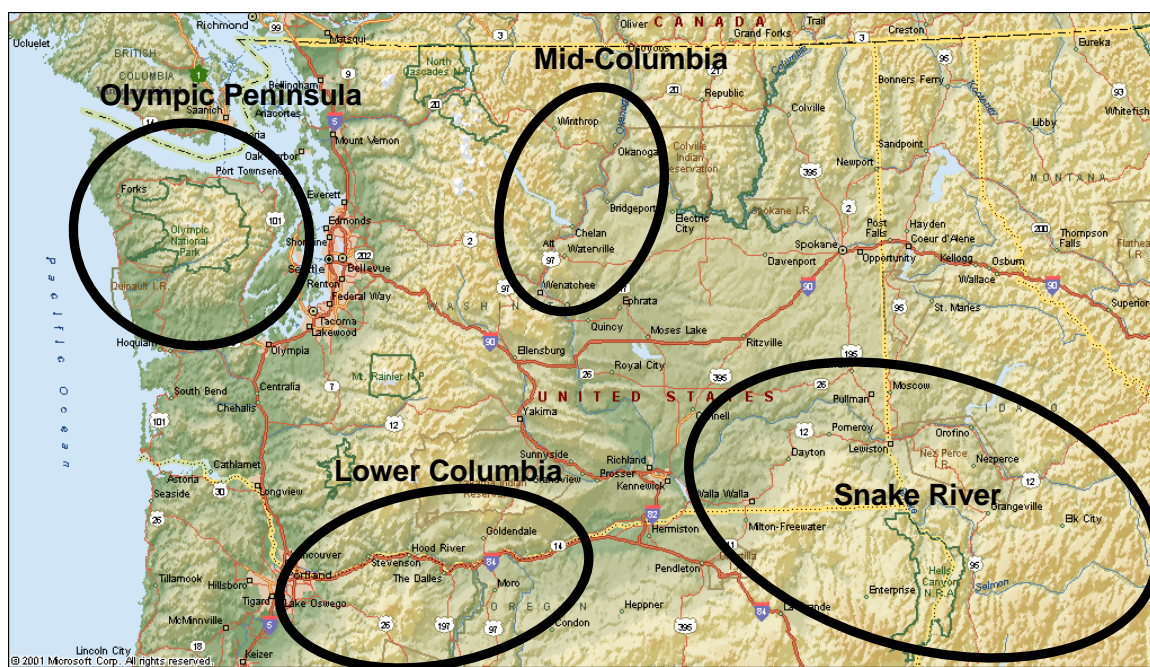




U.S. Fish and Wildlife Service - Pacific Region

Hatchery Review Team - Columbia Basin & Olympic Peninsula

Summary and Overview of the U.S. Fish and Wildlife Service Review of Federal Hatcheries in the Pacific Region: A Roadmap to the Future



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<<http://www.fws.gov/pacific/fisheries/Hatcheryreview/team.html>>.¹

¹ The report presented here was initially drafted by Michael Schmidt, Long Live the Kings, who served as facilitator for the Service's review process 2007-2010. Supplemental input was provided by members of the Service's Hatchery Review Team.

USFWS Pacific Region Hatchery Review Team

Summary and Overview of the USFWS Review of Federal Hatcheries in the Pacific Region

INTRODUCTION

The US Fish and Wildlife Service (Service) conducted a five-year, science-based review of 24 federally-owned salmon hatcheries² in Washington, Oregon, and Idaho, 2005-2010. The review examined 53 hatchery programs for Pacific salmon and steelhead (*Oncorhynchus* sp.). The goal of these reviews was to ensure that Service hatcheries³ operate in accordance with the best scientific information available and contribute to sustainable fisheries and the conservation of naturally-spawning populations of salmon, steelhead, and other aquatic species. The report presented here summarizes the history, results, and conclusions of this review process. The report concludes with the perspectives of the Hatchery Review Team.

HISTORICAL BACKGROUND

An extensive hatchery system for Pacific salmon (*Oncorhynchus* spp.) and steelhead (*O. mykiss*) developed in the Pacific Northwest during the 20th Century.⁴ From their inception in the late 1800's, hatcheries have been used primarily to support fisheries and to mitigate for lost habitat and reduced abundance of fish from natural populations resulting from overfishing, land-use practices (e.g., logging, agriculture), and hydropower development. As the abundance of natural-origin fish decreased over the past century, more hatcheries were built, and the abundance of hatchery-origin fish increased proportionately.⁵

The continued decrease in abundance of natural-origin salmon and steelhead in the Pacific Northwest during the 1970's and 1980's led to the listing of many natural populations, or *Evolutionarily Significant Units* (ESUs), as *threatened* or *endangered* species under the Endangered Species Act (ESA).⁶ During this period, hatcheries continued to meet their traditional purpose of providing fish for harvest in support of commercial and recreational fisheries, mitigation obligations, and tribal trust responsibilities. However, many scientists questioned the efficacy of hatcheries to meet their goals and raised additional questions regarding the risks that hatchery-origin fish pose to natural populations.⁷

FACTS:

- 70-80% of the salmon and steelhead harvested in the Pacific Northwest are hatchery origin.
- Of the region's 38 salmon and steelhead population units (as identified by NOAA Fisheries Service), half are listed as threatened or endangered under the Endangered Species Act.

Source: <http://www.nwr.noaa.gov/>

² The 24 federal hatcheries include fifteen National Fish Hatcheries operated by the Service and nine state-operated hatcheries administered by the Service through the Service's Lower Snake River Compensation Plan (LSRCP).

³ "Service hatcheries" or "Service hatchery programs" refer to both Service-operated National Fish Hatcheries and to federally-owned but state-operated LSRCP hatcheries.

⁴ Lichatowich, J. 1999. *Salmon Without Rivers: A History of the Pacific Salmon Crisis*. Island Press, Covelo, California.

⁵ The direct offspring of naturally-spawning fish are called "natural-origin", whereas the direct offspring of fish that are spawned artificially in a hatchery are called "hatchery-origin". These designations are independent of ancestry of the parental fish but reflect the distinct biological characteristics of hatchery-origin and natural-origin fish.

⁶ <http://www.nwr.noaa.gov/ESA-Salmon-Listings/Index.cfm>

⁷ Biological issues and conflicts regarding fish hatcheries led to a national symposium in 1994. The proceedings of that symposium were published as a book by the American Fisheries Society: Schramm, H.L., Jr., and R.G. Piper (eds.). 1995. *Uses and Effects of Cultured Fishes in Aquatic Ecosystems*. American Fisheries Society, Symposium 15, Bethesda, Maryland.

USFWS Pacific Region Hatchery Review Team

Summary and Overview of the USFWS Review of Federal Hatcheries in the Pacific Region

The listing of salmon and steelhead populations under the ESA, changing management priorities resulting from those listings, and questions regarding the effects of hatcheries on natural populations resulted in a surge of scientific research.⁸ This research dramatically increased our understanding of the biology of salmon and steelhead and provided increased awareness of the genetic and ecological risks posed by hatchery-origin fish to natural populations (primarily through interbreeding, competition, and related factors).⁹ At the same time, scientists and managers began to contemplate how hatcheries could contribute to the conservation and recovery of ESA-listed populations while continuing to meet their traditional role of providing fish for harvest. Conflicts between harvest and conservation goals, and new scientific information regarding the biological risks posed by hatcheries, motivated hatchery reform efforts in the Pacific Northwest.

PUGET SOUND AND COASTAL WASHINGTON HATCHERY IMPROVEMENT PROJECT

Hatchery reform efforts in the Pacific Northwest were initiated in 1998 in response to the proposed ESA listing of Chinook salmon as a *threatened species* in Puget Sound.¹⁰ That proposed listing cited large numbers of hatchery fish released in Puget Sound streams as one of the risk factors contributing to the threatened status of Chinook salmon.

Congress appropriated funds for fiscal year 2000 to initiate the *Puget Sound and Coastal Washington Hatchery Improvement Project*. The purpose of the project was to facilitate a scientific solution to problems associated with hatcheries, including conflicts between harvest and conservation goals. Those Congressional actions and appropriations were in response to the recommendations of a Science Advisory Team appointed by Senator Slade Gorton (WA).¹¹ The Science Team proposed to Congress that hatcheries and their programs undergo a systematic, science-based review and redesign to achieve two desired goals: (1) help conserve wild salmon and steelhead populations, and (2) support sustainable fisheries. Congress also provided funding to support a *Hatchery Scientific Review Group* (HSRG) to assess hatchery programs in Puget Sound and coastal Washington.

The HSRG reviews of state, tribal, and federal hatchery programs in Puget Sound and coastal Washington were completed in 2005. Those reviews resulted in more than 1,000 recommended changes to over 200 hatchery programs and 100 facilities. Those reviews provided a new ecosystem perspective and scientific template for managing hatcheries to support sustainable harvests while, at the same time, reducing biological risks to natural populations and contributing to their conservation. The Service was an active participant in those reviews, and the success of the HSRG in Puget Sound

⁸ Naish, K.A., and six co-authors. 2008. *An evaluation of the effects of conservation and fishery enhancement hatcheries on wild populations of salmon*. *Advances in Marine Biology* 53: 61-194.

⁹ Currens, K.P., and C.A. Busack. 2004. *Practical approaches for assessing risks of hatchery programs*, p.277-289. In: Nickum, M.J., and three co-editors. *Propagated Fish in Resource Management*. American Fisheries Society, Symposium 44, Bethesda, Maryland.

¹⁰ NMFS-NOAA 1998. *Endangered and threatened species: Proposed endangered status for two Chinook salmon ESUs and proposed threatened status for five Chinook salmon ESUs; proposed redefinition, threatened status, and revision of critical habitat for one Chinook salmon ESU; proposed designation of Chinook salmon critical habitat in California, Oregon, Washington, Idaho*. U.S. Federal Register 63: 11482-11520 (March 9, 1998).

¹¹ Gorton Science Advisory Team. 1999. *The reform of salmon and steelhead hatcheries in Puget Sound and coastal Washington to recover natural stocks while providing fisheries*. Report to Senator Slade Gorton, May 7, 1999.

USFWS Pacific Region Hatchery Review Team

Summary and Overview of the USFWS Review of Federal Hatcheries in the Pacific Region

and coastal Washington motivated the Service to initiate similar reviews of its federal hatcheries in the Columbia River basin.¹²

THE US FISH AND WILDLIFE SERVICE TAKES ON HATCHERY REFORM

In 2004, the Service concluded that its 12 National Fish Hatcheries in the Columbia River basin should undergo an internal “hatchery review” similar to the HSRG’s efforts in Puget Sound and coastal Washington.¹³

- Federal hatchery programs are operated in accordance with best available science;
- Programs are consistent with ESA-protection and recovery plans; and
- Programs are responsive to new scientific information and changing regional priorities.

The Service appointed a *Hatchery Review Working Group* (HRWG) in November, 2004.¹⁴ The HRWG was tasked with proposing a process for reviewing all National Fish Hatcheries in the Columbia River Basin. The HRWG proposed a process modeled after the HSRG reviews in Puget Sound and coastal Washington.¹⁵

The HRWG first adopted, with slight modification, the principles and goals of the HSRG review process, as presented below.

Principles of the Service review process:

1. Every hatchery stock and program must have well-defined goals described in terms of desired benefits and purposes (e.g., harvest, conservation, research, education);
2. Hatchery programs must be scientifically defensible; and
3. Hatchery programs must respond adaptively to new information.

¹² The HSRG reviews in Puget Sound and coastal Washington were considered successful because they brought state, tribal, and federal biologists and managers together whereby goals were clarified, risks were identified, and conflicts were resolved. New scientific methods for assessing risks of hatchery fish to natural populations were also developed. The Service had a science representative on the HSRG and a policy-management representative on the Comanager Coordinating Committee. The HSRG completed its reviews in Puget Sound and coastal Washington in 2005. For more information, visit www.hatcheryreform.org.

¹³ The 12 National Fish Hatcheries (NFHs) in the Columbia River Basin are Eagle Creek, Carson, Little White Salmon, Willard, Spring Creek, Warm Springs, Leavenworth, Entiat, Winthrop, Dworshak, Kooskia, and Hagerman NFHs.

¹⁴ Members of the HRWG, all fish biologists with the Service, were: Ray Brunson, Don Campton (co-chair), Steve Croci, Douglas DeHart (co-chair), Craig Eaton, Rich Johnson, Joe Krakker, Larry Marchant, Doug Olson, Tim Roth, Larry Telles, and Dave Zajac.

¹⁵ Hatchery Review Working Group. 2005. Proposed process for U.S. Fish and Wildlife Service review of National Fish Hatcheries in the Columbia River Basin. Co-Manager Report for Public Distribution, Fishery Resources, U.S. Fish and Wildlife Service, Pacific Region, Portland, Oregon (June 10, 2005). Available at: <http://www.fws.gov/pacific/Fisheries/hatcheryreview/reports.html>.

USFWS Pacific Region Hatchery Review Team

Summary and Overview of the USFWS Review of Federal Hatcheries in the Pacific Region

Goals of the Service review process:

1. Establish the scientific foundations for National Fish Hatcheries and cooperative programs;
2. Conserve genetic resources for salmonid species;
3. Assist with the recovery of naturally spawning populations;
4. Provide for sustainable fisheries;
5. Conduct scientific research; and
6. Improve quality and cost-effectiveness of hatchery programs.

The HRWG provided 15 recommendations for reviewing federal hatcheries in the Columbia River Basin. Among the first tier recommendations, the HRWG recommended (a) the formation of a Hatchery Review Team composed of Service personnel with complementary expertises and (b) inclusion of state-operated hatcheries of the Lower Snake River Compensation Plan (LSRCP) with the review of all National Fish Hatcheries (NFH) in the Columbia River Basin.

THE HATCHERY REVIEW TEAM

The Service's *Hatchery Review Team* (Team) was formed in September, 2005. Many members of the Working Group were subsequently appointed as members of the Team. The Team also included a representative from NOAA Fisheries and several recognized scientists who assisted with the reviews for specific regions. Most of the original members remained with the Team for the entire review process, but the composition did change slightly during the course of the reviews.¹⁶ The Service's Division of External Affairs provided outreach support, and *Long Live the Kings*, a non-profit organization devoted to restoring wild salmon to the waters of the Pacific Northwest, provided facilitation and logistic support via contract from the Service.¹⁷

THE SERVICE'S HATCHERY REVIEW PROCESS

The Team conducted their reviews from October 2005 through September 2010. The Warm Springs NFH in the Deschutes River basin of eastern Oregon was reviewed first (Fig. 1). It served as a "pilot review" to refine the review process. The remainder of the Columbia River basin was subdivided into three major regions: Lower Columbia River (Eagle Creek, Carson, Little White Salmon, Willard, and Spring Creek NFHs), the Mid-Columbia River (Leavenworth, Entiat, and Winthrop NFHs), and the Snake River basin (Dworshak, Kooskia, and Hagerman NFHs, and the nine LSRCP hatcheries

¹⁶ Service members of the Review Team were: Don Campton (co-chair), Doug DeHart (co-chair), Ray Brunson, Susan Gutenberger, Joe Krakker, Larry Marchant, Doug Olson, Larry Telles, and Dave Zajac. The NOAA Fisheries representative on the Team was Tom Flagg (Director, Manchester Research Station, NOAA Fisheries, Manchester, Washington). Temporary members of the Team who served for specific regions were: David Carie (USFWS, lower and mid-Columbia River reviews), Bryan Kenworthy (USFWS, Snake River LSRCP reviews), Chris Pasley (USFWS, Olympic Peninsula and Snake River LSRCP reviews), Barry Berejikian (NOAA Fisheries, Olympic Peninsula review), Herb Pollard (ret., Snake River NFH and LSRCP reviews), Carl Schreck (Oregon State University, Warm Springs NFH review), and Bruce Stewart (Northwest Indian Fisheries Commission, Olympic Peninsula review).

¹⁷ Outreach support was provided by Amy Gaskill and Cheri Anderson of the Service. Facilitation and logistic support was provided by Michael Kern of Long Live the Kings (Warm Springs NFH and mid-Columbia reviews) and Michael Schmidt, also of Long Live the Kings (Lower Columbia, Olympic Peninsula, and Snake River reviews).

USFWS Pacific Region Hatchery Review Team

Summary and Overview of the USFWS Review of Federal Hatcheries in the Pacific Region

operated by the states of Idaho, Oregon, and Washington).¹⁸ In 2008, the review was expanded to include the three National Fish Hatcheries on the Olympic Peninsula (Makah, Quilcene, and Quinault NFHs). Overall, a total of 24 hatcheries and 53 hatchery programs were reviewed.

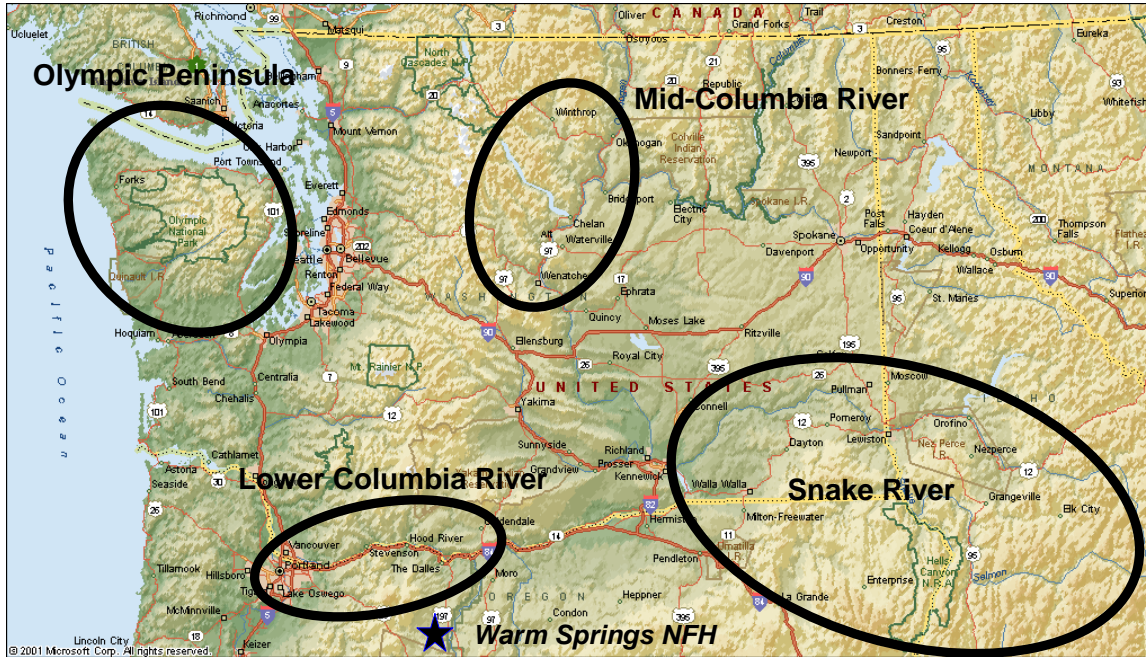


Figure 1. Regions of the Pacific Region Hatchery Review Project

The Team asked many questions during the course of the reviews. Do these hatchery programs have well-defined goals described in terms of harvest, conservation, or other benefits that are quantifiable and measurable? Do the hatchery programs contribute to those goals? Are the programs at each hatchery, including their respective protocols, scientifically defensible? Are existing monitoring and evaluation programs sufficient to allow for “informed decision making” and “adaptive management”?

The Team used the published scientific literature, detailed information provided by biologists and managers representing the Service and comanaging states and tribes, and the Team’s 500+ years of cumulative professional experience to assess the benefits and risks of each program relative to the stated goals of the program and those for the populations themselves (e.g., support harvest, conservation, etc.).¹⁹ T

¹⁸ The Team reviewed programs and facilities at the following LSRCP hatcheries, operated by Idaho Department of Fish and Game (IDFG), Oregon Department of Fish and Wildlife (ODFW), and Washington Department of Fish and Wildlife (WDFW): Clearwater (IDFG), Magic Valley (IDFG), McCall (IDFG), Sawtooth (IDFG), Irrigon (ODFW), Lookingglass (ODFW), Wallowa (ODFW), Lyons Ferry (WDFW) and Tucannon (WDFW) fish hatcheries.

¹⁹ The principle benefits assessed were harvest and conservation, but included research, cultural and education benefits. The principle risks assessed were biological risks to natural and hatchery populations, but included risks to human health and safety and assessments of facility needs.

USFWS Pacific Region Hatchery Review Team

Summary and Overview of the USFWS Review of Federal Hatcheries in the Pacific Region

assessments and recommendations and provided comments and suggestions back to the Team for completing the final reports.

Separate final reports were prepared for Warm Springs NFH, National Fish Hatcheries in each of the four geographic regions, and state-operated LSRCP hatcheries in Idaho, Oregon, and Washington. Overall, the Team produced ten detailed reports containing approximately 750 program-specific recommendations and 16 region-wide recommendations.

The review process provided a special opportunity to inform the public about the benefits, risks, capabilities, and limitations of hatcheries and artificial propagation as tools for supporting conservation and sustainable fisheries goals. Indeed, this opportunity turned out to be a major benefit of the review process itself. The review was conducted in a transparent manner with both direct meetings with comanagers and public meetings with stakeholders. These meetings provided additional opportunities for input from federal, state, and tribal comanagers, as well as the interested public. All draft and final reports were posted on the Team's Service website.²⁰

KEY FINDINGS OF THE HATCHERY REVIEW TEAM

The Team concluded that federal hatchery programs are, in general, moving in a direction consistent with the Team's three principles. These hatchery programs are: (a) incorporating new scientific information, including concepts of hatchery reform, in management and operations, (b) improving program monitoring and evaluation via new methodologies (e.g., PIT tags), (c) implementing new practices to reduce risks to natural populations, and (d) changing existing programs or initiating new programs that assist with the conservation and recovery of ESA-listed salmon and steelhead populations. Some examples are listed below.

- The vast majority of fish released from the Service's 15 National Fish Hatcheries in the Pacific Region (approximately 22.6 million fish) are marked or tagged so that they can be distinguished from natural-origin fish in (a) recreational, commercial, and tribal fisheries, (b)

The Columbia River HSRG review: A tandem effort

In 2005, Congress directed NOAA Fisheries, - the federal agency responsible for implementing the ESA for Pacific salmon and steelhead - to initiate a review of hatchery programs in the Columbia River Basin. NOAA Fisheries requested that the HSRG conduct the reviews. The HSRG used a recently developed population dynamics modeling tool, the "All-H Analyzer" (AHA), to review 178 hatchery programs and 351 salmon and steelhead populations, 2006-2009 (www.hatcheryreform.us).

The Service's Hatchery Review Team (HRT) and the HSRG both reviewed the Service's hatchery programs, but with different perspectives and objectives. The HSRG used AHA and population dynamics modeling to evaluate alternative hatchery strategies for reducing risks to natural populations while maintaining harvest as part of an integrated, Columbia River basin strategy. The HSRG recommendations focused on (a) re-sizing hatchery programs, (b) managing natural spawning escapement of hatchery-origin fish, and (c) genetic management of hatchery broodstocks to meet conservation goals while retaining harvest benefits. The Service's review focused on fish culture protocols, facilities, and "on-the-ground" management of hatchery fish with respect to the three stated principles of the review. In the end, recommendations of the two review groups were very similar, but their approaches were quite different and complementary: the fine-scale approach of the HRT vs. the "big picture" approach of the HSRG. Two members of the HRT were also members of the HSRG, creating crossover between the two review groups. Review schedules were also coordinated so that findings could be shared.

²⁰ www.fws.gov/Pacific/fisheries/hatcheryreview/

USFWS Pacific Region Hatchery Review Team

Summary and Overview of the USFWS Review of Federal Hatcheries in the Pacific Region

at the hatchery during broodstock collection, and (c) on natural spawning grounds. Marking and tagging improves broodstock and population management (e.g., the contributions of natural-origin fish to hatchery broodstocks and hatchery-origin fish to the naturally spawning populations), increasing the likelihood of achieving desired benefits and program goals while reducing risks to natural populations. Marking and tagging also improves program monitoring and evaluation.

- Four Service hatchery programs are focused exclusively on research and recovery of species listed as threatened or endangered under the ESA.²¹
- Three Fish Health Centers of the Service provide “state-of-the-art” scientific monitoring and diagnostic analyses of fish health at Service hatcheries.²²
- Service programs are increasingly implementing progressive broodstock management strategies. For example, Warm Springs NFH integrates natural-origin spring Chinook into the broodstock annually to maintain genetic continuity with the indigenous natural population in the watershed. In addition, Spring Creek NFH has modified its spawning protocols in accordance with genetic guidelines to maximize the reproductive success of all fish selected for broodstock.
- Most hatchery programs are providing benefits consistent with their stated purposes (e.g., harvest, conservation). Indeed, the collective benefits of all hatchery programs are substantial.

The Team did note many areas where programs could be improved relative to the three principles that guided the reviews. Overall, the team provided approximately 750 program-specific recommendations intended to increase benefits and/or decrease risks of Service hatchery programs. These recommendations covered all areas of fish culture and hatchery management including: (a) program goals and objectives, (b) broodstock choice and collection, (c) hatchery and natural spawning, including adult returns, (d) incubation and rearing, (e) release and outmigration of juvenile fish, (f) facilities and operations, (g) research, monitoring, and accountability, and (h) education and outreach.

One overall recommendation of the Team was that program goals should be stated explicitly as intended benefits that can be measured and evaluated. The Team observed that program goals were often expressed qualitatively (e.g., “support harvest”) or in terms that reflected mitigation goals or legal agreements; for example, goals were often stated as the number of juvenile fish released, or the number of adult fish returning to a particular location. However, release numbers describe strategies, not benefits, and adult fish by themselves provide no measurable benefits if they do not contribute to fisheries, conservation, or other quantifiable goals. Many programs provide very substantial benefits that can be quantified, although the stated *mitigation goal* of the program may not be achieved. In some cases, management goals for particular populations—both hatchery and wild—were themselves unclear, hindering proper association between the hatchery program and desired outcomes or benefits (e.g., conservation and harvest goals for spring Chinook in the Clearwater River were unclear). The Team concluded that hatchery programs need to express goals quantitatively as desired or intended benefits so that success can be defined, measured, and evaluated relative to those goals.

²¹ Hood Canal Steelhead at Quilcene NFH, White River (Wenatchee River) spring Chinook at Little White Salmon NFH, Lake Ozette sockeye at Makah NFH, and Redfish Lake sockeye at Sawtooth FH.

²² Idaho Fish Health Center (FHC), Lower Columbia FHC, and Olympia FHC.

USFWS Pacific Region Hatchery Review Team

Summary and Overview of the USFWS Review of Federal Hatcheries in the Pacific Region

The Team also identified some management actions that did not have sufficient scientific support, or justification for those actions was not documented or readily available. Examples included the transfer and release of eggs and fish between watersheds, the loading of hatchery raceways with juvenile fish in excess of fish culture guidelines, and the outplanting into streams of “surplus” hatchery-origin adults or subyearling fry. In some cases, the Team concluded that the risks of the action exceeded the likelihood that the desired benefits would be achieved based on conclusions from published, scientific studies (e.g., presumed benefits versus risks of fry outplants).

Several of the Service’s hatchery facilities require significant modifications to operate more effectively and/or to reduce fish health risks. Service facilities are, on average, 30 to 40 years old and were originally designed to propagate one or two populations, primarily to satisfy mitigation agreements. Today, regional fish management strategies require the propagation of many populations to address both harvest and conservation needs, thus placing greater demands for more and varied rearing space. Many facilities lack sufficient space to rear the required number of fish at densities consistent with fish health guidelines, especially during early rearing immediately after hatching. Hatchery water supplies at some facilities also need to be improved to reduce fish health risks and/or to maintain current program sizes.²³

The Team described several other issues common to many hatcheries including the need to:

- Develop localized hatchery broodstocks based on genetic concepts that promote local adaptation of hatchery populations;
- Re-evaluate the use of antibiotics to minimize disease and environmental risks;
- Mark or tag all hatchery fish intended for harvest so they can be distinguished from natural-origin fish; and
- Improve public education and outreach at each facility (e.g. consistent message, new signage, visitors center upgrades, web site improvements).

The Team also recommended the establishment of region-wide *best management practices* (BMPs) for fish culture, facility operations, and data recording/reporting to facilitate the consistent application of best science and best practices in the conduct of Service hatchery programs at multiple facilities.

TAKE-HOME LESSONS OF THE HATCHERY REVIEW PROCESS: WHAT IS HATCHERY REFORM?

Hatchery reform, as a process, is the scientific and systematic redesign of hatchery programs to help conserve naturally spawning fish populations while continuing to support sustainable fisheries. New concepts emerging from this process define hatchery reform and change the context of hatchery management. Traditional management strategies such as maximizing the number fish reared or *produced* at each

A comprehensive management approach

Under hatchery reform, hatcheries are viewed as one tool for achieving conservation and harvest goals that must be part of a comprehensive strategy including management of harvest, habitat, and hydropower dams.

²³ For example, the declining water supply at Hagerman NFH and Magic Valley FH pose significant challenges to meeting regional fish management goals for steelhead. Dworshak NFH relies on water pumped directly from the vicinity of the adult return ladder, thereby exposing that water to pathogen-laden adult steelhead and spring Chinook, and posing disease risks to juvenile fish reared at the hatchery.

USFWS Pacific Region Hatchery Review Team

Summary and Overview of the USFWS Review of Federal Hatcheries in the Pacific Region

hatchery, and measuring program performance by the number of fish released, do not measure benefits and may be difficult to defend scientifically. Instead, the biological and environmental needs of the propagated populations, the intended benefits of the program (harvest, conservation, research, education, and cultural), and the biological risks posed by the program—both to the propagated population and to other populations and species—are the critical elements that need to be evaluated and understood under the new paradigm of hatchery reform. Hatchery reform is based on management concepts adapted from those used to manage natural populations; that is, maximize population viability, allow local adaptation, and conserve indigenous gene pools. Hatchery reform inevitably leads to the view that hatcheries are a type of habitat within the ecosystems and watersheds in which they occur. In this context, hatchery fish are viewed as a renewable natural resource, not as an aquaculture product or commodity, but with population dynamic attributes that allow sustainable harvest rates to exceed those for fish from natural populations. In short, hatchery reform is managing hatcheries as a type of habitat, managing hatchery and wild fish as components of viable populations, and managing hatchery and wild populations for maximum viability.

IMPLEMENTING A NEW HATCHERY MANAGEMENT PARADIGM

The U.S. Fish and Wildlife Service has established a policy for implementing the recommendations of the Hatchery Review Team.²⁴ Many recommendations relate to culture protocols or facilities and can be implemented directly. Other recommendations are *programmatic* and relate to the number of fish raised, released, or transported to other locations. Implementation of these programmatic recommendations requires collaboration and agreement with the states and tribes.

The Service is currently developing methods for tracking and communicating – both to the public and internally – implementation progress. The following are examples of changes the Service has already implemented in response to the recommendations of the Team.

- The spring Chinook program at Entiat NFH was terminated because ESA constraints prevented attainment of intended harvest benefits on hatchery-origin fish, but those same fish posed significant genetic and ecological risks to ESA-listed natural-origin spring Chinook salmon in the Entiat River.
- Idaho Department of Fish and Game has initiated the development a local broodstock of B-run steelhead at the Pahsimeroi Hatchery in the upper Salmon River. If successful, this new broodstock program will eliminate the annual transfers of B-run steelhead to the upper Salmon River from Dworshak NFH in the Clearwater River, thus reducing fish health and other biological risks. In addition, all B-run steelhead destined for release in the Upper Salmon River are now reared at Magic Valley FH, rather than split between Magic Valley FH and Hagerman NFH, reducing disease and fish transfer risks.
- Winthrop NFH is currently developing a local Methow River steelhead program to replace the existing program that relies on adults collected at Wells Dam on the Columbia River. Adult steelhead trapped at Wells Dam represent multiple populations, including fish destined for the

²⁴ Memorandum dated September 18, 2008 from Daniel H. Diggs, former Assistant Regional Director for Fisheries, Pacific Region, U.S. Fish and Wildlife Service, Portland, Oregon.

USFWS Pacific Region Hatchery Review Team

Summary and Overview of the USFWS Review of Federal Hatcheries in the Pacific Region

Methow and Okanogan rivers. A local broodstock for the Methow River reduces genetic and other biological risks to all populations upstream of Wells Dam.

- The Service reduced the number of Chinook salmon released from Spring Creek NFH (via Spring Creek reprogramming), eliminating the need release fish in March each year, one month earlier than the normal outmigration period. In previous years, Spring Creek NFH released a portion of its fish in March when the capacity of the hatchery had been reached. Reducing the total number of fish reared and released from Spring Creek NFH allows all fish to be released during their normal outmigration periods in April and May.
- The holding facility for adult fish at Winthrop NFH and the weir at Kooskia NFH have been modified in response to recommendations of the Review Team, thereby improving efficiency and safety of broodstock collection.

Implementation of hatchery reform across the Pacific Northwest

The implementation phase of hatchery reform is fully underway now that formal reviews are completed for all National Fish Hatcheries in the Pacific Northwest region. Federal, state and tribal comanagers and partners are also moving forward with implementing hatchery reform. For example:

- *The Washington State Fish and Wildlife Commission recently adopted a hatchery and fishery reform policy for the Washington Department of Fish and Wildlife.*
- *The Washington Department of Fish and Wildlife implemented numerous recommendations proposed by the HSRG and continues to incorporate hatchery reform in their 21st Century Salmon and Steelhead strategic planning and management framework.*
- *Recommendations of the Service's Hatchery Review Team and the HSRG were incorporated into the most recent versions of the Hatchery and Genetic Management Plans (HGMPs) for hatchery programs in the Snake River basin. Recommendations that change existing co-manager agreements are directed to appropriate forums for review and concurrence.*
- *The Northwest Power and Conservation Council and Bonneville Power Administration included HSRG recommendations into their proposal process for fish and wildlife projects on the Columbia River.*
- *Hatchery reform efforts identified ecological interactions between hatchery and wild fish as a major scientific uncertainty. As a result, an international symposium devoted to ecological interactions- the 2010 State of the Salmon Conference – was held in Portland, Oregon in May, 2010.*
- *United States Congress recently provided funding to initiate a HSRG review of hatcheries in California.*

CONCLUDING REMARKS AND PERSPECTIVES: A ROADMAP TO THE FUTURE

The Review Team evaluated hatchery programs primarily from the perspective of the three principles adapted from the Hatchery Scientific Review Group (HSRG). Consistencies with the Team's principles and the scientific literature were driving factors in the Team's reviews from their inception. "Best management practices" reflect scientific defensibility and have gained increasing support in the Pacific Northwest among the comanagers in recent years. The Team believes that scientific information should be the foundation of hatchery management and endorses consistent application of best science and best practices in the conduct of Service hatchery programs.

The Team recognizes that site-specific circumstances and differing comanager strategies, from one basin to another and from one program to another, may require different local practices. These differences do not detract from the benefit or importance of using consistent methods and standards that are goal-driven, scientifically-defensible, and accountable.

USFWS Pacific Region Hatchery Review Team

Summary and Overview of the USFWS Review of Federal Hatcheries in the Pacific Region

The recommendations and reports of the Hatchery Review Team are both tactical and strategic. The recommendations can be viewed as tactical changes that are intended to increase benefits, reduce risks, and/or increase the scientific defensibility of specific programs and actions. The reports can be viewed as a strategic plan for addressing hatchery reform in a holistic and integrative manner.

The Team believes the Service has a unique opportunity to take a broader ecological and long-term perspective regarding hatchery management. From the Team's perspective, hatcheries represent a type of habitat, and the biological principles used to manage and conserve natural populations of anadromous salmonid fishes should be applied equally to the conservation and management of hatchery populations. In this context, some populations depend on only the hatchery environment or the natural environment for their reproduction and early life history, while other populations depend on both. The reports and recommendations of the Team can be viewed as a road map to the future. They also represent an opportunity for the Service and comanagers in the 21st Century.

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The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people.

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