adults at age five. IDFG Program results have not achieved comparable sizes. Small age-to-size ratios could affect the ability of IDFG Program broodstock to compete for mates.

On the other hand, theory has it that longer rearing duration intensifies some domestication effects. Parr obviously spend less time in-hatchery than eyed eggs, which could give them an advantage over rearing from eyed eggs. However, the relationship between rearing duration and domestication intensity is not known and, as in the case of age-to-size ratios, may lessen the intensity of some effects. These issues are monitored and evaluated by the IDFG Program.

Indirect Effects - Genetic Fitness/Variability: Collecting free-swimming parr for broodstock rather than stationary eyed eggs makes proper selection more difficult. Two problems have presented themselves in past IDFG Program years: Over-representation of one gender or another; and uncontrolled family representation. Unequal representation of family groups could potentially reduce genetic fitness/variability within the hatchery cohort, although this is probably not a severe problem. Unequal gender representation (observed 60+ percent female over-representation [IDFG 2000]) becomes a problem if and when broodstock are spawned in the hatchery, leading to less than ideal 1:1 spawn crossing.

High losses from parr-transmitted disease could reduce IDFG Program releases, which in turn could contribute to inbreeding depression. No other issues of genetic fitness/variability present themselves, other than those discussed in Section 4.2.2.4. All other impacts would be the same as well.

4.3.2. Alternative Adult Release Site

Big Springs Creek is considered a reasonable, and perhaps a preferable, alternative to the Proposed Action Bear Valley Creek Release site. This is because Big Springs Creek provides *relatively* (as opposed to absolutely) more reliable water quantity. Now that planned water withdrawal from Bear Valley Creek during adult release periods has stopped, water quantity does not appear to be a problem. In either case, direct and indirect effects on anadromous salmon from this alternative would be same as the Proposed Action *(see Sections 4.2.1 and 4.2.2).*

Big Springs Creek topography, ecology, and human and environmental resource profiles resemble those of the Lemhi River. Direct effects to any resources from adult releases are expected to be the same as for the Proposed Action *(see Sections 4.2.3, 4.2.4, 4.2.5, and 4.2.6).*

4.3.3. No Action Alternative

If the No Action Alternative were selected, the current IDFG Program would most likely cease operation due to lack of funding. ESA-listed salmon would not be collected and would be allowed to spawn in the wild. Present target populations have an annual escapement of less than 20 fish. Since these numbers are below population critical thresholds, the risk of extirpation for these populations would be greater under the No Action Alternative. These impacts would reduce absolute numbers of the Snake River spring/summer chinook salmon ESU.

Within the populations themselves, genetic fitness/variability would remain at present levels until declining numbers began producing the effects of inbreeding. Critical genetic material may be lost to the ESU. This is uncertain, due to incomplete understanding of the overall genetic relationship between local populations and the ESU.

The cessation of the IDFG Program would reduce the opportunity for projects licensed by the Federal Energy Regulatory Commission to mitigate for lost salmonid production. Selection of the No Action Alternative could result in litigation by affected Northwest Indian tribes to ensure that the chinook salmon population is recovered and fishing rights are preserved.

Cessation of the IDFG Program would reduce current research on artificial rearing using captive broodstock techniques and protocols.

4.4. CUMULATIVE EFFECTS OF THE ALTERNATIVES

One objective of the IDFG Program is to increase spawning opportunities among spring/summer chinook salmon target populations by supplementing naturally reared adult returns with their hatchery-reared cohort. This objective has been met (IDFG 1999, 2000).

A second objective is to rear the hatchery cohort so that they mimic the natural cohort morphologically, physiologically, behaviorally, and genetically, which the IDFG Program hypothesizes would both maximize spawning success and produce fit fish. Since the hatchery-reared cohorts share gene pools with their natural-reared cohorts, and since they survive to sexual maturity in high proportions, they should genetically represent the populations. Whether or not hatchery rearing compromises spawning success is currently being monitored.

To the extent that the two objectives are met (and the underlying assumptions are correct), target populations could begin to recover. Increased offspring should increase genetic fitness/variability among the target populations. Increased natural escapement would add nutrients to streams, which would help reforge a critical link in ecosystem health.

Technology and data developed within the IDFG Program would be transferred to other programs, bringing similar benefits. In the long term, abundant anadromous species would produce economic benefits for local economies that depend on fish, fishing, tourism, and recreation for their income.

Should the IDFG Program hypotheses be incorrect, the numbers of eggs and parr removed from the natural environment would represent a net loss of broodstock. This would further endanger local populations on the brink of extirpation. This would hasten extirpation, without necessarily being its proximate cause. While healthy populations would seem on the face of it to contribute to the health of ESUs, determining the impact of the loss of these populations on the ESUs is uncertain.

6. CONSULTATION AND PERMIT REQUIREMENTS

6.1. PERMIT REQUIREMENTS

NATIONAL ENVIRONMENTAL POLICY ACT

This EA was prepared pursuant to NEPA (42 U.S.C. 4321 et. seq.) and the Council of Environmental Quality (CEQ) Implementing Regulations, which require Federal agencies to assess the impacts that their proposed actions may have on the environment. Based on information in the EA, BPA will determine whether the proposal significantly affects the quality of the human environment. If it does, an EIS is required. If BPA determines that the proposal would not have significant impacts, a FONSI would be prepared.

UNITED STATES FOREST SERVICE SPECIAL USE PERMIT

The USFS is required to issue Special Use Permits for activities on USFS land not specifically allowed under its Forest Management Plans. Application was made by the holder of the permit, James R. Lukens, IDFG Salmon Region (holder number 1000-09). Special Use Permit FS# 2700-4 was issued, and expires on December 31, 2002. Holder is authorized to use or occupy National Forest System lands on the Salmon-Challis National Forest, subject to the conditions set out in the permit.

THREATENED AND ENDANGERED SPECIES AND CRITICAL HABITAT

The Endangered Species Act of 1973, as amended, requires that Federal agencies ensure that their actions do not jeopardize threatened or endangered species and their critical habitats. It also gives review authority to USFWS and NMFS.

A Section 10 permit for direct take of juvenile chinook salmon from all program area streams for captive rearing has been issued by NMFS (1998). This would be updated to include the remaining actions described in this EA, including releasing adults. BPA and IDFG would ensure that all necessary consultations and permits are obtained prior to undertaking the actions proposed in this EA, and that any permit conditions are followed.

WETLANDS AND FLOODPLAINS PROTECTION

There would be no impacts from any ground-disturbing activities to either floodplains or wetlands at the site. All equipment for all activities is short term and temporary and would be removed following use.

STATE, AREAWIDE, AND LOCAL PLAN AND PROGRAM CONSISTENCY

There are no applicable state or local plans.

HERITAGE CONSERVATION

Potential effects of any future improvements and operations at the two hatcheries and marine laboratory would be negligible because all work would be done within the confines of the existing hatchery properties. No new property would be acquired, so land uses would not change. There will be no ground-disturbing activities and, therefore, cultural resources surveys would not be needed and no cultural resources of any kind would be disturbed.

PERMITS FOR DISCHARGES INTO WATERS OF THE UNITED STATES

A permit for discharge into waterways of the United States would not be required.

CLEAN WATER ACT

No activities from the Proposed Action would adversely affect water quality.

SAFE DRINKING WATER ACT

The proposed action would not affect a sole-source aquifer because work would be done within existing structures.

RESOURCE CONSERVATION AND RECOVERY ACT

No hazardous waste products would be used, discarded, or produced by this project.

FARMLAND PROTECTION POLICY ACT

The proposed project would not affect any prime, unique, or other important farmland as defined in the Farmland Protection Policy Act (7 U.S.C., 4201 et seq.).

RECREATION RESOURCES

The proposed action would not affect Wild and Scenic Rivers, National Trails, Wilderness Areas, National Parks, or other specially designated recreational areas.

THE EXECUTIVE ORDER ON ENVIRONMENTAL JUSTICE

The project would not adversely affect minority or disadvantaged groups—no adverse effects on any human groups or individuals are expected.

NOISE CONTROL ACT

The present use and operation of the facilities would not create noise problems.

GLOBAL WARMING

The project would not create conditions that would increase the potential for global warming.

COASTAL ZONE MANAGEMENT CONSISTENCY

The proposed project is not in a coastal zone.

PERMITS FOR STRUCTURES IN NAVIGABLE WATERS

The project would not involve construction, removal, or rehabilitation of any structures in navigable waters.

PERMITS FOR RIGHTS-OF-WAY ON PUBLIC LANDS

The proposed action requires no right-of-way on land managed by another Federal agency. See above, United States Forest Service Special Use Permit.

CLEAN AIR ACT

The proposed action would not cause air emissions. Vehicles used in the course of the project will be maintained to minimize emissions.

FEDERAL INSECTICIDE, FUNGICIDE AND RODENTICIDE ACT

No substances regulated by this Act would be used as part of the project.

TOXIC SUBSTANCES CONTROL ACT

No toxic substances would be used on this project.

ENERGY CONSERVATION AT FEDERAL FACILITIES

Energy conservation practices are not relevant to the proposed project or the alternative because the hatcheries and marine laboratory are not Federal facilities.

MIGRATORY BIRD TREATY ACT

The project would not intentionally take any MBTA-listed birds.

6.2. CONSULTING AGENCIES AND INTERESTED PARTIES

- National Marine Fisheries Service
- Nez Perce Tribe
- Shoshone-Bannock Tribe
- United States Fish and Wildlife Service
- United States Forest Service
- University of Idaho

GLOSSARY

Definitions are tailored to anadromous fish and the captive rearing program, and may have different meanings in different contexts.

alevin - The life stage of a fish at which the fish has hatched from egg, but remains attached to its egg sac.

alleles – Sites on individual genes composed of some variation of two amino acids. Taken together, these alleles make up the individual gene, which, taken together, encode the genetic heritage of the individual and determine gene-linked physiological, morphological, and behavioral traits.

anadromous (fish) – Species of fish that spend a part of their lifecycle in fresh water, and another part in salt water.

behavior (fish)/behavioral characteristics - Pertaining to behaviors of an individual fish or population of fish whose behaviors are adapted to a specific in-stream environment.

breeding unit – a term used to designate a subpopulation of fish that mate exclusively among themselves (unless straying occurs), and contain within the subpopulation 100 percent of the designated subpopulation's genetic material.

broodstock (wild/captive) - Fish capable of reproducing, either in the wild or in the hatchery.

broodyear (BY) - The year a group of fish spawns; the year of origin of a cohort.

captive rearing - Referring to a set of program techniques and scientific protocols with goals to remove juvenile wild fish from their stream of origin, rear them to sexually mature adults, and release them back to their stream of origin to breed.

carrying capacity - Given the topological and biological profile of a particular habitat, its capacity as related to its ability to provide support (provide food, cover, etc.) for a particular population of fish.

Council - The Northwest Power Planning Council. The Council was mandated under the Northwest Power Act to manage anadromous fish conservation and recovery and power distribution in the region. Funded by BPA.

cryopreservation - Pertaining to the freezing of biological material for preservation and storage.

culture (fish) - Pertaining to the artificial spawning and rearing of fish, usually in a hatchery, or the artificial management of any element of the life cycle of a fish.

demonstration program - A program recognized by authorizing and funding agencies as an experimental program designed to prove or disprove its own hypotheses. Such programs usually have limited goals and small samples, and are held to less rigorous conservation standards than a full-scale program.

domestication effects - Referring to morphological, physiological, and behavior changes that issue from hatchery rearing when the changes are selected by that environment. Such changes, if genetically based, are theorized to enter the gene pool of a wild fish population when the hatchery-reared fish are allowed to spawn with that wild population.

Endangered Species Act (ESA) - The Endangered Species Act of 1973 recognizes several levels of risk to species that are depressed due to human or natural actions. The ESA requires consultation among Federal agencies taking actions that may disturb the habitat of such species and the agencies with authority over different habitats.

escapement - Referring to adult fish that have survived to return to their place of origin and spawn.

Evolutionarily Significant Unit (ESU) - Refers to a population that's continued existence is crucial to the preservation of the larger species.

eyed egg - A fertilized egg (embryo) that has developed to the point where the eyes become readily visible.

fecundity - Refers to the numbers of eggs produced by an individual female of the species.

forecasted adult returns - The numbers of adult fish of a population predicted to return to their streams of origin to spawn, based on past returns, fertilization rates, escapement rates, and known ocean conditions.

gametes – The reproductive cells that unite with one another to form the cell that developed into a new individual.

genetic - Referring to the genes, or basic functional units of inheritance of a species.

genetic diversity/variability - All the genetic variation in an individual, population, or species.

genotype - Refers to the genetic material and its structure in the individual that expresses itself in the phenotype of that individual.

habitat - The physical/biological environment in which fish spend some or all of their life cycle, to which the fish are well adapted.

haplotype – The set of genetic determinants received from one parent.

hatchboxes - Boxes in which fertilized eggs are put prior to hatching. Hatchlings remain in the boxes as alevins. When the alevin loses its egg sac, it swims to the surface of the box and out as a fry. The boxes are designed to approximate natural conditions for hatching, such as allowing for water flow-through, etc.

hydroelectric (dams) - Referring to energy produced by a flow of fluid water through or around turbines; the turbines transform the energy from flow into electrical energy for generation and/or storage.

inter-specific/intra-specific - Among species and within a species.

life history - The physical appearance and/or social behavior of a population or individual of a species at each biologically differentiated phase of the life cycle.

listed threatened and endangered species/population/evolutionarily significant unit - A species listed through the Endangered Species Act as threatened, endangered, or of special concern.

metapopulation - The totality of subpopulations of a species in a region that can be considered genetically similar.

mitigate - Measures to reduce impacts from actions taken, including: 1) Not taking a certain action or parts of an action, 2) limiting the degree or magnitude of an action and its implementation, 3) repairing, rehabilitating, or restoring the affected environment, 4) preservation and maintenance operations during the life of the action, and/or 5) replacing or providing substitute resources or environments.

morphological - Refers to physical characteristics of an individual fish, such as coloration, size, shape, etc.

National Environmental Policy Act (NEPA) - The National Environmental Policy Act of 1969 requires the production of various levels of analysis for any Federal activity. Levels of analysis include Categorical Exclusions (CX), a short document that demonstrates that the action would not impact the environment in which the activity takes place; Environmental Assessments (EA), which demonstrate that, while there may be impacts, they will not be significant; and Environmental Impact Statements (EIS), which demonstrate that impacts are uncertain.

native population – A population of fish that has not been substantially impacted by genetic interactions with non-native populations, or by other factors that persist in all or part of its original range. In some cases, a native population may also exist outside of its original range (e.g., in a captive broodstock program).

natural spawning population - A species endemic to an area; species naturally reproducing in an area.

natural production - Production of offspring by natural in-stream spawning of broodstock and birth, as opposed to artificial production.

naturally spawned - Fertilization of the female gamete by a male, unassisted, in the natural habitat.

Northwest Power Act - Pacific Northwest Electric Power Planning and Conservation Act of 1980

outplanting - Release of an individual or population from the hatchery back to stream of origin to finish its life cycle in its natural habitat.

parr - Life stage of a juvenile anadromous fish between swim up and smoltification. Usually lasts about 8 to 12 months, at which point the fish begins the morphological, physiological, and behavioral adaptations to a saltwater environment and begins migration.

pathogens - Disease-bearing agents, such as certain types of bacteria.

phenotype - The outward appearance of an organism resulting from the interaction of that organism's genotype and environment.

pysiology/physiological characteristics - The physical and chemical processes or functions in an organism.

population – A group of organisms of the same species that breed in the same place and time, and whose progeny tend to return and breed in approximately the same place and time, exhibiting reproductive continuity from generation to generation.

pre-smolt - The life stage of a juvenile anadromous fish following the parr stage and prior to smolt stage. At this life stage, the fish remains adapted to freshwater habitat, and continues feeding and rearing in its natal stream, or may begin its downstream migration.

production - The emergence of offspring from breeding populations.

propagation, artificial/natural - Production of a species by means other than natural production, relating mainly to hatchery production. Such artificial propagation usually entails the capture of male and female broodstock; some manual/mechanical process for gamete retrieval and fertilization; and mechanical incubation of fertilized eggs; and rearing of fry.

protocols - The plan for carrying out a scientific study.

quarantine - The segregation of one fish population from another to prevent disease transmission, interbreeding, etc.

recovery – The establishment of a threatened or endangered species to self-sustaining level in its natural ecosystem (i.e., to the point that the protective measures of the Endangered Species Act are no longer necessary).

redd - A bed of anadromous salmon eggs present within the natural substrate of a stream.

release - Referring to the reintroduction of an individual or population to their natural habitat from an artificial environment.

scoping - The sub-process within the National Environmental Policy Act process which seeks to identify pertinent issues to be analyzed within such NEPA documents as Environmental Assessments or Environmental Impact Statements.

smolt - The life stage of an anadromous salmon during which it migrates from its natal stream as a juvenile to its arrival in the marine environment. This stage is characterized by emerging physiological, morphological, and behavioral changes (called smoltification) that adapt the fish to its new environment.

spawning matrix - A table of cross-referenced spawning criteria used to select proper spawning protocols given specific broodstock availability and/or genetic variability conditions.

supplementation – The use of artificial propagation to re-establish or increase the abundance of naturally reproducing populations (cf. recovery/restoration).

swim up - The period during which an alevin completes its development on the bottom of a river or hatchbox and subsequently swims to the surface as a fry.

sympatric – Referring to a pattern in which differing species evolve together (spacially), adapting to and exploiting differing habitats and resources within the same ecosystem.

underseeded - A body of water (in the case of anadromous salmon, a stream or river) that's carrying capacity exceeds the number of fish utilizing it.

wild fish - Genetically unique populations of fish that have maintained reproduction successfully without artificial rearing from hatcheries.

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Appendix A: Summary of Losses for Past IDFG Program Years

Table 5: Summary of losses and magnitude of mortality for BY94 through BY98 East Fork Salmon River captive chinook culture groups (IDFG 1999)

	Culture Groups		
	BY94	BY96	BY98
Starting Inventory (January 1, 1998)	37	5	
Eyed-Egg to Fry			
Undetermined[b]	n/a	n/a	46
Mechanical Loss			
Handling	1	0	0
Jump-out	2	0	0
Non-infectious			
Lymphosarcoma	0	0	0
Other[c]	6	0	0
Infectious			
Bacterial	0	0	0
Viral	0	0	0
Other	0	0	0
Maturation			
Mature Males[d]	5	0	0
Mature Females[d]	23	0	0
Other[e]	6	0	0
Relocation			
Transferred In[f]	18	0	0
Transferred Out[g]	0	5	0
Planted/Released	0	0	0
Ending Inventory (December 31, 1998)	12	0	

[a] Fall 1998 "safety-net" progeny.
[b] Typical egg to fry mortality includes non-hatching eggs, abnormal fry, and swim-up loss.
[c] Includes culling associated with cultural abnormalities, and all undetermined, non-infectious mortality.
[d] Spawned at Eagle Fish Hatchery.
[e] Mature fish with non-viable gametes.
[f] Transferred from the Manchester Marine Laboratory to Eagle Fish Hatchery for distribution and spawning.
[g] Transferred from Eagle Fish Hatchery to the Manchester Marine Laboratory for seawater rearing.
[h] Number of fry ponded in January 1999.

Table 6: Summary of losses and magnitude of mortality for BY94, BY96, and BY97 West Fork Yankee Fork captive chinook culture groups (IDFG 1999)

	Culture Groups		
	BY94	BY96	BY97
Starting Inventory (January 1, 1998)	34	103	210[a]
Eyed-Egg to Fry			
Undetermined	n/a	n/a	n/a
Mechanical Loss			
Handling	0	3	8
Jump-out	0	1	0
Non-infectious			
Lymphosarcoma	0	0	0
Other[b]	4	2	2
Infectious			
Bacterial	0	27[c]	0
Viral	0	0	0
Other	0	0	0
Maturation			
Mature Males[d]	4	0	0
Mature Females[d]	3	0	0
Other	0	0	0
Relocation			
Transferred In	23[e]	16[f]	0
Transferred Out[g]	0	60	0
Planted/Released[h]	44	0	0
Ending Inventory (December 31, 1998)	2	26	200

[a] Fall 1998 collections.
[b] Includes culling associated with cultural abnormalities, and all undetermined, non-infectious mortality.
[c] Mortality associated with bacterial kidney disease *Renibacterium salmoninarum* infection.
[d] Spawned at Eagle Fish Hatchery.
[e] Transferred from the Manchester Marine Laboratory to Eagle Fish Hatchery for distribution and spawning.
[f] Spring 1998 outmigrant collections.
[g] Transferred from Eagle Fish Hatchery to the Manchester Marine Laboratory for seawater rearing.
[h] Released for volitional spawning in 1998.

Table 7: Summary of losses and magnitude of mortality for BY94 through BY97 Lemhi River captive chinook culture groups (IDFG 1999)

	Culture Groups			
	BY94	BY95	BY96	BY97
Starting Inventory (January 1, 1998)	49	59	177	147[a]
Eyed-Egg to Fry				
Undetermined	n/a	n/a	n/a	n/a
Mechanical Loss				
Handling	2	4	13	2
Jump-out	2	0	0	2
Non-infectious				
Lymphosarcoma	0	0	0	0
Other[b]	8	5	2	5
Infectious				
Bacterial	0	1	1	0
Viral	0	0	0	0
Other	0	0	7[c]	0
Maturation				
Mature Males[d]	0	8	2	0
Mature Females[d]	7	0	0	0
Other	2[e]	0	1[f]	3[f]
Relocation				
Transferred In[g]	33	14	0	0
Transferred Out[h]	0	0	110	0
Planted/Released[i]	54	19	0	0
Ending Inventory (December 31, 1998)	7	36	41	135

[a] Fall 1998 collections.
[b] Includes culling associated with cultural abnormalities, and all undetermined, non-infectious mortality.
[c] Attributed to parasitic copepod *Salmincola californensis* infestations.
[d] Spawned at Eagle Fish Hatchery.
[e] Mature fish with non-viable gametes.
[f] Unspawned, precocial males.
[g] Transferred from Manchester Marine Laboratory to Eagle Fish Hatchery for distribution and spawning.
[h] Transferred from Eagle Fish Hatchery to the Manchester Marine Laboratory for seawater rearing.
[i] Released for volitional spawning in 1998.