



**U.S. Fish & Wildlife Service - Pacific Region
Olympic Peninsula Hatchery Review Team**

Olympic Peninsula

Big Quilcene, Quinault, and Sooes River Watersheds



Quilcene, Quinault, and Makah National Fish Hatcheries Assessments and Recommendations

Draft Report: Summary

February 2009

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

Summary

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 US Fish and Wildlife Service (Service) began, in October 2005, a multi-year review of 21 salmon and steelhead hatcheries that the Service owns or operates in the Columbia River Basin. This review was expanded in 2007 to include the three National Fish Hatcheries on Washington's Olympic Peninsula. 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 Project¹. 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 Quilcene, Makah, and Quinault National Fish Hatcheries (NFH). Quilcene NFH is located on the Big Quilcene River along the western side of Hood Canal. Quinault NFH located on Cook Creek within the Quinault River watershed along the southern coast and Makah NFH on the Sooes River along the northern coast of Washington's Olympic Peninsula.

The Review Team considered, as a foundation for its assessments, four characteristics of each salmonid stock in the Northern Hood Canal, Quinault River and Sooes 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 comanagers², as a foundation for assessing the benefits and risks of the Service's hatchery programs. 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.³

Quilcene NFH

Facility Overview: The Quilcene NFH occupies approximately 47.4 acres. Its main facilities consist of 39 8-foot x 80-foot raceways, three water intake structures (two on the Big Quilcene

¹ www.lltk.org/HRP.html

² *Comanagers in the Hood Canal/Quilcene River watershed (Quilcene NFH) are the Skokomish Tribe, Washington Department of Fish and Wildlife, Point No Point Treaty Council, Jamestown S'Kallam Tribe, Port Gamble S'Kallam Tribe, National Marine Fisheries Service (NOAA Fisheries), and the U.S. Fish and Wildlife Service. Comanagers in the Quinault River watershed (Quinault NFH) are the Makah Nation, Washington Department of Fish and Wildlife, National Marine Fisheries Service (NOAA Fisheries), and the U.S. Fish and Wildlife Service. Comanagers in the Sooes River watershed (Makah NFH) are the Makah Nation, Washington Department of Fish and Wildlife, National Marine Fisheries Service (NOAA Fisheries), and the U.S. Fish and Wildlife Service.*

³ www.fws.gov/Pacific/fisheries/HatcheryReview/

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

River and one on Penny Creek), a pre-settling pond, a pollution abatement pond, a hatchery building (containing the office, laboratory, and tank room), an isolation/quarantine building, and a shop building, all of which are located on the west bank of the Big Quilcene River at RM 2.8. One residence is on the hatchery grounds proper, and two other residences for hatchery staff are situated on a hill just north of the hatchery. The hatchery diverts returning adult salmon to holding facilities by means of a graduated-field electrical weir and fish ladder at RM 2.8. This facility is one of the oldest federal fish hatcheries in the region having begun operation in 1911.

The hatchery is funded by Congressional appropriation of hatchery operations funds to the Service and the Service's hatchery cyclical maintenance fund. The operational budget for FY2008 was \$617,343. Costs for monitoring and evaluation (M&E) and fish health in FY2008 were approximately \$85,000 and \$91,000, respectively. Capital Improvements to the Quilcene NFH have totaled \$907,797 during the period 2004- 2008.

Coho

Program overview: The coho program operates as a segregated harvest program within Quilcene Bay and the Big Quilcene River. This stock has been artificially propagated since 1911 and currently exhibits a run timing that is approximately one to four months earlier than other hatchery and natural stocks of Hood Canal coho. While historic egg transfers occurred sporadically prior to 1974, the Quilcene NFH coho stock is believed to largely represent the ancestral lineage of the original Quilcene River stock, although the stock has been propagated artificially for more than 30 coho generations. The hatchery currently releases 400,000 yearlings on-station. An additional 200,000 smolts are released from floating net pens in Quilcene Bay (Skokomish Tribal program). Adult collection, incubation, and pre-smolt rearing occur on-station.

Benefits: Coho from Quilcene NFH support commercial, tribal and sport fisheries coast wide (Alaska, British Columbia, North Coast, Strait of Juan de Fuca) and in the Big Quilcene River, Hood Canal, and Admiralty Inlet. A quantified harvest goal has not been established. On-station releases: Based on a desired 5.0% smolt to adult return rate (harvest plus hatchery escapement) and the current program size, the predicted potential harvest would 18,800 adult coho per year. Quilcene net pen releases: Assuming that net pen survival to adult is similar to on-station releases, the predicted potential harvest would be 10,000 adult coho per year. Tribal fisheries within Hood Canal and surplus hatchery returns distributed to tribal members are highly significant benefits of this program.

Risks: Algae blooms in Quilcene Bay in some years prevent timely transfer of coho to the net pens. This may result in increased rearing densities due to keeping coho on station until the blooms recede, posing a fish health risk. The Quilcene coho program may pose a genetic risk to other coho populations in Hood Canal, limited to the degree of overlap in spawn time between the earlier returning Quilcene NFH coho and the later returning Hood Canal coho population, and limited by the degree of straying that occurs. The Quilcene weir and adult fishway inhibit upstream migration of winter steelhead and other wild fish populations native to the Big Quilcene River.

Recommendations for current program: The Review Team identified 24 specific recommendations to reduce risks and/or improve benefits of the current coho program at Quilcene NFH. These recommendations include; (a) development of natural production and escapement goals for Big Quilcene River coho, (b) assessment of straying risk from Quilcene NFH and Quilcene Bay Net Pen coho to natural populations of coho in North Hood Canal, (c) assessment of

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

water management practices to determine maximum production capacity without exceeding water right limitations, and (d) modification of weir and ladder configuration to improve upstream passage conditions for winter steelhead. Quilcene NFH needs improved infrastructure and expanded program activities to accommodate visitors. The latter is especially timely with the hundredth anniversary of the facility approaching in 2011.

Alternatives to Current Program: The Review Team considered the pros and cons of four alternatives to the existing coho program ranging from the current program with full implementation of all program specific recommendations (Alternative 1) to termination of all programs at Quilcene NFH and decommissioning of the facility (Alternative 4). The Review Team recommends the implementation of Alternative 2 – Reduce the current program from a 600,000 to a 400,000 (or other program size equivalent to the number of coho that can be reared on station to full term without exceeding the Service’s recommended upper rearing thresholds and Quilcene NFH’s water right restriction) smolt release. The combined effect of water right restrictions, presence of harmful algal bloom (HAB) in Quilcene Bay, and large number of fish returning to the hatchery rack support the program reduction from a 600,000 to 400,000 combined on-station and Quilcene Bay Net Pen coho smolt release. Adopting this alternative would allow the hatchery to continue to contribute significantly to local tribal, sport and commercial fisheries and still operate within the constraints of the Big Quilcene River water right. This alternative also allows more flexible management in use of the net pen. If HAB presents a problem all 400,000 coho could remain on-station without exceeding the water right restrictions. Conversely when HAB is not an issue, up to half the fish in production could be transferred to and released from the net pen. This would reduce feed and workloads at the hatchery and could, under some circumstances present opportunity for the hatchery to participate in conservation and recovery programs of aquatic species in the Hood Canal area.

Steelhead

Program overview: The Hood Canal Steelhead Project is a NOAA-led multi-agency collaborative study and rebuilding effort that involves supplementing three populations (Skokomish River, Dewatto River, and Duckabush River) and monitoring them along with three control populations that receive no hatchery fish. The Quilcene NFH incubates up to 18,000 embryos collected from natural redds in its quarantine facility until viral pathogen sampling is complete (30 d post-ponding). Incoming embryos represent 5 to 20 redds from each of two populations (Duckabush and Dewatto River). The fry are transferred to the Long Live the Kings Lilliwaup hatchery for rearing and release.

Benefits: Steelhead incubation and early rearing at the Quilcene NFH provides a significant conservation benefit to *threatened* steelhead populations in Hood Canal. The quarantine facility provides for incubation and rearing of embryos collected from natural redds while pathology screening is completed. The Hood Canal Steelhead Project will amplify the abundance of naturally spawning steelhead for approximately eight years, after which the program will be terminated. Based on a similar program in the Hamma Hamma River, the expectation is that the program will result in an approximate 10-fold increase in natural redd production in the supplemented streams when hatchery fish are spawning. The effectiveness of supplementation in increasing natural population productivity and maintaining genetic diversity will be determined by comanager monitoring of the productivity of subsequent generations after the programs have been terminated.

Risks: The review Team could not identify any major or significant risks of the steelhead program at the Quilcene NFH. Genetic risks associated with variability and effective population size are

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

minimized by representing a large portion of the adult population and releasing fewer than 10,000 fish per population per year over an 8 year period. Genetic risks associated with domestication are minimized by rearing the steelhead according to a natural life-history pattern, then releasing the fish as two-year old smolts. Rearing age-4 and age-5 adults has the potential to cause some domestication selection. There is a potential to mine the population by removing eggs; however, this project attempts to mitigate for this by avoiding excess egg collections. Mortality associated with redd pumping to non-collected eggs disturbed by pumping is unknown. A greater proportion of the total population must be sacrificed for pathology screening because of current disease management policies and the small number of fish in the program. Disease risk has also been minimized due to utilization of the existing quarantine/isolation building and subsequent testing of representative fry prior to transfer. Although precautions are in place, there is a slight risk of transferring pathogens and disease from target drainages to Lilliwaup Creek.

Recommendations for Current Program: The Team recommends that Quilcene NFH continues to support the Hood Canal Steelhead Project (HCSP) through completion of the supplementation phase (2014). This contribution is critically important to the success of the HCSP..

Alternatives to Current Program: The Review Team considered the pros and cons of five alternatives to the existing steelhead incubation program. These alternatives ranged from maintaining the current level of support to termination of the steelhead incubation and early rearing program. Maintaining the current program requires no major modifications, only small adjustments to current practices and facilities. In the near term, the Team recommends expanding the existing program by developing the capability for Quilcene NFH to rear Hood Canal steelhead beyond the early rearing stage (Alternative 2). This capability would provide for complete implementation of the HCSP by rearing 400 adult steelhead or rearing approximately 8,000 smolts, depending which of four rearing scenarios are chosen. To accomplish this, the team supports the following upgrades to the Quilcene NFH: 1) prioritizing water use from Penny Creek or adding some type of disinfection unit for Quilcene River water, 2) dedicating rearing containers in a secure area to provide isolation from the rest of the hatchery and adequate biosecurity, and 3) obtaining an exemption from the Disease Control Policy for a reduced virus testing level because of the listed status of the stocks and small size of the program. Two longer-term alternatives included expanding the capabilities of the Quilcene NFH to contribute to culture-based rebuilding efforts for Quilcene River steelhead (Alternative 3) or other Hood Canal salmon populations (Alternative 4).

Quinalt NFH

Facility Overview: The Quinalt NFH began operations in 1968 and its programs serve to restore and enhance depleted runs of salmon and steelhead and associated fisheries on the Quinalt Indian Reservation and adjacent federal lands. The main facilities of Quinalt NFH consist of thirty-six 16-foot-wide by 80-foot-long raceways, two water re-use pumps, a pollution abatement pond, and three water intake structures. The main intake structure is located on Cook Creek, and a smaller one on Hatchery Creek. A third intake structure siphons water from a large pond adjacent to the Moclips Highway approximately 2 miles northeast of the facility. The hatchery diverts returning adult salmon to holding facilities by means of an electrical fish barrier and fish ladder. There are three permanent government residences and five temporary residential trailer pads.

Hatchery operations are coordinated with the Quinalt Nation via a Cooperative Agreement. The hatchery is funded by Congressional appropriation of hatchery operations funds to the Service and

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

the Service's hatchery cyclical maintenance fund. The operational budget for FY2008 was \$798,251. Costs for monitoring and evaluation (M&E) and fish health in FY2008 were approximately \$200,000 and \$115,000, respectively. Capital Improvements to the Quinault NFH have totaled \$1,586,167 during the period 2004-2008.

Steelhead (on-station release)

Program overview: The current steelhead hatchery stock was founded from natural-origin adults captured in the lower portion of the Quinault River watershed downstream from Lake Quinault. The hatchery currently produces 190,000 winter steelhead smolts for release into Cook Creek. The purpose of the program is to mitigate for tribal and sport fisheries in the Quinault River and Cook Creek where production has declined due to loss of habitat. The program also includes a 20,500 steelhead fry release upstream of the hatchery in Cook Creek

Benefits: A specific harvest goal has not been established. However, based on the current program size and capability to achieve a 2.0% smolt to adult return rate (2001-2005, harvest plus hatchery escapement), the program would contribute a mean harvest of 3,250 adult steelhead per year. The facilities location on tribal lands provides significant economic, educational and cultural opportunities for the local tribal community.

Risks: Incidental passage of adults above the weir into the hatchery's water source due to weir malfunction or natural occurrences (e.g. high flows) poses a disease transmission risk to fish reared on station. Of special concern is the *Infectious Hematopoietic Necrosis* (IHN) virus. The operation of an electric weir in an area where tribal and sport fishing occurs poses a human safety risk. The segregated steelhead hatchery program poses an inherent genetic risk to wild steelhead stocks in the Quinault basin. Available information indicates high homing fidelity of on-station Quinault steelhead releases but information regarding hatchery steelhead on spawning grounds is lacking.

Recommendations for current program: The Review Team identified 31 specific recommendations to reduce risks and/or improve benefits of the current steelhead program at Quinault NFH. These recommendations include: (a) assess distribution and abundance of naturally spawning steelhead in the lower Quinault River Basin and assess the extent of straying of Quinault NFH steelhead that occurs in the lower Quinault River basin; (b) re-implement mass marking of on-station Quinault steelhead releases; (c) protect on-station steelhead releases from infection, explore disinfecting the water supply (e.g. UV or ozone treatment) for steelhead rearing and/or reconfigure the water supply so that Duck Pond and Hatchery Creek can be utilized; and (d) discontinue all steelhead fry outplants.

Alternatives to Current Program: The Review Team considered the pros and cons of four alternatives to the existing steelhead program ranging from the current program with full implementation of program specific recommendations (Alternative 1) to termination of all programs at Quinault NFH and decommissioning of the facility (Alternative 4). The Review Team recommends the implementation of Alternative 1.

Steelhead (Hoh River release)

Program overview: The Quinault NFH was originally established to restore fisheries to the Quinault Reservation and to adjacent Federal lands. As part of this commitment a Quinault NFH steelhead pre-smolt transfer to the Hoh Reservation and a smolt release into the Hoh River were

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

initiated in the mid-1980s. 50,000 steelhead smolts are reared for direct release into Hoh River, and 50,000 pre-smolts for transfer, imprint, and subsequent release from Chalaat Creek hatchery (Hoh River). The broodstock for this program is hatchery steelhead returning to Quinault NFH. All steelhead released into the Hoh River are adipose fin clipped.

Benefits: The program confers significant sport and tribal harvest benefits in the Hoh River. From return years 1990-2007, approximately 2,110 Quinault NFH steelhead were recovered in the Hoh River annually (range 916 to 3,747). Of this an average of 1,492 (738 to 3,067) and 618 (76 to 1,518) were harvested in tribal and sport fisheries, respectively. The program provides important economic, social, and cultural benefits to the Hoh Tribe.

Risks: There are no terminal recovery areas for Quinault steelhead returning to the Hoh River, posing a genetic risk to the wild Hoh River steelhead population. The transfer and release of Quinault NFH steelhead into the Hoh River poses a fish health risk to fish stocks in the Hoh River. The transfer and release of Quinault NFH steelhead in the Hoh River poses a competition risk to native Hoh River steelhead (especially those that may residualize) and to other native species.

Recommendations for current program: The Review Team identified 10 specific recommendations to reduce risks and/or improve benefits of the current Hoh River steelhead hatchery program conducted by Quinault NFH. These recommendations include: (a) discontinue the 50,000 direct stream releases at Allen's Bar; (b) assess the feasibility of capturing returning adult hatchery steelhead at Chalaat Creek or at an alternate lower Hoh River site, (c) assist the Hoh Tribe in obtaining and placing bird netting over the Chalaat Creek pond (d) work with the Hoh Tribe, WDFW, and the National Park Service to conduct spawning ground surveys and smolt trapping to estimate juvenile production for the Hoh River, and (e) provide or assist with a training internship for a Hoh Tribal staff member at Quinault NFH or other appropriate facility.

Alternatives to Current Program: The Review Team considered the pros and cons of six alternatives to the existing Hoh steelhead program ranging from the current program with full implementation of program specific recommendations (Alternative 1) to termination of the steelhead hatchery program and managing the Hoh River for natural production only (Alternative 6). The Review Team recommends the implementation of Alternative 1 for the next five years while the Service works with tribal and state co-managers to develop a long-term steelhead management strategy for the Hoh River. A segregated steelhead program using locally adapted broodstock may be feasible in the lower river area (Alternative 4). An integrated program using Hoh River steelhead may also be feasible (Alternative 5). In the long-term, the Team concluded that the Hoh River may present an unusual opportunity to be managed under a natural production only strategy.

Coho

Program overview: The Quinault coho program is a segregated hatchery program intended to provide fish for harvest. The program is primarily intended to mitigate for marine and freshwater fisheries since production has declined in the Quinault River basin due to loss of habitat. The hatchery currently produces 660,000 coho salmon smolts for release into Cook Creek. An additional 143,000 fry are released upstream of the hatchery into Cook Creek. The original broodstock was from coho returning to Cook Creek. Since 1983 all broodstock have been from returns to the hatchery.

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

Benefits: The coho program supports commercial, tribal and sport fisheries in both marine and freshwater areas. Based on a 3.0 % smolt to adult return rate (harvest plus hatchery escapement), the program can achieve a goal of 18,900 coho annually to the various fisheries based on the current program size.

Risks: The segregated coho hatchery program poses inherent genetic and ecological risks to the wild coho stock in the Quinault basin. Research also indicates that coho released as fry displaces natural-origin young of the year coho in the preferred rearing habitat of nursery streams conferring an additional ecological risk. Relying on surface water supply at the hatchery has inherent risks, including the risk of disease transmission, contamination, and affects resulting from organisms in the watershed that is the water source. Lack of shade covers over the raceways concentrates fish in shaded areas along pond walls, increasing effective densities, potential stress, and disease risks.

Recommendations for Current Program: The Review Team identified 6 specific recommendations to reduce risks and/or improve benefits of the current coho program at Quinault NFH. These recommendations include: (a) assess distribution and abundance of naturally spawning coho in the lower Quinault River Basin and assess the extent of straying of Quinault NFH coho that occurs in the lower Quinault River basin., (b) discontinue all fry outplants, and (c) continue to investigate and implement methods to ensure green to eyed-egg survival are consistently high.

Alternatives to Current Program: The Review Team considered the pros and cons of four alternatives to the existing steelhead program ranging from the current program with full implementation of program specific recommendations (Alternative 1) to termination of all programs at Quinault NFH and decommissioning of the facility (Alternative 4). The Review Team recommends the implementation of Alternative 1.

Fall Chinook

Program overview: The Quinault NFH fall Chinook program is a segregated hatchery program intended to provide fish for harvest. The program began in 1968 to mitigate for declines in production due to habitat loss. Initial broodstock sources included Quinault returns and other Washington coastal and Puget Sound hatchery stocks. No imports of eggs from stocks outside the basin have occurred since 1985. Stated goals were to enhance and restore coastal fisheries, especially those conducted by the Quinault Nation. The hatchery currently has a production goal of 600,000 fall Chinook smolts for release into Cook Creek. Most of the eggs for this program are currently taken from adults returning to the Lake Quinault net pens (Quinault Nation) because of poor adult returns to Cook Creek and the hatchery.

Benefits: The program supports marine and freshwater sport and tribal fisheries and mitigates production declines in the Quinault River basin due to loss of habitat. Based on a goal of 0.50 % smolt to adult return rate (harvest plus hatchery escapement), the program can achieve a benefit of 2,670 Chinook annually to the various fisheries based on the current program size.

Risks: The apparent lack of cross-breeding between adults trapped at Quinault NFH and the Lake Quinault net pens may be posing a genetic risk to the hatchery stock by reducing within-stock genetic variation and heterozygosity. High stray rates of returning hatchery-origin fall Chinook from Quinault NFH into natural spawning areas of the Quinault River pose a genetic domestication risk to Quinault River Fall Chinook. Predator exclusion and control devices are inadequate, posing a risk of horizontal disease transmission into the hatchery and between ponds.

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

Recommendations for Current Program: The Review Team identified 6 specific recommendations to reduce risks and/or improve benefits of the current fall Chinook program at Quinault NFH. These recommendations include: (a) develop future fall Chinook broodstock management strategies consistent with genetic guidelines for managing hatchery-origin fall Chinook in the Quinault River as a properly integrated population; and (b) adjust species composition and program sizes at Quinault NFH in order to achieve desired survival and return rates for the Quinault NFH fall Chinook program

Alternatives to Current Program: The Review Team considered the pros and cons of five alternatives to the existing fall Chinook program ranging from the current program with full implementation of program specific recommendations (Alternative 1) to termination of all programs at Quinault NFH and decommissioning of the facility (Alternative 5). The Review Team recommends the implementation of Alternative 2, transfer of all fall Chinook production to Lake Quinault pen rearing (subject to agreement with tribal co-manager).

Chum

Program overview: The Quinault NFH fall Chum program is a segregated hatchery program intended to provide fish for harvest. The program is intended to mitigate for declines in production due to habitat loss. Initial broodstock sources included Quinault returns and other Washington stocks. Imports of eggs from stocks outside the basin ended in approximately 1985. Most of the eggs for this program are currently taken from adults returning to the hatchery. Stated goals were to enhance and restore coastal fisheries, especially those conducted by the Quinault Nation. The hatchery currently has a production goal of 1,500,000 chum smolts for release into Cook Creek.

Benefits: The purpose of the program is to mitigate for tribal fisheries in the Quinault River since production has declined due to loss of habitat. No specific numeric harvest goal exists. However, from 1996 to 2005 the average catch in the Quinault River was 1,995 per year. The harvest probably includes both hatchery and natural origin chum.

Risks: Potential mass spawning of hatchery-origin chum in the Quinault River poses a genetic risk to the natural population in the Quinault River. The inability to distinguish hatchery and natural origin chum increases this risk and uncertainties regarding its magnitude. The inability to distinguish hatchery and natural origin chum salmon poses a demographic, over-harvest risk to the natural chum population in the Quinault River.

Recommendations for Current Program: The Review Team identified 6 specific recommendations to reduce risks and/or improve benefits of the current chum program at Quinault NFH. These recommendations include: (a) hatchery-origin chum should be otolith-marked prior to release to allow assessments of natural spawning stray rates and potential inclusion of natural-origin chum into the broodstock each year, (b) determine an appropriate future broodstock management strategy, and (c) Evaluate other means of trapping and collecting chum adults.

Alternatives to Current Program: The Review Team considered the pros and cons of three alternatives to the existing chum program ranging from the current program with full implementation of program specific recommendations (Alternative 1) to termination of all programs at Quinault NFH and decommissioning of the facility (Alternative 4). The Review Team recommends the implementation of Alternative 1 but also concludes that Alternative 2 (increase to 3 million release) is cost effective if an alternative broodstock collection site can be developed.

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

Makah NFH

Facility Overview: The Makah NFH began operations in 1981 to restore and enhance depleted runs of salmon and steelhead on the Makah Indian Reservation. The Makah NFH is located, approximately 8 miles southwest of the town of Neah Bay, Washington on the northwest tip of the Olympic Peninsula and is located within the Makah Indian reservation. The hatchery is located at river mile 3 on the Sooes River. Its main facilities consist of twenty-nine 11-foot-wide by 80-foot-long raceways, four 4-foot-wide by 40-foot-long raceways, a pump house building, and a two-story hatchery building. There are three permanent government residences for required-occupancy staff. An acclimation facility on Educket Creek is operated by the Makah Nation as an acclimation facility for hatchery releases into the Waatch River system

Operation of the Makah NFH is coordinated with the Makah Nation. The hatchery is funded by Congressional appropriation of hatchery operations funds to the Service and the Service's hatchery cyclical maintenance fund. The operational budget for FY2008 was \$743,859. Costs for monitoring and evaluation (M&E) and fish health in FY2008 were approximately \$290,000 and \$115,000, respectively. Capital Improvements to the Makah NFH have totaled \$2,512,120 during the period 2004-2008.

Fall Chinook

Program overview: The Makah NFH fall Chinook program is an integrated hatchery program intended to provide fish for harvest and to maintain the fall Chinook run in the Sooes River. A variety of fall chinook stocks were introduced into the Sooes River prior to the construction of the hatchery in 1981. Since the construction of the hatchery, only fall chinook returning to the Sooes River have been used for the Makah NFH fall chinook program. The hatchery currently produces 2,200,000 Chinook smolts for release into the Sooes River at the hatchery and produces 100,000 smolts for transfer and subsequent release at the Educket Creek acclimation facility (Waatch River). Fish not otherwise coded-wire tagged are mass marked with adipose-fin clips for both the Sooes River release and Educket Creek transfer.

Benefits: The hatchery fall Chinook program support commercial and sport fisheries in both marine and freshwater areas. Based on a goal of 0.75 % smolt to adult return rate (harvest plus hatchery escapement), the program can achieve a harvest benefit of 16,150 Chinook annually to the various tribal and non-tribal fisheries (including the Waatch) based on the current program size, although no specific harvest goal has been established. The Waatch River fishery is viewed as a secondary harvest opportunity to the Sooes River fishery. Nearshore and in-river fisheries are of particular economic, social, and cultural significance to the Makah Nation. The Makah NFH fall Chinook program also serves as a genetic repository for the Sooes River fall Chinook population, reducing demographic risks to the population.

Risks: Propagation of Sooes River fall Chinook poses a domestication risk relative to the conservation goal to conserve the genetic integrity of the naturally spawning population of fall Chinook in the Sooes River because the proportion of natural spawners composed of hatchery-origin fish is not controlled. Similarly, the proportion of the broodstock composed of natural-origin fish is not controlled. Makah NFH is more susceptible to catastrophic loss than other most other hatchery facilities due to floods and tsunamis, disease, low flows, and high water temperatures and due to mechanical malfunction, increasing the potential to eliminate one or more broodyears of the Makah NFH Chinook population.

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

Recommendations for Current Program: The Review Team identified 19 specific recommendations to reduce risks and/or improve benefits of the current fall Chinook program at Makah NFH. These recommendations include: (a) in consultation with the Makah Nation, develop a natural escapement and hatchery broodstock management plan for the Sooes watershed based on the relative numbers of hatchery-origin and natural-origin fall Chinook intercepted at the hatchery, (b) install a tsunami warning system that can be heard throughout the facility and develop a tsunami evacuation plan, (c) develop a consistent and clearly defined M&E program and review on an annual basis, (d) conduct spawning ground surveys and smolt trapping to estimate juvenile production for the Sooes and Waatch Rivers, and (e) work with the Makah Nation to develop a single cooperative agreement regarding program management which addresses fish production levels, marking, responsibilities of the parties, and communications.

Alternatives to Current Program: The Review Team considered the pros and cons of three alternatives to the existing fall Chinook program ranging from the current program with full implementation of program specific recommendations (Alternative 1) to termination of all programs at Makah NFH and decommissioning of the facility (Alternative 5). The Review Team recommends the implementation of Alternative 1.

Coho

Program overview: The Makah NFH coho program is a segregated hatchery program intended to provide fish for harvest. The coho program was initiated in 1982 using eggs from the Quinault NFH. In the late 1980's two brood years were replaced with Quinault NFH stocks after the hatchery had been de-populated when the *Viral Hemorrhagic Septicemia* (VHS) virus was found in fish reared at Makah NFH. The hatchery currently produces 200,000 coho smolts for release into the Sooes River at the hatchery and produces 40,000 smolts for transfer and subsequent release at the Educket Creek acclimation facility (Waatch River). Fish not otherwise coded-wire tagged are mass marked with adipose-fin clips for both the Sooes River release and Educket Creek transfer. Broodstock is collected from returns to the hatchery. Additional fish not needed for broodstock are passed upstream to use the available habitat.

Benefits: For coho released at Makah NFH, the program confers significant sport, tribal, and commercial harvest benefits as well as returns to the hatchery that are used for broodstock and tribal subsistence. Based on coded-wire tag data, for broods 1993-2002, on average approximately 4,700 coho are recovered annually. Nearshore and in-river fisheries are of particular economic, social, and cultural significance to the Makah Nation.

Risks: The status and viability of the natural population of coho is unknown. Passing an unknown number of hatchery versus natural-origin coho upstream could preclude the maintenance of a self-sustaining natural population. Amplification of disease within the hatchery poses a disease risk, especially with the occurrence of Furunculosis to fish populations in the Sooes River. Antibiotics and other chemicals used annually during coho rearing that are in the hatchery effluent into the Sooes River may cause the development of drug-resistant pathogens that could impact fish, wildlife or humans.

Recommendations for Current Program: The Review Team identified 7 specific recommendations to reduce risks and/or improve benefits of the current coho program at Makah NFH. These recommendations include: (a) evaluate the ability of the watershed to maintain a self-sustaining natural population under current habitat and harvest conditions, (b) in consultation with the Makah Nation, develop a natural escapement and hatchery broodstock management plan for

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

coho in the Sooes watershed, (c) discontinue coho fry outplants and (d) evaluate opportunities for chilling and/or disinfecting incoming water for use during summer months

Alternatives to Current Program: The Review Team considered the pros and cons of five alternatives to the existing coho program ranging from the current program with full implementation of program specific recommendations (Alternative 1) to termination of all programs at Makah NFH and decommissioning of the facility (Alternative 5). The Review Team recommends the implementation of Alternative 1.

Steelhead

Program overview: The Makah NFH winter steelhead program is a segregated hatchery program intended to provide fish for harvest. The steelhead program was started in 1983 with eggs from the Quinault NFH. Broodstock are collected from returns to the hatchery. The weir operations during the steelhead return were modified to direct early returning hatchery stock into the facility and allow later returning wild stock to continue upstream. In the late 1980's two brood years were replaced with Quinault NFH stock after the hatchery had been de-populated when the VHS virus was found in fish reared at Makah NFH. The hatchery currently produces 158,000 winter steelhead smolts for release into the Sooes River at the hatchery and produces 22,000 smolts for transfer and subsequent release at the Educket Creek acclimation facility (Waatch River). Currently no tags or fin marks are applied to either group of smolts.

Benefits: The program confers significant tribal and sport harvest benefits in the Sooes and Waatch Rivers. Based on catch records for the Sooes and Waatch Rivers, from 1997– 2007, in the Sooes River, the average harvest was 2,563 (range, 1,163-4,362). From 1997– 2007, in the Waatch River, the average harvest was 99 (range, 23-301). The harvest is predominantly tribal. Spawmed out carcasses and surplus adults trapped at the facility are provided to the Makah Nation for subsistence and ceremonial purposes.

Risks: Hatchery steelhead vary greatly in size during rearing and at release. Steelhead released below target size could reduce the smolt-to-adult survival rate, and thus the broodstock needs and harvest benefits, of the hatchery population. Rearing densities in the start tanks appear to exceed a density index of 0.20 prior to transfer to outdoor raceways. High rearing density can increase disease incidence, particularly cold-water disease, reducing survival of the propagated stock. Hatchery steelhead could pass upstream if they return later than March 1st when the electric weir is turned off, or during extreme flood conditions, posing a genetic risk to the wild population.

Recommendations for current program: The Review Team identified 16 specific recommendations to reduce risks and/or improve benefits of the current steelhead program at Makah NFH. These recommendations include: (a) mass mark steelhead releases annually in accordance with Service best management practices, (b) initiate a study to evaluate the current run-time of the hatchery and wild steelhead population, (c) reduce initial loading densities to a maximum of 2 females per tray or approximately 8,000 eggs per tray, (d) increase predator control measures to reduce fish losses due to bird and mammal predation, (e) conduct genetic analysis of hatchery and wild steelhead in the Sooes River, and (f) work with comanagers to develop and participate in a Washington coast-wide monitoring and evaluation plan to assess and address the emerging strain of the IHN virus.

Alternatives to Current Program: The Review Team considered the pros and cons of five alternatives to the existing steelhead program ranging from the current program with full

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

implementation of program specific recommendations (Alternative 1) to termination of all programs at Makah NFH and decommissioning of the facility (Alternative 5). The Review Team recommends the implementation of Alternative 1.

Ozette Sockeye

Program overview: The Lake Ozette sockeye program is an integrated hatchery program intended to assist in the recovery of sockeye in the Lake Ozette system. Lake Ozette sockeye were listed as threatened under the ESA in 1999. The current supplementation program was initiated in 2000. An evaluation of the program is scheduled to occur 12 years (3 full generations) post implementation. The evaluation will determine if it is necessary to continue or to terminate the tributary supplementation project. Beginning in 2000, eggs were collected from returns to tributaries of Lake Ozette, primarily Umbrella Creek. At the request of the Makah Nation, Makah NFH became involved in the Lake Ozette sockeye program in 2003. The Makah NFH Isolation/Quarantine facility was modified at that time to be used for initial incubation to reduce the risk of egg loss that could occur at the Umbrella and Stony Creek remote sites. Unfertilized gametes are taken to Makah NFH. The egg take goal is 305,000. Incubation and otolith marking occur at Makah NFH. Eyed eggs are taken to Umbrella Creek (122,000) and to Stony Creek Hatchery (183,000). Planting goals are 122,000 at 450 fish per pound into Umbrella Creek, plus 91,500 at 900 fish per pound and 91,500 at 450 fish per pound into Stony Creek.

Benefits: The program reduces the demographic risk of extinction of the Lake Ozette sockeye population. This program also will provide information as to whether supplementation can rebuild the tributary spawning aggregations and to test whether sockeye can be successfully reintroduced to the point where there are established self-sustaining tributary spawning populations. The Proposed Recovery Plan (PRP) outlines numerous educational and outreach benefits relating to the recovery of Lake Ozette sockeye.

Risks: The hatchery program poses a genetic risk to the population's spatial structure by potentially preventing distinct shoreline and tributary spawning populations to develop and evolve naturally. There is an inherent risk of domestication associated with the program as well. There is also potential for catastrophic loss in the isolation incubation building, the staging facility, remote rearing sites, or during transport. Hatchery-reared sockeye may have greater vulnerability to predation than naturally-produced smolts.

Recommendations for Current Program: The Review Team identified one specific recommendation to reduce risks and/or improve benefits of the current Lake Ozette sockeye program at Makah NFH. This recommendation is to acquire a chilling unit to bring the incubation water temperature down to a safe range for thermal otolith marking.

Alternatives to Current Program: The Review Team considered the pros and cons of four alternatives to the existing sockeye program ranging from the current program with full implementation of program specific recommendations (Alternative 1) to termination of all programs at Makah NFH and decommissioning of the facility (Alternative 4). The Review Team recommends the implementation of Alternative 1 and also to use the isolation quarantine facility to support hatchery production for the restoration of other naturally spawning populations in the region (Alternative 2)

Conclusions

USFWS Olympic Peninsula Hatchery Review Team

Olympic Peninsula NFHs Assessments and Recommendations Report – February 2009

The Team concluded that each of these three NFHs is effectively performing its original intended function of providing fishing opportunities to partially replace those lost due to habitat alteration in the Olympic Peninsula region. Each of the three facilities works closely with Indian Tribes in their local area and provides important economic, social, and cultural benefits to tribal members. This is a very significant role for these facilities and should remain a Service priority. While the Team identified some ways in which the individual facilities can improve their success in providing fish for harvest opportunities, many of the Team's recommendations address means to better protect naturally spawning populations from possible adverse effects of production hatchery releases and opportunities to utilize available facilities to assist in restoration of depleted or ESA listed populations.

Each of these NFHs has isolation and early rearing capability for small conservation programs. The Service should actively seek opportunities to partner with co-managers in developing and implementing new conservation/recovery programs where needed.