



U.S. Fish & Wildlife Service - Pacific Region
Columbia Basin Hatchery Review Team

Columbia River Basin, Mountain Snake Province
Clearwater and Salmon River Watersheds



**Dworshak, Kooskia and Hagerman National Fish
Hatcheries**

Assessments and Recommendations

Final Report, Summary

June 2009

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<http://www.fws.gov/Pacific/fisheries/Hatcheryreview/reports.html>.

Summary¹

Long-term conservation needs of natural salmonid populations and their inherent genetic resources require a reexamination of the role of hatcheries in basin-wide management and conservation strategies. Hatcheries must be viewed as part of the environmental and ecological landscape to help achieve both conservation and harvest goals. These goals need to be part of a holistic and integrated strategy that combines habitat, hydropower and harvest needs for conserving and managing fishery resources. These strategies must establish short- and long-term goals for both hatchery-propagated and naturally-spawning populations.

To ensure that its hatchery programs are best meeting conservation and harvest goals, the U.S. Fish & Wildlife Service (Service) began, in October 2005, a four-year review of 21 salmon and steelhead hatcheries that the Service owns or operates in the Columbia River Basin. The goal of this review is to ensure that Service hatcheries are operated in accordance with best scientific principles, and contribute to sustainable fisheries and the conservation of naturally-spawning populations of salmon, steelhead and other aquatic species. The Service's review process is modeled after the recent Puget Sound and Coastal Washington Hatchery Reform Project². The Service plans to complete its reviews by early 2010.

The report presented here provides benefit/risk assessments and recommendations for salmon and steelhead propagation programs conducted at hatchery facilities in Idaho owned and/or operated by the Service: Dworshak, Kooskia and Hagerman National Fish Hatcheries (NFHs).³ Dworshak and Kooskia NFHs are located within the Clearwater River watershed in north central Idaho. Hagerman NFH is located in the Thousand Springs area of the Snake River near Hagerman, Idaho. The Service owns four additional hatcheries in Idaho that are operated by Idaho Department of Fish and Game (IDFG): Clearwater, Magic Valley, Sawtooth and McCall fish hatcheries. Programs at these latter four hatcheries will be reviewed in a subsequent report. Programs at all seven at hatcheries (3 NFHs, 4 state-operated hatcheries) operate cooperatively within the Lower Snake River Compensation Plan (LSRCP), a federally funded program to mitigate for fish losses associated with four "run-of-the-river" hydroelectric and transportation dams on the lower Snake River in Washington state.

The Review Team considered, as a foundation for its assessments, four characteristics of each salmonid stock in the Clearwater and Salmon River watersheds: *biological significance*, *population viability*, *habitat* conditions, and *harvest* goals. The Review Team attempted to use both short- (15 years) and long-term (50–75 years) goals for each salmonid stock, as identified by the fishery cooperators⁴, as a foundation for assessing the benefits and risks of the Service's hatchery programs.

¹ This report is intended to be a scientific review of Dworshak, Kooskia and Hagerman National Fish Hatcheries. The assessments and conclusions presented throughout this report are those of the Review Team and are not necessarily the policy position of the U.S. Fish and Wildlife Service.

² www.ltk.org/HRP.html. See also www.hatcheryreform.us/.

³ Dworshak NFH was constructed by the Army Corps of Engineers and the Corps continues to fund Dworshak mitigation program as part of the Federal Columbia River Power System.

⁴ LSRCP cooperators in Idaho are the U.S. Fish and Wildlife Service, Idaho Department of Fish and Game, Nez Perce Tribe, and the Shoshone-Bannock Tribes, with comanaging input from the National Marine Fisheries Service (NOAA Fisheries).

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Source documents not readily available to the general public, including appendices and background documents for this report, are accessible via the Service's hatchery review website.⁵

Dworshak NFH

Facility Overview: Dworshak National Fish Hatchery (NFH) is located at river mile 40 (rkm 65) of the Clearwater River at the confluence of the North Fork Clearwater River, 75 miles (121 km) upstream from Lower Granite Dam, and 523 miles (842 km) upstream from the mouth of the Columbia River. The hatchery was constructed by the Army Corps of Engineers in 1969 to mitigate for fish losses, particularly steelhead, resulting from the construction and operation of Dworshak Dam, a 600-foot high water storage and hydroelectric dam two miles upstream from the hatchery on the North Fork Clearwater River. The principle water source for fish culture at Dworshak NFH is the North Fork Clearwater River, the intake for which is located immediately adjacent to the adult fish ladder into the hatchery. Facility operations, maintenance, fish health, and monitoring and evaluation at Dworshak NFH are 100% funded by the U.S. Army Corps of Engineers via a direct agreement with the Bonneville Power Administration (BPA). The LSRCP funds a spring Chinook program at Dworshak NFH to mitigate for fish losses associated with four hydroelectric dams on the lower Snake River in Washington State.

Summer Steelhead (B-run)

Program overview: The steelhead program at Dworshak NFH operates as a *segregated harvest* program within the Clearwater River watershed with returning hatchery-origin adults used exclusively for broodstock. The North Fork Clearwater River was historically one of the most productive rivers for steelhead and spring Chinook in the Columbia River basin, but Dworshak Dam totally blocks upstream migration of anadromous fish. The broodstock objective at Dworshak NFH is to collect 3,000-4,000 adults at the hatchery and spawn a minimum of 1,100 females and 1,100 males pairwise with an on-station release of 1.2 million yearling smolts into the Clearwater River. In addition, Dworshak NFH outplants 300,000 smolts into Clear Creek at Kooskia NFH, 400,000 smolts into the South Fork (S.F.) Clearwater River, and 100,000 smolts each into Newsome Creek and the American River within the upper S.F. Clearwater River watershed. The hatchery also provides 1.3-1.4 million fertilized green eggs to the Clearwater Fish Hatchery for subsequent transfer and outplanting of yearling smolts in the Salmon River basin. Dworshak NFH also provides 1.2-1.3 million eyed eggs to the Clearwater Fish Hatchery for direct outplanting of smolts into the S.F. Clearwater River. These latter two transfers of eggs to Clearwater Fish Hatchery are part of the LSRCP. All releases of steelhead within the Clearwater River basin, both on-station and outplants into Clear Creek and the S.F. Clearwater River, support recreational and tribal fisheries in the Clearwater River, the lower Columbia River, and the Snake River.

Benefits: Steelhead from Dworshak NFH provide significant harvest benefits to recreational and tribal fishers in the Clearwater River. From 2000 to 2006, the sport fishery harvested an estimated 12,230-30,168 fish per year in the Clearwater River. During those same years, the tribal fishery harvested an estimated 1,000-1,470 fish per year in the North Fork of the Clearwater River. The sport harvest data reflect steelhead released on station and outplanted throughout the Clearwater River Basin. Relative harvest benefits and adult return rates for on-station releases versus outplanting sites have not been accurately quantified. Based on recovery of coded wire tags for

⁵ www.fws.gov/Pacific/fisheries/HatcheryReview/

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steelhead released on station from Dworshak NFH (brood years 1980 through 2001), approximately 28% of the recaptured adults were caught in gillnet fisheries in the mainstem Columbia River, 27% percent were caught in sport fisheries in the Columbia and Snake River basins, and 45% were recaptured at Dworshak NFH or other hatcheries. Less than 1% of coded wire tags were recovered elsewhere. The Dworshak NFH B-run steelhead stock serves as a genetic repository for the North Fork Clearwater River population, a genetically unique stock within the Columbia River basin, but the naturally-spawning population was extirpated after construction of Dworshak Dam. As a result, the hatchery program confers a significant long-term conservation benefit.

Risks: Continued propagation of Dworshak NFH B-run steelhead as a genetically-segregated hatchery stock, for which only hatchery-origin adults are used for broodstock, poses a domestication risk to the population as a genetic repository for the extirpated North Fork Clearwater steelhead population. The use of pumped water from the North Fork Clearwater River, immediately adjacent to the adult entry ladder into the hatchery, creates several disease risks to fish reared on station. These risks include (a) extended rearing of steelhead juveniles in the indoor nursery tanks prior to transfer to outside ponds as a means to reduce fish susceptibility to IHN virus shed from adult fish returning to the hatchery into the hatchery's water supply and (b) the use of re-use (recirculated) water to yield steelhead smolts of the desired target size at one year of age. The continued outplanting of Dworshak B-run steelhead into Clear Creek and the South Fork Clearwater River poses biological risks to natural populations and inhibits local adaptation of both hatchery-origin and natural-origin fish.

Recommendations for current program: The Review Team identified 30 specific recommendations to reduce risks and/or improve benefits of the current summer steelhead program at Dworshak NFH. These recommendations include: (a) replacement of pumped water from the North Fork Clearwater River (in the immediate vicinity of the hatchery ladder) with gravity-feed water from Dworshak Reservoir to reduce fish health risks; (b) construction of a smolt acclimation pond at Kooskia NFH to replace the direct outplanting of smolts into Clear Creek, thereby reducing straying risks and increasing opportunities to recapture unharvested adults; and (c) development of local *segregated* broodstocks for the South Fork Clearwater River and Kooskia NFH, derived from hatchery-origin adults returning to those locations, to allow termination of the annual outplants from Dworshak NFH. The Review Team also recommends reduction of rearing densities in the indoor nursery tanks at Dworshak NFH from an upper density index (DI) value of $DI = 0.75$ to $DI = 0.50$ by increasing the number of nursery tanks, decreasing the total number of steelhead smolts reared on station, or transferring juveniles to outdoor rearing ponds at a smaller mean size *if* the current river water supply to those ponds is replaced with reservoir water. The Review Team also acknowledges the high desirability, but significant logistic difficulty, of developing a genetically-integrated natural spawning component for the Dworshak NFH steelhead stock whereby natural-origin adults would be included in the broodstock to reduce domestication risks to the hatchery stock.

Alternatives to Current Program: The Review Team considered the pros and cons of seven alternatives to the existing summer steelhead program, ranging from (a) the current program with full implementation of all program specific recommendations (Alternative 1) to (b) termination of all programs at Dworshak NFH and decommissioning the facility (Alternative 7). The Review Team recommends continuation of the existing program with implementation of all recommendations (Alternative 1). The Review Team noted several merits of rearing only steelhead or spring Chinook at Dworshak NFH (see below) and rearing the other species at Clearwater Fish Hatchery (Alternatives 3 and 4, respectively), but the absence of smolt-release

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and adult-recapture capabilities at the latter hatchery precluded further consideration of those alternatives. As a *long-term* goal, the Review Team recommends continuation of the current program (Alternative 1) but developing a naturally-spawning component to the program whereby natural-origin adults could be included with the broodstock to reduce long-term domestication risks to the Dworshak NFH steelhead stock.

Spring Chinook

Program overview: The program operates as a *segregated harvest* program within the Clearwater River watershed with returning hatchery-origin adults used exclusively for broodstock. The broodstock objective at Dworshak NFH is to collect 1,200 adults and spawn a minimum of 500 females with an on-station release of 1.05 million yearling smolts into the Clearwater River. Adult collection, egg incubation, rearing, and release all occur on station at the hatchery. The Dworshak NFH stock of spring Chinook originated ancestrally from the Rapid River Hatchery stock with some genetic contribution from the Carson NFH stock. Native populations of spring Chinook in the Clearwater River were extirpated in the mid-1900's by Lewiston Dam (1927-1973) which blocked all upstream migration of Chinook salmon into the Clearwater River.

Benefits: Spring Chinook released from Dworshak NFH, Kooskia NFH and Clearwater Fish Hatchery in the Clearwater River have provided variable harvest benefits, but those benefits have not been accurately quantified for each hatchery. For example, the total estimated annual sport harvest of spring Chinook in the Clearwater River ranged from 0 to 14,752 fish, and the tribal harvest ranged from 0 to 3,144 fish, for the 20 year period, 1987-2006. The 20-year average was 1,517 and 581 fish in sport and tribal harvests, respectively. Based on the available information, sport harvest of Dworshak NFH spring Chinook in the Clearwater River for return years 2001 through 2005 averaged 3,668 fish per year (range = 606 to 8,355 fish) and composed an average of 45.1% of the spring Chinook salmon harvested in the Clearwater River. As available, excess adults trapped at the hatchery are provided to the Nez Perce Tribe for subsistence and ceremonial purposes. Based on recovery of coded wire tags for spring Chinook released from Dworshak NFH (brood years 1985 through 2002), approximately 7% of the recaptured adults were caught in gillnet fisheries in the mainstem Columbia River, 15% percent were caught in sport fisheries in the Columbia and Snake River basins, 7% were caught in Columbia River treaty and ceremonial fisheries, and 71% were recaptured at Dworshak NFH or other hatcheries. Less than 1% of coded wire tags were recovered elsewhere. PIT tagged fish provide a research benefit for assessing downstream survival passage at hydroelectric dams and comparing survival estimates of volitional passage through the hydropower system versus barging around Snake and lower Columbia River dams.

Risks: The use of pumped water from the North Fork Clearwater River, immediately adjacent to the adult entry ladder into the hatchery, poses disease risks to spring Chinook reared on station. Greater than 20% of all coded-wire tags recoveries for adult spring Chinook originating from Dworshak NFH occur outside the mainstem migration corridor of the Columbia and Snake Rivers; those high stray rates pose genetic risks to other spring Chinook stocks in the Columbia River basin.

Recommendations for Current Program: In addition to the facility recommendations identified under the Dworshak NFH steelhead program, the Review Team identified 11 program specific recommendations to reduce risks and/or improve benefits of the current spring Chinook program at Dworshak NFH. These recommendations include: (a) reducing the total number of adult spring Chinook retained for broodstock by approximately 20% to the maximum number of fish

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(approximately 1,000 adults) needed to meet program objectives; (b) quantification of homing and straying rates of spring Chinook released from Dworshak NFH, including evaluations to correlate stray rates with variable fish culture practices; and (c) elimination of backfilling broodstock shortages with eyed eggs from other hatcheries (e.g. Rapid River Hatchery) to maximize local adaptations and homing fidelity of the spring Chinook stock propagated at Dworshak NFH.

Alternatives to Current Program: The Review Team considered the pros and cons of six alternatives to the existing spring Chinook program, ranging from (a) the current program with full implementation of all program specific recommendations (Alternative 1) to (b) termination of all programs at Dworshak NFH and decommissioning the facility (Alternative 6). The Review Team recommends continuation of the existing program with implementation of all recommendations (Alternative 1). The Review Team noted several merits of rearing only steelhead or spring Chinook at Dworshak NFH and rearing the other species at Clearwater Fish Hatchery (Alternatives 3 and 4, respectively); however, the absence of smolt-release and adult-recapture capabilities at Clearwater Hatchery precluded further consideration of those alternatives. Overall, the spring Chinook program at Dworshak NFH appears to be an important component for achieving fisheries management and LSRCP mitigation goals for spring Chinook within the Clearwater River basin. Additional monitoring and evaluation based on recovery of coded-wire tags (or PIT tags) is necessary to further quantify benefits and risks of the program.

Kooskia NFH

Facility Overview: Kooskia NFH is located on Clear Creek, a tributary to the Clearwater River (Middle Fork) at river mile 77 (rkm 124). The hatchery and its programs are 100% funded by the U.S. Fish & Wildlife Service. Kooskia NFH was authorized by Congress in 1961 and construction began in 1966. Fish production began in 1969. The purpose of the hatchery is to mitigate for reduced tribal and sport fisheries in the Clearwater River resulting from water development projects in the Columbia River basin. Kooskia NFH currently supports a spring Chinook program and releases up to 650,000 yearling smolts annually into Clear Creek.

Kooskia NFH is currently entering a period of transition. Recent adoption (May 2007) of the *Snake River Basin Adjudication Agreement* transfers operation and management of the facility from the U.S. Fish & Wildlife Service to the Nez Perce Tribe. The Service will continue to own the hatchery as a National Fish Hatchery, but day-to-day operations will transition to the Tribe. An annual cooperative agreement between the Service and the Tribe currently governs operations and management of Kooskia NFH. The Service currently transfers funds to the Tribe to pay the salaries of the Tribal employees. All other hatchery expenses are paid directly by the Service. This arrangement is anticipated to continue into the foreseeable future.

Spring Chinook

Program overview: The program operates as a *segregated harvest* program within the Clearwater River watershed with returning hatchery-origin adults used exclusively for broodstock. The broodstock objective at Kooskia NFH is to collect 600 adults and spawn a minimum of 265 females and 265 males with an on-station release of 600,000 yearling smolts into Clear Creek. Adults are trapped at Kooskia NFH, May through July, and are transported to Dworshak NFH for holding and spawning. Adults cannot be held and spawned at Kooskia NFH because Clear Creek water is too warm during the summer months to hold spring Chinook. Adults are spawned at Dworshak NFH; the fertilized eggs are incubated to the eyed stage there, and the eyed eggs are

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then transferred to Kooskia NFH for incubation, hatch, and subsequent rearing of juveniles to the yearling smolt stage prior to release into Clear Creek. The Kooskia NFH stock originated primarily from the Carson NFH stock with some genetic contribution from the Rapid River Hatchery stock. Native populations of spring Chinook in the Clearwater River were extirpated in the mid-1900's by Lewiston Dam (1927-1973) which blocked all upstream migration of Chinook salmon into the Clearwater River. The spring Chinook program at Kooskia NFH participates in a collaborative research project known as the Idaho Supplementation Studies (ISS). These studies are evaluating the efficacy of hatchery-origin Chinook to spawn naturally and increase the abundance of natural-origin smolts and adult recruits.

Benefits: See harvest benefits for Dworshak NFH spring Chinook. Based on recovery of coded-wire tags for spring Chinook released from Kooskia NFH (brood years 1988 through 2002), approximately 9% of the recaptured adults were caught in gillnet fisheries in the mainstem Columbia River, 12% percent were caught in sport fisheries in the Columbia and Snake River basins, 4% were caught in Columbia River treaty and ceremonial fisheries, and 75% were recaptured at Kooskia NFH or other hatcheries. Less than 1% of coded wire tags were recovered elsewhere. ISS studies conducted at Kooskia NFH provide a research benefit.

Risks: Spring Chinook juveniles at Kooskia NFH are reared on chilled, recirculated (reuse) well water. Dependence on mechanical chillers and reuse water poses demographic and fish health risks, respectively, to the hatchery stock. High spring flows in Clear Creek causes debris, rocks, sand, and silt to block the water intake entrance and can prevent water from entering the hatchery. Debris-laden water in Clear Creek during high spring flows, and icing of the water intake structure during winter, pose demographic risks to fish reared on station when outdoor rearing vessels are supplied with creek water. Clear Creek water carries the parasite *Ichthyophtherius* (*Ich*) sp., and the use of this surface water for fish culture and aerosols resulting from sprinkler irrigation of the hatchery grounds increases fish health risks to fish on station. The facility switches from chilled, reuse well water to Clear Creek water when the temperature of the creek water drops below 50 degrees F., usually near the end of October. Yearling pre-smolts are redistributed among Burrows' Ponds and raceways starting in January to reduce rearing densities, and those ponds and raceways are supplied with single-pass Clear Creek water for acclimation and imprinting of smolts prior to release. Approximately 11% of the coded-wire tag recoveries for Kooskia NFH spring Chinook occur outside the migration corridor to the hatchery, thus posing genetic straying risks to other stocks in the Columbia River basin.

Recommendations for current program: The Review Team identified 21 specific recommendations to reduce risks and/or improve benefits of the current spring Chinook program at Kooskia NFH. These recommendations include: (a) investigating the feasibility of expanding the well field for the hatchery or installing chillers for surface water to provide sufficient water of the correct temperature to hold and spawn adult broodstock during the summer; (b) disinfection of Clear Creek water (e.g., via ozone treatment) prior to use for fish culture to reduce fish health risks of *Ichthyophtherius* sp.; (c) investigate options for improving the intake structure for Clear Creek water to reduce debris buildup in the spring and icing during the winter; and (d) minimize or eliminate the use of aerial sprinklers for irrigation of hatchery grounds to reduce potential aerial discharge of *Ichthyophtherius* sp.

Alternatives to Current Program: The Review Team considered the pros and cons of six alternatives to the existing spring Chinook program, ranging from (a) the current program with full implementation of all program specific recommendations (Alternative 1) to (b) termination of all programs at Kooskia NFH and decommissioning the facility (Alternative 6). The Review Team

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recommends replacing the existing on-station spring Chinook program with a reintroduction and harvest coho program (Alternative 2). The Team concluded that coho salmon, fall Chinook and steelhead are better suited for the culture conditions at Kooskia NFH than spring Chinook. The team favored coho salmon because (a) the Nez Perce Tribe has initiated a coho reintroduction program in the Clearwater River Basin (see below), but the success of the program has been hindered by the absence of a locally-adapted, self-sustaining hatchery stock within the watershed, and (b) large steelhead and Chinook hatchery programs already exist within the Clearwater River. The Review Team concluded that a self-sustaining coho program could be established at Kooskia NFH based on recent returns of adult coho salmon back to Kooskia NFH; for example, more than 300 adult coho returned to Kooskia NFH in the fall of 2007, and 765 adult coho (+ 564 age 2 males or “jacks”) returned in 2008. Under this recommended alternative, the Review Team believes that spring Chinook could continue to be released from Kooskia NFH in reduced numbers if rearing space is available at another facility. The long-term goal would be to maintain a localized broodstock of coho salmon at Kooskia NFH to support harvest and reestablishment of natural populations within the Clearwater River basin consistent with the Nez Perce Tribe’s master plan for coho salmon.

Clearwater River Coho

Program overview: Coho salmon were extirpated from the Clearwater River by Lewiston Dam (1927-1973) in the mid-1900’s. Coho were subsequently declared *extinct* in the Snake River basin in 1986. Overharvest in lower Columbia River fisheries and reduced smolt-to-adult survivals associated with eight hydroelectric dams in the Snake and lower Columbia rivers are considered the principle factors resulting in the extirpation of coho salmon in the Snake River. The Nez Perce Tribe began reintroducing coho salmon to the Clearwater River in 1995. Currently, 550,000 coho smolts are imported annually from Eagle Creek NFH; 275,000 of which are released into Clear Creek at Kooskia NFH and the other 275,000 smolts are released directly into Lapwai Creek. The program also has a local broodstock goal of trapping 502 adult coho at Dworshak and Kooskia NFHs to produce 280,000 smolts for acclimation at Kooskia NFH and release into Clear Creek (for a total release of 555,000 smolts into Clear Creek). Adult holding, spawning, and juvenile rearing for the Clearwater River broodstock program occur currently at Dworshak NFH. Coho reared at Dworshak NFH are transferred as yearlings to Kooskia NFH during the first week of April for a four to six week acclimation period prior to volitional release as smolts into Clear Creek. Broodstock shortages from adult returns to the Clearwater River are backfilled with additional smolts from Eagle Creek NFH. In 2008, a total of 997 adult coho (excluding age 2 males or “jacks”) were captured within the Clearwater River basin: 765 coho at Kooskia NFH, 228 coho at Dworshak NFH, and four coho at Nez Perce Tribal Hatchery.

Benefits: Conservation and harvest benefits of the coho reintroduction program have not yet been realized. Nevertheless, the program is returning significant numbers of hatchery origin adult coho back to the Clearwater River that could serve as the foundation for developing a localized, Clearwater River hatchery population. The program provides research and education benefits to the Nez Perce Tribe.

Risks: The continued importation of coho smolts from lower Columbia River hatcheries (i.e., Eagle Creek NFH) impedes establishment of a self-sustaining, locally-adapted hatchery population within the Clearwater River. Coho smolts imported from Eagle Creek NFH are not differentially marked or tagged relative to the hatchery-produced progeny of adult coho that return and are

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trapped in the Clearwater Basin, impeding further the establishment of a self-sustaining locally-adapted hatchery population.

Recommendations for Current Program: The Review Team identified ten specific recommendations to reduce risks and/or improve benefits of the coho reintroduction program in the Clearwater River. First, the Team recommends reprioritization of the goals and objectives of the coho reintroduction program. To date, the program has been managed in a manner that attempts to establish a local hatchery stock, naturally spawning populations, and harvestable fish simultaneously. These three goals need to be addressed sequentially, not simultaneously. The first priority for reintroducing coho salmon to the Clearwater Basin should be establishment of a self-sustaining hatchery population of coho salmon in the Clearwater River with all broodstock collection occurring at Dworshak NFH, Kooskia NFH or Nez Perce Tribal Hatchery. The Nez Perce Tribal Hatchery, as proposed for future modification, is identified in the Master Plan as the primary location for the long-term propagation of hatchery-origin coho salmon in the Clearwater River basin. However, replacement of the spring Chinook program at Kooskia NFH with a coho program, as recommended by the Review Team, would allow the immediate on-station rearing and production of 550,000 smolts that are currently imported annually from Eagle Creek NFH. The importation of smolts from Eagle Creek NFH should be terminated as soon as possible. Releasing coho salmon for either harvest or natural spawning should only occur after a self-sustaining, locally-adapted hatchery stock has been established within the Clearwater River basin.

Alternatives to Current Program: The Review Team considered the pros and cons of only two alternatives for the existing coho reintroduction program: continuation of the program with implementation of all program specific recommendations (Alternative 1) or termination of the program (Alternative 2). The Review Team recommends, as a short-term goal (1-5 years), continuation of the current program (Alternative 1) with implementation of all recommendations. Implementation of Alternative 1 here for coho salmon could be part of the recommended alternative for Kooskia NFH where the on-station rearing of spring Chinook would be replaced with a coho program. The Team assumes that a minimum of 600,000 coho smolts, the current size of the spring Chinook program, could be reared at Kooskia NFH. As a long-term goal (5-15 years), the Team recommends implementation of the Coho Master Plan of the Nez Perce Tribe but only after a self-sustaining hatchery population has been established within the Clearwater Basin.

Hagerman NFH

Facility Overview: The Hagerman National Fish Hatchery is located near Hagerman, Idaho about 30 miles (48 km) west of Twin Falls, Idaho in the Thousand Springs area of the Snake River. Hagerman NFH was authorized by 46 Stat, 371 on May 21, 1930. Construction began in 1932, and fish production began in 1933. The initial purpose of the hatchery was to rear rainbow trout for stocking in Idaho, eastern Oregon, and northern Nevada. In the late 1970's, the hatchery became part of the LSRCP which was authorized by the Water Resources Development Act of 1976, Public Law 94-587, to mitigate for fish and wildlife losses caused by the construction of four dams on the lower Snake River in Washington. The primary responsibility of the hatchery was changed from rearing "catchable" rainbow trout to rearing steelhead smolts as part of the LSRCP. The hatchery operates currently under cooperative program management between the Service and IDFG. The hatchery currently rears steelhead smolts from eyed eggs obtained from other hatcheries and then transports and releases those smolts into the Salmon River basin. The current mitigation goal for the hatchery is to return 13,600 adult steelhead upstream of Lower Granite Dam on the Snake River to support harvest in the Snake River basin.

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Summer Steelhead (B-run)

Program overview: The program operates as a *segregated harvest* outplanting program within the Salmon River watershed. Hagerman NFH receives 215,000 Dworshak NFH B-run steelhead eyed eggs annually from the Clearwater Fish Hatchery. Adult steelhead are trapped and spawned at Dworshak NFH. The fertilized eggs are transferred to Clearwater Fish Hatchery for incubation to the eyed stage prior to transfer to Hagerman NFH. Fish are hatched and reared at Hagerman NFH. The hatchery transports and releases 100,000 yearling steelhead smolts annually into the East Fork Salmon River and 100,000 yearling smolts into the Little Salmon River.

Benefits: The harvest benefit of releasing Dworshak NFH B-run steelhead into the Little Salmon and East Fork Salmon rivers from Hagerman NFH has not been accurately quantified. Those releases began in 2004, and fish released from 2004 to 2007 were not given coded-wire tags.

Risks: Yearling Dworshak steelhead exhibit significantly increasing mortality at Hagerman NFH during the four months (December-April) immediately prior to transport and release into the Salmon River. Those mortalities are stock specific and are not exhibited by Sawtooth A-run steelhead reared on station (see below). Stock-specific susceptibility to the parasite *Nucleospora salmonis* - which is in the water supply of the hatchery - and water chemistry at Hagerman NFH - which is quite different from the water chemistry of the North Fork Clearwater River - have been hypothesized as the cause of mortality of Dworshak steelhead yearlings at Hagerman NFH. Outplanting of Dworshak NFH B-run steelhead into the Salmon River basin poses genetic risks to ESA-listed natural populations, particularly in the East Fork Salmon River which supports a *biologically significant* population for which IDFG conducts a conservation hatchery program. In addition, straying risks of Dworshak B-run steelhead outplanted in the Salmon River basin have not been adequately assessed. These latter risks are particularly a concern for native populations of B-run steelhead in the South and Middle Forks of the Salmon River where steelhead are managed as natural population reserves.

Recommendations for current program: The Review Team identified 26 specific recommendations to reduce risks and/or improve benefits of the current B-run summer steelhead program at Dworshak NFH. These recommendations include: (a) additional research to identify the cause of juvenile mortality during the four months prior to transport and release into the Salmon River, (b) releasing Dworshak steelhead only at locations where smolts can be acclimated and non-harvested adults recaptured (e.g., Pahsimeroi Fish Hatchery) to reduce genetic risks to natural populations; and (c) development of a self-sustaining, local hatchery broodstock program derived from recaptured adults returning to the Salmon River.

Alternatives to Current Program: The Review Team considered the pros and cons of seven alternatives to the existing B-run summer steelhead program, ranging from (a) the current program with full implementation of all program specific recommendations (Alternative 1) to (b) termination of all programs at Hagerman NFH and decommissioning the facility (Alternative 7). The Review Team recommends termination of the existing B-run summer steelhead program at Hagerman NFH but retention of the ongoing A-run steelhead program (Alternative 6). The Review Team concluded that the risks of rearing Dworshak B-run steelhead at Hagerman NFH and releasing those fish into the Salmon River outweigh the potential harvest benefits (currently undocumented). The Review Team concluded that greater harvest benefits and contribution to LSRCP mitigation goals would be achieved by rearing only A-run steelhead at Hagerman NFH (see below).

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A-run Steelhead

Program overview: The program operates as a *segregated harvest* program within the Salmon River watershed. Hagerman NFH receives 1.15 million eyed eggs from Sawtooth Hatchery and 215,000 eyed eggs from Pahsimeroi Hatchery. Adult steelhead are trapped and spawned at the latter two hatcheries, and the resulting fertilized eggs are incubated at Sawtooth Hatchery prior to transfer as eyed eggs to Hagerman NFH. Fish from the two source hatcheries are hatched and reared separately at Hagerman NFH prior to transport and release as yearling smolts into the Salmon River basin. The majority of Sawtooth A-run steelhead (810,000 smolts) are released into the upper Salmon River at Sawtooth Hatchery to maintain the hatchery stock and support downstream fisheries. An additional 240,000 Sawtooth steelhead smolts are released into the Yankee Fork of the Salmon River. Pahsimeroi steelhead (200,000 yearling smolts) are released into the Little Salmon River. – **Stock ancestries:** A-run steelhead propagated at Sawtooth and Pahsimeroi hatcheries originated from adult steelhead trapped in the Hells Canyon region of the Snake River. A hatchery broodstock was developed initially at the Pahsimeroi Fish Hatchery from adult steelhead trapped in the Hells Canyon region, 1966-1970. The Pahsimeroi Hatchery stock was then used to establish the A-run steelhead program at Oxbow and Sawtooth Fish Hatcheries in the Hells Canyon region of the Snake River and the Stanley Basin of the upper Salmon River, respectively. As a result, adult steelhead returning to the Sawtooth, Pahsimeroi, and Oxbow hatcheries have common ancestral origins but are largely propagated as three separate stocks. NOAA Fisheries excludes fish of the three hatchery stocks from the *S Snake River Summer Steelhead Distinct Population Segment* (DPS) which is currently listed as *threatened* under the ESA.

Benefits: Specific harvest contributions of A-run steelhead reared at Hagerman NFH have not yet been quantified. However, based on limited data used to estimate returns upstream of Lower Granite Dam, A-run steelhead reared at Hagerman NFH and released into the Salmon River exhibited a mean smolt-to-adult return rate of 0.72% (BY 1992-2000). This mean return rate translates into a predicted mean return of 8,640 adult steelhead based on an annual release of 1.2 million smolts into the Salmon River basin. Although estimated harvest contributions of each hatchery stock to fisheries in the Salmon River basin are not yet available, fishery biologists have concluded that hatchery-origin A-run steelhead released into the Salmon River contribute significantly to recreational fisheries. For example, IDFG estimated that approximately 33,000 steelhead were harvested by anglers in Idaho during the fall-spring fishing seasons of 2000-2001, with approximately 18,000, 12,000, and 3,000 steelhead caught in the Salmon, Clearwater, and mainstem Snake rivers, respectively. The vast majority of fish harvested in the Salmon River were believed to be A-run steelhead based on preliminary data. The release of A-run steelhead in the Yankee Fork may be contributing to the maintenance of a naturally spawning population in that tributary, although that outcome is not an explicit goal of the program.

Risks: Because of their common origins, broodstock shortages at Sawtooth and Pahsimeroi hatcheries have – in the past - each been “backfilled” with eggs or fish from the other hatchery or with eggs or fish from Oxbow Hatchery. Mutual backfilling of egg shortages among Sawtooth, Pahsimeroi, and Oxbow fish hatcheries inhibits development of locally-adapted broodstocks at each of the three facilities where returning adults are trapped for broodstock. Backfilling, in the long run, is expected to reduce smolt-to-adult return rates, increase stray rates, and reduce desired benefits (e.g., harvest). - Multiple transport of fish and eggs among adult steelhead trapping locations (Sawtooth, Pahsimeroi, and Oxbow Fish Hatcheries) and three steelhead rearing locations in the Snake River Valley (Hagerman NFH, Magic Valley Fish Hatchery, and Niagara Springs Fish Hatchery) increases demographic risks due to repeated handling and transportation.

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Rearing multiple stocks at multiple facilities creates a “criss-cross” network of egg and fish transfers among broodstock collection facilities, rearing facilities, and release locations that increases fish culture and transportation risks.

Recommendations for current program: The Review Team identified 12 specific recommendations to reduce risks and/or improve benefits of the current A-run summer steelhead program at Hagerman NFH. These recommendations include: (a) discontinue rearing Pahsimeroi A-run steelhead at Hagerman NFH, and rear only Sawtooth A-run steelhead - representing all egg takes from Sawtooth Hatchery - at Hagerman NFH to minimize culture risks and maximize culture and transportation efficiencies; (b) terminate, as a future management policy, backfilling egg take shortages at Sawtooth and Pahsimeroi fish hatcheries and manage Sawtooth A-run steelhead, Pahsimeroi A-run steelhead, and Oxbow A-run steelhead as three reproductively distinct hatchery stocks to maximize local adaptations and individual stock viabilities; and (c) restrict the release of Sawtooth A-run steelhead to the upper Salmon River upstream of the confluence of the East Fork Salmon River, with the Sawtooth Hatchery site serving as the first priority for release (to maximize adult returns back to the hatchery) when the total number of Sawtooth Hatchery smolts available for release is less than the sum of all release objectives for that stock.

Alternatives to Current Program: The Review Team considered the pros and cons of four alternatives to the existing A-run summer steelhead program, ranging from (a) the current program with full implementation of all program specific recommendations (Alternative 1) to (b) termination of all programs at Hagerman NFH and decommissioning the facility (Alternative 4). The Review Team recommends continuation of the current A-run steelhead program with full implementation of all recommendations (Alternative 1). Implementation of Alternative 1 for the A-run steelhead program and the recommended alternative for the B-run program (Alternative 6) would result in the following actions: (1) the rearing of all Sawtooth A-run steelhead for the Salmon River at Hagerman NFH; (2) the rearing of all Pahsimeroi A-run steelhead at Magic Valley Fish Hatchery (LSRCP portion) and Niagara Springs Fish Hatchery (Idaho Power mitigation portion); and (c) termination of the rearing of Dworshak B-run steelhead at Hagerman NFH. Implementation of Alternative 1 would not change the number of A-run steelhead smolts released in the upper Salmon River upstream of the confluence of the East Fork Salmon River (1.28M smolts), but those released fish would be restricted to progeny of adults trapped at Sawtooth Fish Hatchery with no “backfilling” of egg shortages with eggs from either Pahsimeroi or Oxbow fish hatcheries.

Rainbow trout

Program overview: The program operates as a *segregated harvest* program for outplanting triploid rainbow trout in southern Idaho. This is an *in-kind* exchange program with IDFG whereby Hagerman NFH rears rainbow trout and releases them in local area waters in southern Idaho, while IDFG stocks rainbow trout from the Nampa State Fish Hatchery directly into Dworshak Reservoir as partial fishery mitigation for Dworshak Dam. Hagerman NFH initially receives 150,000 eyed triploid eggs from Hayspur State Fish Hatchery in late December each year. The following May, 90,000, 5-inch fish are transported and released into various local waters to support IDFG “put, grow, and take fisheries”. During the following fall, 40,000 9-inch catchable rainbow trout fish are released into local reservoirs. The program uses 12 raceways dedicated to rainbow trout culture at Hagerman NFH.

Benefits: Local harvest benefits are not adequately documented. Anecdotal information indicates rainbow trout released into Little Camas Reservoir and Lake Walcott make significant

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contributions to their respective fisheries. A harvest evaluation report from IDFG is pending for catchable rainbow trout released into Lake Walcott.

Risks: The rearing of rainbow trout increases fish health risks at Hagerman NFH. A disease outbreak among Hayspur rainbow trout (fall release, group) in 2007 resulted in a 40% loss of fish, with daily mortalities ranging from 0.1% to 3.5% beginning in April 2007 and continuing through the fall. These fish had infections of *Nucleospora salmonis*, *Gyrodactylis*, and *Costia*, although clinical signs indicated another, undetermined disease agent was involved. The rearing of rainbow trout at Hagerman NFH with a continuing declining water supply may jeopardize the rainbow trout program or create culture conflicts with the steelhead programs.

Recommendations for current program: The Review Team identified three specific recommendations for the rainbow trout program at Hagerman NFH: (a) establish a *Memorandum of Agreement* (MOA) with the Army Corps of Engineers and IDFG that defines the mitigation exchange agreement and responsibilities of Hagerman NFH⁶, (b) establish a water inflow threshold which triggers a reduction in the number, time, and/or size at release of rainbow trout reared at Hagerman NFH if the water supply continues to decline, and (c) purchase eyed triploid eggs from a commercial vendor in late March or early April after the hatchery has begun transporting steelhead yearlings off-station to minimize water-use conflicts with the steelhead programs.

Overall recommendation: The Review Team acknowledges that Hagerman NFH is a particularly good facility for rearing resident rainbow trout. However, the Army Corps of Engineers and IDFG should re-assess the need for the rainbow trout program based on current management goals for Dworshak Dam mitigation. The Team supports continuation of the program if the two parties determine that the program is viable and provides intended benefits. However, the Team feels that rearing steelhead for release into the Salmon River should take precedence at Hagerman NFH. The Team recommends that the Service continue to assess the carrying capacity of Hagerman NFH, especially given the declining water supply, so that the rainbow trout program does not affect or pose risks to the steelhead programs on station.

Conclusions

In general, Dworshak, Kooskia, and Hagerman NFHs are providing significant fishery benefits that outweigh risks associated with those programs. Indeed, programs at all three hatcheries are conferring valuable fishery benefits to both sport and tribal fishers in the Salmon and Clearwater rivers. Nevertheless, current management of those three hatcheries to meet comanager goals for harvest often conflict with the physical constraints of the facilities, conservation goals for natural populations, and/or the biological constraints of the fish themselves. For example, water quantity and temperature constraints at Kooskia NFH impose fish culture risks for spring Chinook at that facility. The Review Team concluded that rearing another species at Kooskia NFH, specifically coho salmon, would reduce fish culture risks, contribute to the Nez Perce Tribe's program for reintroducing coho salmon to the Clearwater River, and provide future harvest opportunities that currently do not exist. Such a change would not preclude the continued release of spring Chinook smolts at Kooskia NFH with rearing occurring at Dworshak NFH. The Team also concluded that the annual transfer and rearing of Dworshak B-run steelhead at Hagerman NFH, followed by the outplanting of those fish into the East

⁶ The Service has begun negotiations on a new MOA with the Walla Walla district of the Army Corps of Engineers, and this new MOA will clarify Dworshak Dam mitigation responsibilities, including rainbow trout.

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Fork Salmon River, increases fish health risks at the latter hatchery and poses biological risks to natural populations in the upper Salmon River, particularly in the East Fork. Rearing multiple stocks of steelhead at multiple facilities in southern Idaho for direct release at multiple sites in the Salmon River increases fish culture risks at each facility and is inconsistent with development of local adaptations, minimizing straying, and maximizing the viability of each hatchery stock. The direct outplanting of Dworshak B-run steelhead into the South Fork Clearwater River and Clear Creek - without facilities or strategies for recapturing non-harvested adults – increases biological risks compared to on-station releases from hatcheries or satellite acclimation facilities that can trap returning adults. Disease risks at Dworshak NFH are particularly acute and would be reduced substantially if gravity-feed water from Dworshak Reservoir could be used for fish culture instead of pumped water from the North Fork Clearwater River at the hatchery site downstream from Dworshak Dam. The declining water supply at Hagerman NFH, due to decreasing output from the Eastern Snake Plain aquifer, is expected to reduce the carrying capacity of the hatchery and increasingly limit the ability of the facility to meet its mitigation goal for steelhead. All of the Team's recommendations are intended to reduce the aforementioned risks while maintain current fishery benefits.

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