❖Willapa Bay

Overview

This region includes the watersheds draining into Willapa Bay. For the purposes of this review, the HSRG reviewed the hatchery programs involving each identified regional salmonid stock (for example, Naselle River fall Chinook). The review included a consideration of the program's effects on all other hatchery and naturally spawning regional salmonid stocks (see table below under Stock Status). This chapter provides an overview of the Willapa Bay region, followed by reviews and recommendations for each salmonid stock that has an associated hatchery program.

FISHERIES[23]

In Willapa Bay, unlike other regions of western Washington, there are no treaty tribal fisheries. The significance of this is that there is no commercial harvest of steelhead. Steelhead and cutthroat are managed to meet the needs of natural production, while hatchery supplementation provides opportunity for recreational harvest. Chinook, coho and chum in Willapa Bay and the associated watershed are managed to meet escapement goals of both wild and hatchery stocks. In the Willapa Bay system, both natural production and hatchery supplementation provide opportunity for recreational and commercial harvest. Salmon harvest in Willapa Bay is implemented through the Willapa Bay Fisheries Management Framework. This plan delineates the goals, objectives and intent of management in the Willapa Basin. The goals and intent of management in the Willapa are to create sustainable fishing opportunities, while providing ecological benefits from both natural and hatchery salmon populations in the basin. WDFW will continue managing for adequate hatchery coho, Chinook and steelhead egg take needs, to continue future, programmed hatchery release levels.

CONSERVATION[24]

Though there are no ESA-listed species in the Willapa Bay watershed, salmon fisheries have been modified to accommodate special requirements for the protection of salmon species listed under the federal ESA in other areas. The conservation needs of salmon and sturgeon in the Willapa Bay watershed are addressed, from a management perspective, through the Willapa Bay Fisheries Management Framework. This document is updated annually and it provides a comprehensive overview of current year management objectives, as well as a summary of the proceeding year. This plan serves as a road map for fisheries management, whose goal is to maintain exploitation of natural salmon populations below levels that would negatively impact the health of a particular stock, and achieve hatchery escapement adequate to make egg take goals. In basins where habitat continues to degrade, hatchery production will continue to be necessary to maintain significant commercial and recreational fisheries.

The goal of management for natural steelhead is to consistently maintain or exceed current escapement levels in the wild. Hatchery production of steelhead provides ample opportunity for recreational fishers. The management strategy for sea-run cutthroat trout is to promote catch-and-

[23] *Information provided by Jack Tipping, WDFW.*
[24] *Ibid.*

release in larger waters, and require minimum size limits, so that the majority of females are allowed to spawn at least once. Harvest under this scenario is allowed only where stocks are thought to be healthy and such harvest is consistent with management objectives.

HABITAT[25]

In total, there are roughly 745 streams encompassing over 1,470 linear stream miles in the Willapa region (Phinney and Bucknell 1975). Annual rainfall in the basin has averaged about 85", with a range of 44–145" and an average of three inches of rain per month during the summer (The Willapa Alliance 1998). No streams within the Willapa basin originate from glaciers; all depend on surface and ground water inputs. Therefore, precipitation plays an important role in the quantity and quality of salmon habitat. However, Willapa Bay salinity appears to be linked not only to the Willapa Basin drainages, but also to flow from the Columbia and Chehalis river basins (The Willapa Alliance 1998). Many salinity profiles for Pacific coast estuaries shows a peak in the summer and a low in the winter, but Willapa Bay salinity drops in the late spring, when snowmelt from the Columbia and Chehalis basins is emptying into the Pacific Ocean. Because the greatest source of freshwater for Willapa Bay is the Columbia River, the Willapa Bay ecosystem depends upon the maintenance of high water quality in the Columbia. The rivers and tributaries in this area provide spawning and rearing habitat for winter steelhead trout, and chum, coho and Chinook salmon.

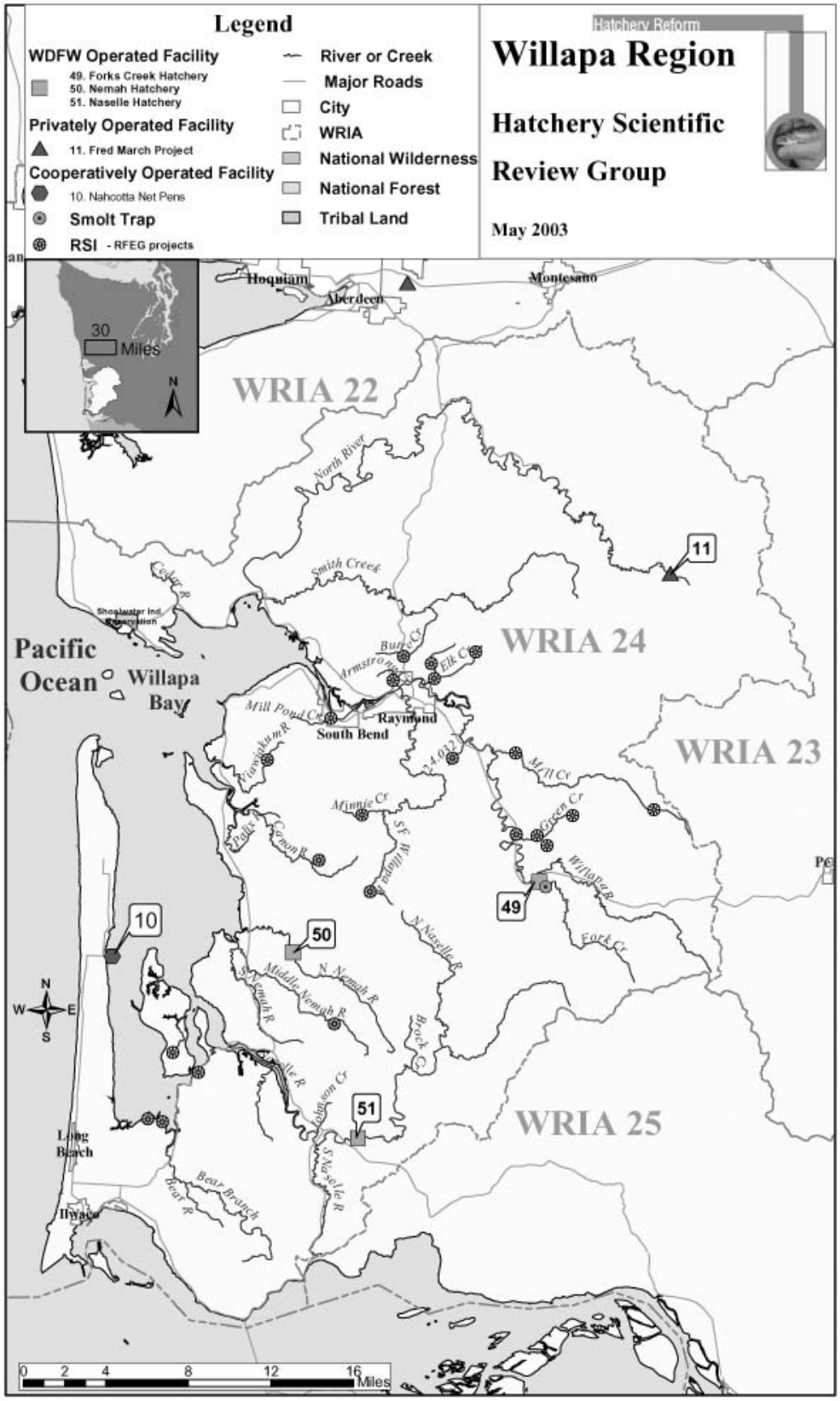
Historically, the region faced disturbances from natural fires about every 200 years. The last great fire was in the early 1400s. Since then, the climate has changed to become wetter and cooler (Pentec Environmental Inc. 1997). Tree trunks measuring from four to ten feet in diameter attest to the size of the trees at the onset of timber harvest. Logging began in the mid-1800s, starting near the tidewater areas, and floating the logs to saw mills (Weyerhaeuser 1994). Early logging techniques, such as railroad logging, steam donkeys and log floats, were very destructive, altering stream morphology, removing large, woody debris (LWD), and increasing sediment delivery (Seddell and Luchessa 1982). Numerous splash dams were constructed throughout the region, and their effects on channel morphology continue today. By the 1930s, the channel impacts were large (Pentec Environmental Inc. 1997). In the 1940s, log truck use gained popularity, and roads were constructed throughout the basins. By the mid-1960s, most of the region had been logged at least once (Weyerhaeuser 1994). Today's forest practices are much improved over these early, destructive activities, but unfortunately, many of these early impacts are still present.

The floodplains in the lower reaches were cleared for agriculture, and some of these areas later became urbanized. Often, these areas have little to none of the type of riparian vegetation that used to exist along these streams. Stream clearing also occurred, for flood control reasons and under the misguided belief that salmon needed streams devoid of wood for spawning (Hadley 1994). Historic and current land use patterns are summarized as follows (The Willapa Alliance 1998): within the 600,000 acres of Willapa Basin, approximately 78% of the land is in timber production, about 12% in estuary lands, six percent in agriculture, and four percent in residential use. These percentages have remained essentially unchanged since 1950. Less than three percent of the timberland is in permanent conservation and only a fraction of that is old growth timber (The Willapa Alliance 1998).

The 80,000 acre estuary is considered the cleanest large estuary in the continental United States (Suzumoto 1992). It is shallow, with about 50% of the high tide surface area exposed at low tide

[25] *Information provided by Chad Stussy, WDFW Habitat Program Region 6.*

(Suzumoto 1992). There has been more than a 30% increase in salt marsh habitat in the last 120 years, even with the removal of 20% of historic marshes by diking (The Willapa Alliance 1998). However, there has been a decrease in freshwater marsh and tidelands. Native grasslands and wetlands have been altered by urbanization and agriculture, and none of the dominant grasses of the current dune grasslands is native (The Willapa Alliance 1998).


Legend
WDFW Operated Facility
49. Forks Creek Hatchery
50. Nemah Hatchery
51. Naselle Hatchery
Privately Operated Facility
11. Fred March Project
Cooperatively Operated Facility
10. Nahcotta Net Pens
Smolt Trap
RSI - RFEG projects
River or Creek
Major Roads
City
WRIA
National Wilderness
National Forest
Tribal Land
Hatchery Reform
Willapa Region
Hatchery Scientific
Review Group
May 2003
30
Miles
N
Hoquiam
Aberdeen
Montesano
WRIA 22
WRIA 24
WRIA 23
WRIA 25
Pacific
Ocean
Willapa
Bay
Raymond
South Bend
Long
Beach
Ilwaco
11
10
50
49
51
W
E
S
0 2 4 8 12 16
Miles

STOCK STATUS[26]

Stocks	Hatchery Program?	Biological Significance (L=Low, M =Intermediate, H =High)			Population Viability (L=Critical, M = At Risk, H = Healthy)			Habitat (L = Inadequate, M = Limiting, H = Healthy)			Harvest Opportunity (0 = None, L = Occasional, M = Most years, H = Each year)		
		Now	Goals		Now	Goals		Now	Goals		Now	Goals	
			Short-Term	Long-Term		Short-Term	Long-Term		Short-Term	Long-Term		Short-Term	Long-Term
Bear River Fall Chinook	N	M	M	M	L	L	M	M	M	M	H	H	H
Naselle River Fall Chinook	Y	M	M	M	M	M	H	M	M	H	H	H	H
Nemah River Fall Chinook	Y	M	M	M	L	L	M	M	M	M	H	H	H
North River Fall Chinook	N	M	M	M	M	M	H	M	M	H	H	H	H
Palix River Fall Chinook	N	M	M	M	L	L	M	M	M	M	H	H	H
Willapa River Fall Chinook	Y	M	M	M	M	M	H	M	M	H	H	H	H
Independent Tributaries Fall Chinook	N	M	M	M	M	M	H	M	M	H	L	L	M
Bear River Coho	Y	M	M	M	L	L	M	M	M	H	H	H	H
Naselle River Coho	Y	M	M	M	M	M	H	M	M	H	H	H	H
Nemah River Coho	Y	M	M	M	M	M	H	M	M	H	H	H	H
North River Coho	Y	M	M	M	M	M	H	M	M	H	H	H	H
Palix River Coho	N	M	M	M	M	M	H	M	M	H	H	H	H
Willapa River Coho	Y	M	M	M	M	M	H	M	M	H	M	M	H
Independent Tributaries Coho	Y	M	M	M	M	M	H	M	M	H	H	H	H
Naselle River Late Coho	Y	M	M	M	M	M	M	M	M	H	H	H	H
Willapa River Late Coho	Y	M	M	M	M	M	M	M	M	H	H	H	H
Bear River Chum	N	M	M	M	M	M	M	M	M	H	H	H	H
Naselle River Chum	Y	M	M	M	H	H	H	M	M	H	H	H	H
Nemah River Chum	N	M	M	M	H	H	H	M	M	H	H	H	H
North River Chum	Y	M	M	M	M	M	H	M	M	H	H	H	H
Palix River Chum	N	M	M	M	H	H	H	M	M	H	H	H	H
Willapa River Chum	Y	M	M	M	H	H	H	L	M	H	H	H	H
Independent Tributaries Chum	Y	M	M	M	H	H	H	M	M	H	H	H	H
Bear River Winter Steelhead	N	M	M	M	M	M	H	M	M	H	H	H	H
Naselle River Winter Steelhead	N	M	M	M	M	M	H	M	M	H	H	H	H
Nemah River Winter Steelhead	N	M	M	M	M	M	H	M	M	H	H	H	H
North River Winter Steelhead	N	M	M	M	M	M	H	M	M	H	H	H	H
Palix River Winter Steelhead	N	M	M	M	M	M	H	M	M	H	H	H	H
Willapa River Winter Steelhead	N	M	M	M	M	M	H	M	M	H	H	H	H
Willapa Basin Hatchery Winter Steelhead	Y	L	L	L	L	M	M	M	M	H	H	H	H
Willapa Bay Coastal Cutthroat	Y	M	M	M	H	H	H	M	M	H	H	H	H

Biological significance *is determined by considering a number of specific factors relating to stock origin, biological attributes and population subdivisions, with the stock defined as being of either* low, intermediate *or* high *significance.*

Population viability *is determined by considering a number of specific factors such as age class structure, spawner escapement and proportion of hatchery-origin fish in natural spawning, with the stock's viability defined as being either* critical, at risk *or* healthy. *This rating refers to the stock's ability to sustain itself in the natural environment (except in the case of a segregated harvest program, in which case the ratings are* low, medium *and* high *and refer to the stock's ability to sustain itself in the culture environment).*

The stock's spawning, freshwater, migration and estuarine ***habitat*** *is rated as either* inadequate *(target stock is unproductive and the population will go extinct, even without terminal harvest),* limiting *(target stock is productive enough for the population to sustain itself at a low level terminal harvest) or* healthy *(productivity of the stock is high and the population is capable of growth and supporting significant terminal harvest).*

Harvest opportunity *is rated according to whether the goal is to provide* no *directed harvest opportunity,* occasional *opportunity, opportunity* most years, *or opportunity* each year.

[26] *This table contains ratings for all the salmonid stocks in the region, as provided by the managers. For a more detailed definition of these ratings, see HSRG Principles and Recommendations Report, Benefit/Risk Tool appendix.*

HATCHERIES[27]

Forks Creek Hatchery

Forks Creek Hatchery sits on 12 acres and is owned, funded and operated by WDFW. It is located at river mile four on Forks Creek, a tributary of the Willapa River, which flows into Willapa Bay on the southwest coast of Washington near Raymond. The hatchery site is at mile 12.2 on State Highway 6. It was originally constructed in 1899 and rebuilt in 1953. A pumping facility and eight new ponds were constructed in 1972.

Fred March Project

This property, owned and operated by Fred March, is located near the town of Brooklyn, on the upper North River (river mile 56.5), a tributary to Willapa Bay. There are approximately 93 acres associated with this site. Funding for this project comes from Aquatic Lands Enhancement Act funds. The primary goal of this project is to supplement natural coho production in the North River, using a combination of controlled and semi-natural rearing environments. The water supply is pathogen free. Spring water comes directly from the ground.

Nahcotta Net Pens

These pens are located within the Nahcotta Boat Basin, on the western shore of Willapa Bay, on the Long Beach Peninsula. There are four 12' x 12' x 8' pens that house 40,000 yearlings. The project is funded by WDFW.

Naselle Hatchery

This hatchery is owned by WDFW and funded by the general fund. The approximate size of the property is 14 acres. The buildings are as follows: one two-storey main hatchery building that has offices, restrooms, a break room, an incubation room, a visitors center, a storage area, an inside work and garage area, an outside storage and garage area. There are also three state-owned, on-station residences for hatchery personnel. The hatchery is staffed with 3.5 full-time employees.

Nemah Hatchery

Nemah Hatchery is owned and operated by WDFW. It is located at river mile 3.5 on the North Nemah River, a tributary to Willapa Bay that flows into the Pacific Ocean between Leadbetter Point and Toke Point on the southwestern Washington coast near the town of Tokeland. The North Nemah River, including Williams Creek, drains a region of approximately 1,000 square miles, originating in the Willapa Hills. The hatchery site is located 2.4 miles east of Highway 101, on North Nemah Road East. Nemah Hatchery was originally constructed in 1953. It has had a number of rebuilds, with the most recent occurring in 1998. The property spans 46.8 acres and consists of a hatchery building, constructed in 1997, containing incubation with wet lab, office, domestic water treatment, chemical storage, lunch/meeting room, locker, restroom/shower, incubation viewing/information for visitors, and storage rooms; a three-bay shop building, containing public restrooms; storage building; a three-bay building containing a dry feed storage area, 10,000 pound freezer, 2,000 kilowatt auxiliary generator equipped with an auto transfer and test system; a pump building containing two 60 horsepower, and two 20 horsepower pumps; a river water intake structure/fish ladder and a dam to

[27] *Information provided by Kevin Flowers, Jim Bauer, Ken Jansma and Darrell Mills, WDFW.*

create a pool for this river intake; a river picket rack; a domestic well water building; a covered spawning shed; and two hatchery residences. There is a bank of six standard raceways, each measuring, 10’ x 100’ x 2.5’ (ponds 1–6); a bank of two super raceways, each measuring 20’ x 150’ x 4.5’ (ponds 7 & 8); a one-third acre adult holding/yearling rearing and release pond (pond 9) connected to a adult arrival fish ladder; a pollution abatement pond; and a reuse water pump, located at the hatchery discharge, for supplying water to the adult pond, and/or the super-raceways. The water right is for 30 cubic feet per second of surface water.

Naselle River Fall Chinook

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	At Risk	At Risk	Healthy
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Harvest		
Type	Integrated		

PROGRAM DESCRIPTION

This is a mixed stock comprised of native fish and introductions from the Nemah and Forks Creek hatcheries. Although no non-local, fall Chinook have been released in the last 15 years, the majority of the naturally spawning Chinook are believed to be non-native in origin. This stock is one of nine stocks within the South Coast fall Chinook GDU. For the program, 5.5 million fingerlings are released on-station at Naselle Hatchery. Adult collection, spawning and eyeing may occur at Naselle, Forks Creek or Nemah hatcheries. Hatching and rearing occur at Naselle.

OPERATIONAL CONSIDERATIONS

- The hatchery stock at Naselle was coded wire tagged in brood years 1983–85.
- The contribution of hatchery returns to natural spawning in the Naselle River is considered to be significantly above the HSRG's recommended rate for an integrated stock.
- With the exception of the tag groups, hatchery fish have not been marked. Other than the expansion of the coded wire tag recoveries, it is currently impossible to determine the contribution of hatchery-origin returns to natural spawning, or the contribution of natural-origin returns to the hatchery broodstock.
- Willapa Bay natural Chinook escapement goals have not been met since 1998.
- The attraction of adults to the fish ladder is limited by the current alignment of the river.
- The hatchery program has routinely relied on egg transfers from Forks Creek to meet production goals.
- The program uses a mating strategy of pooling gametes in five fish pools.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?

Based on 18–20 year-old tag recoveries from the program, as well as representation by Willapa River tag codes, the program is assumed to provide annual harvest benefits consistent with the goals described. However, the actual contribution of this program cannot be determined or evaluated because of a lack of current coded wire tagging. Based on current terminal harvests, it appears that the

overall contribution has significantly declined in the last five years, in comparison to the previous five years. There is significant uncertainty as to the consistency of the program with the manager's goals for maintaining biological significance and improving stock viability, because of the effect of the high rate of hatchery straying and the unknown composition of the hatchery broodstock.

B. Likelihood of attaining goals?
The current status of the contribution of hatchery fish to the naturally-spawning population is largely unknown because of the inability to differentiate hatchery- and natural-origin returns. Based on the estimation of straying from tag recoveries, there is a significant risk that long-term straying of hatchery fish has caused a loss of viability from domestication to the naturally spawning component of the Naselle River stock, as well as other Willapa Bay Chinook stocks. The lack of ability to distinguish hatchery from natural fish has also prevented the proper infusion of natural-origin recruits into the hatchery broodstock, to prevent the potential divergence of these two stock components.

C. Consistent with goals for other stocks?
Hatchery releases pose a potential competition risk to naturally produced fall Chinook in both the freshwater and estuarine environments.

RECOMMENDATIONS

- Address the lack of adult collection capability at this facility.
- Mass mark all hatchery releases, so that the composition of both the natural and hatchery spawning components can be determined.
- Develop a monitoring and evaluation program, to evaluate the program's effect on the viability of the stock over time. This program will need to determine the number and composition of natural spawners, as well as subsequent recruitment.
- Institute a regular tagging and monitoring program in terminal area fisheries and escapement (hatchery and natural), to quantify the program's contribution to fishery and stock goals.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).
- Discontinue the transfer of eggs from other facilities, to allow local adaptation of the stock.
- Manage the program to allow natural-origin fish to drive adaptation. In order to do this, the goal should be for natural fish to constitute an average of at least two-thirds of the naturally spawning population.
- Once the correct proportion of the natural spawning component is achieved, ensure sufficient gene flow to the hatchery program, to prevent divergence of the population components. Depending on the composition of the stock components determined from monitoring, this may require developing a new hatchery broodstock from natural origin recruits and subsequently incorporating an annual average of 10–20% naturally spawning fish into the hatchery broodstock each year for on-station releases.

COMMENTS

- Complying with the last two recommendations, along with eliminating backfilling from other facilities, will likely require a significant reduction in the size of the hatchery program.
- The HSRG notes that WDFW has deferred a great deal of maintenance at this facility. Bringing this facility up to proper operational standards, improving adult capture, as well as implementing the proper monitoring and evaluation necessary to develop a successful integrated program will

require a significant investment (see Facility Recommendations for Naselle Hatchery). The department will need to weigh this cost versus the benefit of a revised fall Chinook program at this facility.

- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGER RESPONSE

WDFW has proposed closure of this facility in July 2004.

Nemah River Fall Chinook

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	Critical	Critical	At Risk
Habitat	Limiting	Limiting	Limiting
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Harvest and Conservation		
Type	Integrated		

PROGRAM DESCRIPTION

This is a mixed composite stock comprised of native fish and introductions from numerous sources including Naselle and Forks Creek hatcheries, Spring Creek, the Elochoman River (flows from the Willapa Hills into the Columbia River), Hood Canal, the Green River (Green River sub-region of Central Puget Sound), and the Trask and Elk rivers (Oregon). This stock is one of nine stocks within the South Coast fall Chinook GDU. 50,000 unfed fry are released from Middle Nemah remote site incubators (RSIs). Two million fingerlings are released on-station at Nemah Hatchery. Adult collection, spawning, incubation and rearing occur at Nemah. Adult collection and eyeing could also occur at Forks Creek Hatchery. Unfed fry are always of Nemah-origin stock.

OPERATIONAL CONSIDERATIONS

- Nemah River fall Chinook have not been coded-wire tagged for evaluation.
- On-station fingerling releases, as well as unfed fry releases from the RSIs, are not marked.
- Because hatchery releases are not identifiable, the composition of the hatchery and naturally spawning stock components is unknown.
- Willapa Bay natural Chinook escapement goals have not been met since 1998.
- De-watering of the stream between the intake and hatchery rack in the fall impairs the ability to pass fish upstream.
- The lack of water during dry periods adversely affects incubation and rearing conditions.
- The hatchery program has occasionally had to rely on egg transfers from Forks Creek to meet production goals.
- The program uses a mating strategy of pooling gametes in five fish pools.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?

Based on representation by Willapa River tag codes, the program is assumed to provide annual harvest benefits consistent with the goals described. However, the actual contribution of this program cannot be determined or evaluated because of the lack of coded wire tagging. There is significant

uncertainty as to the consistency of the program with the managers' goals for maintaining biological significance and improving stock viability, because of the lack of information about the composition of the hatchery broodstock and the effect of hatchery straying on the naturally spawning component of the broodstock. The conservation benefit of the release of unfed fry from the RSIs into the Middle Fork Nemah River is unknown.

B. Likelihood of attaining goals?

The current and historic composition of both the natural and hatchery spawning components is unknown. Since there has been no planned incorporation of natural-origin recruits into the hatchery broodstock, there is a risk that the hatchery component of this population has diverged from the natural component. There is also a risk that long-term straying of hatchery fish has caused a loss of viability from domestication to the naturally spawning component of the Nemah River stock, as well as other Willapa Bay Chinook stocks. Hatchery releases also pose a potential competition risk to naturally produced fall Chinook in both the freshwater and estuarine environments. The current level of natural escapement, as well as the amount of available habitat in the Nemah River, make it unlikely that an integrated program of this size can be supported. The likelihood of achieving the conservation goal from the RSI releases is dependent on the fish released being representative of the natural stock and surviving to reproduce at a higher rate than naturally spawning Chinook. These factors are currently unknown.

C. Consistent with goals for other stocks?

The program poses no apparent risk to other stocks through competition or predation, but passage and adult sorting limitations at the facility cause migration delay and mortality to Nemah River chum.

RECOMMENDATIONS

- Mass mark all hatchery releases, so that the composition of both the natural and hatchery spawning components can be determined. RSI releases should be otolith marked.
- Manage the program to allow natural-origin fish to drive adaptation of the composite stock. In order to do this, the goal should be for natural fish to constitute an average of at least two-thirds of the naturally spawning population.
- Reduce the hatchery program to a size consistent with allowing local adaptation to the natural environment. It does not appear that the Nemah River natural component will support a hatchery program of the current size.
- Once the correct proportion of the natural spawning component is achieved, ensure sufficient gene flow to the hatchery program, to prevent divergence of the population components. Depending on the composition of the stock components determined from monitoring, this may require developing a new hatchery broodstock from natural-origin recruits and subsequently incorporating 10–20% known natural-origin fish into the hatchery broodstock per year.
- Monitor and evaluate the program's effect on the viability of the stock over time. This program will need to determine the number and composition of natural spawners, as well as subsequent recruitment.
- Institute a regular tagging and monitoring program in terminal area fisheries and escapement (hatchery and natural), to quantify the program's contribution to fishery and stock goals.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).

COMMENTS

- The approach described above will be necessary if the managers determine that the biological significance of the Nemah River stock is important to the overall stock structure of Willapa Bay.
- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGER RESPONSE

- The HSRG comments indicate that implementation of the approach described in the recommendations "will be necessary if the managers determine that the biological significance of the Nemah River stock is important to the overall stock structure of Willapa Bay." WDFW concurs, and suggests that additional analysis should be conducted prior to modifying this program. These analyses should include estimates of the current and historical capacity, historical evidence of the extent of fall Chinook usage, and the population structure of natural spawners in tributaries to Willapa Bay.
- In the fall of 2003, WDFW implemented the HSRG recommendation to discontinue the pooling of gametes for this program.

Willapa River Fall Chinook

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	At Risk	At Risk	Healthy
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Harvest		
Type	Integrated		

PROGRAM DESCRIPTION

This is a mixed stock with composite production. There has been a long history of releases of non-native hatchery Chinook in the Willapa River, and there is a large Chinook hatchery program at Forks Creek Hatchery. Earliest records at the hatchery go back to the early 1930s, where for the most part, Willapa stocks were derived from the Willapa system. In the 1940s, several stocks were imported as a single stock or mixed to form a hybrid (notably, the Deschutes, Green, Satsop, Kalama, Nemah, White Salmon, Trask and Elk rivers, and Finch and Underwood/Spring creeks). This stock is one of nine within the South Coast fall Chinook GDU. Two million fingerlings are released on-station at Forks Creek. Adult collection, spawning, incubation and rearing occur at Forks Creek.

OPERATIONAL CONSIDERATIONS

- The hatchery stock at Forks Creek has had ten coded wire tag groups applied between brood years 1982–99.
- The contribution of hatchery returns to natural spawning in the Willapa River system is considered to be significantly above the HSRG's recommended rate for an integrated stock.
- With the exception of the tag groups, hatchery fish have not been marked. Other than the expansion of coded wire tag recoveries, it is currently impossible to determine the contribution of hatchery-origin returns to natural spawning, or the contribution of natural-origin returns to the hatchery broodstock.
- Willapa Bay natural Chinook escapement goals have not been met since 1998.
- Adult migration is impaired at the siphon intake diversion dam at both low and high flows.
- The hatchery program has been largely self-sustaining, and has also provided surplus eggs to fall Chinook programs in the Nemah and Naselle rivers.
- The program uses a mating strategy of pooling gametes in five fish pools.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?

The program provides annual harvest benefits consistent with the goals described, although the overall contribution has significantly declined in the last five years, in comparison to the previous five years. There is significant uncertainty as to the consistency of the program with the managers' goals for maintaining biological significance and improving stock viability, because of the effect of the high rate of hatchery straying and the unknown composition of the hatchery broodstock. Hatchery releases also pose a potential competition risk to naturally produced fall Chinook in both the freshwater and estuarine environment.

B. Likelihood of attaining goals?

The current status of the contribution of hatchery fish to the naturally-spawning population is largely unknown, because of the inability to differentiate hatchery- and natural-origin returns. Based on the estimation of straying from 1988–92, there is a significant risk that long-term straying of hatchery fish has caused a loss of viability from domestication to the naturally spawning component of the Willapa River stock, as well as other Willapa Bay Chinook stocks. The inability to distinguish hatchery from natural fish has also prevented the proper infusion of natural-origin recruits into the hatchery broodstock, in order to prevent the potential divergence of these two stock components.

C. Consistent with goals for other stocks?

The program poses no apparent risk to other stocks through competition or predation, but passage problems at the facilities' intakes may limit habitat access for Willapa River coho and chum.

RECOMMENDATIONS

- Mass mark all hatchery releases, so that the composition of both the natural and hatchery spawning components can be determined.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).
- Allow some early Chinook returns above the hatchery rack if Forks Creek will be part of the naturally producing component.
- Monitor and evaluate the program's effect on the viability of the stock over time. This program will need to determine the number and composition of the natural spawners, as well as its subsequent recruitment.
- Reinstitute index stock tagging and monitoring in terminal area fisheries and escapement (hatchery and natural), to quantify the program's contribution to fishery and stock goals.
- Manage the program to allow natural-origin fish to drive adaptation of the composite stock. In order to do this, the goal should be for natural fish to constitute an average of at least two-thirds of the naturally spawning population. This may require resizing the hatchery program and/or improving the ability to collect returning hatchery-origin fish.
- Once the correct proportion of the natural spawning component is achieved, ensure sufficient gene flow to the hatchery program to prevent divergence of the population components. Depending on the composition of the stock components determined from monitoring, this may require developing a new hatchery broodstock from natural-origin recruits and subsequently incorporating 10–20% known natural-origin fish into the hatchery broodstock per year.

COMMENTS

- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGER RESPONSE

- WDFW generally supports the recommendations of the HSRG, but notes that additional funding will be required to:
  - mass mark all hatchery releases;
  - monitor and evaluate the program's effect on the viability of the stock;
  - reinstitute index stock tagging and monitoring in terminal area fisheries and escapement; and
  - integrate natural-origin adults into the broodstock..

Bear River Coho

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	Critical	Critical	At Risk
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Harvest		
Type	Integrated		

PROGRAM DESCRIPTION

This program started around 1993. It uses Naselle Hatchery stock, which was derived from eggs transferred in from Forks Creek and Nemah River hatcheries. It is therefore a composite stock. There has been a history dating back prior to 1950 of large-scale, off-station releases of non-native fish into the basin. Fish were imported from Sooes and Lake Creeks, Dungeness, Satsop, Green, Nemah and Humptulips rivers, and Johnson's Slough. For the program, 5,000 yearlings are outplanted into Indian Creek, a tributary to the Bear River. Adult collection, spawning, incubation, hatching and rearing occur at Naselle.

OPERATIONAL CONSIDERATIONS

- This program apparently started as a mitigation program, to make up for habitat loss in the watershed.
- The immediate and short-term objective for Bear River coho is to manage the stock as a natural population, to achieve a suitable level of natural escapement.
- No adult collection or acclimation facilities are present.
- As with all Naselle Hatchery coho, outplants into Indian Creek are all adipose fin clipped.
- The outplanted stock is apparently well-integrated with the natural spawning population in the Naselle River, as each year approximately ten percent of wild Naselle River spawners are incorporated into the hatchery stock. However, it seems unlikely that this would also hold true for the Bear River stock.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?
The program is consistent with the harvest goal for this stock.

B. Likelihood of attaining goals?
The program is likely to attain the goal, but because of its size, the harvest benefit is likely to be small. Further, other coho harvest opportunities exist within the Willapa Bay region.

C. Consistent with goals for other stocks?

Outplants of yearling coho into the Bear River pose a potential predation risk to juveniles of other species (and to wild coho fry) in the Bear River. Also, because the program uses an out-of-basin stock, it is not likely to be integrated with the Bear River coho population. The introduced stock can therefore be posing a risk to local adaptation in the Bear River coho population.

RECOMMENDATIONS

- Discontinue the program, in view of the risks it poses to the Bear River stock, and because it does not provide significant additional coho harvest in the Willapa Bay region.
- Continue to monitor the productivity of the Bear River for coho, to determine if cessation of the program has an impact on coho returns to the river.

COMMENTS

- None.

MANAGER RESPONSE

- WDFW supports the recommendations of the HSRG, but will need to determine any mitigation responsibilities that may need to be fulfilled.

Naselle River Coho

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	At Risk	At Risk	Healthy
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Harvest		
Type	Integrated		

PROGRAM DESCRIPTION

The stock was originally obtained from Forks Creek and Nemah hatcheries. There has been a history dating back prior to 1950 of large-scale, off-station releases of non-native fish into the basin. Fish have been imported from outside the Willapa Bay region (e.g., Sooes Creek, and the Satsop, Dungeness, Green and Humptulips rivers). This is a mixed stock with hatchery and wild production. One million yearlings are released annually at 17 fish per pound on-station at Naselle Hatchery. 50,000 unfed fry are released into Johnson Creek via remote site incubators (RSIs); 40,000 yearlings are transferred to the Nahcotta Net Pens for an off-station release along the west shore of Willapa Bay. Adult collection, spawning, incubation and rearing occur at Naselle.

OPERATIONAL CONSIDERATIONS

- The release of one million yearlings implies the need for more than 500 adult females for broodstock, assuming 2,000 eggs per female.
- Yearling releases are 100% adipose fin clipped.
- The program's intent is to incorporate ten percent natural-origin (unclipped) adults into the broodstock.
- The first releases of coho from Nahcotta Net Pens will occur in 2003; this is a new release site.
- 5,000 yearlings are outplanted into Indian Creek in the Bear River drainage.
- Fish are released volitionally for two weeks, after which they are force-released.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?

There is an overall harvest benefit from hatchery-origin coho in Willapa Bay, but the contribution of releases from this program to that harvest is unknown.

B. Likelihood of attaining goals?

Goals are likely to be attained if HSRG recommendations are followed. However, harvest restrictions on Chinook inhibit harvest access to these coho.

C. Consistent with goals for other stocks?
There is a predation risk from yearling coho to chum and coho fry.

RECOMMENDATIONS

- Adjust the program's size to be consistent with harvest goals and goals for other stocks. Since the program consistently produces unharvested returns that exceed escapement needs, it should either be reduced or additional harvest options should be explored that take full advantage of harvest opportunities.
- Introduce an average of 10–20% naturally spawning fish into the hatchery broodstock each year for on-station releases.
- Increase the use of jacks to ten percent of the males used for spawning.
- Manage the program to allow natural-origin fish to drive adaptation of the composite stock. In order to do this, the goal should be for natural fish to constitute an average of at least two-thirds of the naturally spawning population. This may require resizing the hatchery program and/or improving the ability to collect returning hatchery-origin fish and/or increase the abundance of the naturally-spawning population.
- Address the need for adult collection capability at this facility.
- Institute coded wire tag releases and estimate stray rates and the contribution of Naselle releases to the fishery.
- Coded wire tag all fish transferred to the Nahcotta Net Pens for at least three consecutive years, to monitor stray rates of returning adults and estimate the contribution to the fishery.
- Continue mass marking.
- Quantify the escapement and abundance of natural origin recruits.
- Increase the proportion of jacks up to ten percent of the males in broodstock.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).
- Increase the number of adults retained for broodstock (e.g., twice as many) and cull a fixed proportion of eyed eggs from each family (e.g., 50%), to increase the effective population size of broodstock and maintain long-term genetic diversity (100,000 fingerlings => 50 females + 50 males). This increase in the number of hatchery spawners may not be necessary if there is a viable natural population in the Naselle River.
- Extend the period of volitional release.

COMMENTS

- The HSRG notes that WDFW has deferred a great deal of maintenance at this facility. Bringing this facility up to proper operational standards, improving adult capture, as well as implementing the proper monitoring and evaluation necessary to develop a successful integrated program will require a significant investment (see Facility Recommendations for Naselle Hatchery). The Department will need to weigh this cost versus the benefit of a revised coho program at this facility.
- It is not clear whether the intent of including ten percent natural-origin fish in the broodstock is being achieved.

- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGER RESPONSE

WDFW has proposed closure of this facility in July 2004.

Nemah River Coho

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	At Risk	At Risk	Healthy
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Harvest		
Type	Integrated		

PROGRAM DESCRIPTION

This is a mixed stock with hatchery and wild production; a number of introductions have been from out-of-basin. Hatchery records show the last introduction of eggs was in 1997. This program started in 1953 with the collection of 674 adults returning to the Nemah River (presumably natural spawners). There has been a history dating back prior to 1950 of large-scale, off-station releases of non-native fish into the basin. Fish have been imported from the Satsop, Dungeness, Green and Humptulips rivers, Sooes and Lake Creeks, and Johnson's Slough. 500,000 yearlings are released on-station at Nemah Hatchery. Adult collection, spawning, incubation and rearing occur at Nemah.

OPERATIONAL CONSIDERATIONS

- Releases are 100% adipose fin clipped.
- Releases occur no earlier than May 1, the actual release date being affected by a number of factors including physiological state and pond loadings.
- Release is volitional for the first two to four weeks, after which it is forced.
- The proportion of hatchery eggs from wild fish has averaged less than one percent over the last five years.
- The number of hatchery fish on the spawning grounds in the Nemah River is said to be uncertain; however, the number is probably too high to meet HSRG guidelines, based on available data for brood years 1996–98, where hatchery stray numbers were higher than the numbers given for escapement.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?

The program is being operated in a manner consistent with the managers' goal of producing fish for harvest. However, the hatchery stock is not properly integrated with its naturally spawning counterpart.

B. Likelihood of attaining goals?

This program has been very successful at producing fish for harvest but, due to harvest management constraints imposed to protect depressed Chinook stocks, it has not been possible to take full advantage of the harvest opportunity. Large numbers of surplus fish, therefore, return to the hatchery. In addition, the intent of having a hatchery stock that is integrated with its wild counterparts is not likely to be achieved with the present level of natural spawners being incorporated into the hatchery broodstock. There is, therefore, a domestication risk.

C. Consistent with goals for other stocks?

The large size of the releases, and the fact that the releases are yearlings, pose a potential predation risk to juveniles of other stocks (Chinook, coho and chum) in the system. However, the indications are that outmigration is rapid, thus reducing this risk.

RECOMMENDATIONS

- Adjust the program's size to be consistent with harvest goals and goals for other stocks. Since the program consistently produces unharvested returns that exceed escapement needs, it should either be reduced or additional harvest options should be explored that take full advantage of harvest opportunities.
- Introduce an average of 10–20% naturally spawning fish into the hatchery broodstock each year for on-station releases.
- Increase the proportion of jacks up to ten percent of the males in the broodstock.
- Manage the program to allow natural-origin fish to drive adaptation of the composite stock. In order to do this, the goal should be for natural fish to constitute an average of at least two-thirds of the naturally spawning population. This may require resizing the hatchery program and/or improving the ability to collect returning hatchery-origin fish and/or increasing the abundance of the naturally-spawning population.
- Institute a three-year fish tagging program to determine the fishery contribution and the extent to which straying of adults occurs.
- Address the need for adult collection capability at this facility.
- Institute coded wire tag releases and estimate stray rates and the contribution of Nemah Hatchery releases to the fishery.
- Continue mass marking.
- Quantify the escapement and abundance of natural origin recruits.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).
- Increase the number of adults retained for broodstock (e.g., twice as many) and cull a fixed proportion of eyed eggs from each family (e.g., 50%) to increase the effective population size of broodstock and maintain long-term genetic diversity (100,000 fingerlings => 50 females + 50 males). This increase in the number of hatchery spawners may not be necessary if there is a viable natural population in the Nemah River.

COMMENTS

- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGER RESPONSE

WDFW generally supports the recommendations of the HSRG, but notes that additional funding will be required to:

- institute coded wire tag releases and estimate stray rates;
- quantify the escapement and abundance of natural-origin recruits;
- integrate natural-origin adults in the broodstock; and
- cull a fixed proportion of eyed eggs from each family.

In 2003, WDFW implemented several of the HSRG recommendations, including tagging of representative production and improved spawning protocols.

North River Coho

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	At Risk	At Risk	Healthy
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Education and Conservation		
Type	Integrated		

PROGRAM DESCRIPTION

This program began in about 1993. It uses the Willapa River Hatchery stock. The stock is derived mostly from Willapa River fish, but at times back-filling has occurred with a number of introduced stocks, including out-of-basin stocks, and thus it should be regarded as a composite stock. There has been a history dating back prior to 1950 of large-scale, off-station releases of non-native fish into the basin. Fish have been imported from Sooes and Lake Creeks, and the Satsop and Dungeness rivers. 300,000 unfed fry/fingerlings are released from the Fred March cooperative project ponds on the North River. Adult collection and spawning occur at Forks Creek Hatchery. Eggs are eyed at Forks Creek and otolith-marked at Bingham Creek Hatchery. Hatching and rearing occur on-site at Fred March Ponds.

OPERATIONAL CONSIDERATIONS

- Juveniles are reared in pathogen-free, spring water under close-to-natural conditions in gravel-bottomed raceways and in earthen ponds.
- The only feeding is with ground-up salmon carcasses (obtained from Forks Creek).
- Fish are allowed to migrate volitionally.
- None of the releases are adipose fin clipped, but all of them have been otolith marked (although otolith marking is apparently being discontinued).
- No counts are made of the number of fish actually released from the ponds, and the contribution of the project to the coho spawning population in the North River has not been evaluated.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?

The natural-rearing approach would appear to be consistent with conservation goals; however the program is using an out-of-basin stock. The program does not appear to be designed to provide an educational benefit, as the site has restricted access.

B. Likelihood of attaining goals?

The program does not provide a conservation benefit, given that it uses the wrong stock for the North River. Further, there is no evidence that the North River coho are in need of a conservation program. It is not at all clear from the program description that the program provides an education benefit.

C. Consistent with goals for other stocks?
The program poses a potential risk to the juveniles of other stocks in the system, but because of its small size, the risks are probably not significant.

RECOMMENDATIONS

- Discontinue the program, due to the lack of any demonstrated or likely educational benefits, the out-of-basin choice of brood stock, and the absence of any apparent need for a coho conservation program on the North River.

COMMENTS

- The coho population in the North River appears to be in a reasonably healthy state. Escapements have increased from 1,600 in 1997 to 23,000 in 2001. There is therefore no convincing need for a coho conservation program in this drainage.

MANAGER RESPONSE

WDFW will review the program with its cooperator, including the need for a coho conservation program, the broodstock source and the number of fish released.

Willapa River Coho

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	At Risk	At Risk	Healthy
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Most Years	Most Years	Each Year
Hatchery Program:			
Purpose	Harvest		
Type	Integrated		

PROGRAM DESCRIPTION

The hatchery population represents an admixture of native and introduced stocks dating back to the 1950s; the relative composition of donor stocks is unknown. Fish have been imported from the Nemah, Satsop, Dungeness, Green and Humptulips rivers, Sooes and Lake Creeks, and Johnson's Slough. 500,000 yearlings are released annually on station from Forks Creek Hatchery; 125,000 unfed fry are released via remote-site incubators (RSIs): 25,000 into Armstrong Creek, and 100,000 into the South Fork of the Willapa River. Adult collection, spawning, incubation and rearing occur on-station at Forks Creek for on-station yearling releases. Adult collection, spawning and eyeing for unfed fry RSI releases also occur at Forks Creek.

OPERATIONAL CONSIDERATIONS

- The intent is to derive ten percent of the eggs for this program from natural-origin fish.
- Escapement back to the hatchery has substantially exceeded broodstock needs in recent years.
- All released yearlings are adipose fin clipped.
- Harvest restrictions on Chinook inhibit harvest on coho.
- Adults are spawned in five-female-by-five-male gamete pools in a single bucket (pooled gametes from ten adults).
- Jacks are included in the broodstock at no more than two percent of the total number of spawners.
- Fish returning before December 1 are considered "normal-timed" coho.
- Eggs are incubated on surface spring water; hatched fish are reared on Forks Creek water.
- Fish are released volitionally for 24 hours, then force-released.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?

There is an overall harvest benefit from hatchery-origin coho in Willapa Bay, but the contribution of releases from this program to that harvest is unknown.

B. Likelihood of attaining goals?
Goals are likely to be attained if HSRG recommendations are followed. However, harvest restrictions on Chinook inhibit harvest access to these coho.

C. Consistent with goals for other stocks?
There is a predation risk from yearling coho to chum and coho fry.

RECOMMENDATIONS

- Adjust the program's size to be consistent with harvest goals and goals for other stocks. Since the program consistently produces unharvested returns that exceed escapement needs, it should either be reduced or additional harvest options should be explored that take full advantage of harvest opportunities.
- Introduce an average of 10–20% naturally spawning fish into the hatchery broodstock each year for on-station releases.
- Increase the proportion of jacks up to ten percent of the males in the broodstock.
- Manage the program to allow natural-origin fish to drive adaptation of the composite stock. In order to do this, the goal should be for natural fish to constitute an average of at least two-thirds of the naturally spawning population. This may require resizing the hatchery program and/or improving the ability to collect returning hatchery-origin fish and/or increase the abundance of the naturally-spawning population.
- Institute a three-year fish tagging program to determine the fishery contribution and the extent to which straying of adults occurs.
- Improve the adult collection capabilities at this facility during high flows.
- Quantify the escapement and abundance of natural origin recruits.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).
- Continue coded wire tag releases and estimate the contribution of Forks Creek releases to sport and commercial fisheries.
- Continue mass marking.
- Extend the period of volitional release.

COMMENTS

- It is not clear whether the intent of including ten percent natural-origin fish in the broodstock is being achieved.
- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGER RESPONSE

WDFW generally supports the recommendations of the HSRG, but notes that additional funding will be required to:

- quantify the escapement and abundance of natural-origin recruits;
- improve the adult collection facilities; and
- integrate natural-origin adults into the broodstock.

Independent Tributaries Coho

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	At Risk	At Risk	Healthy
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Conservation		
Type	Integrated		

PROGRAM DESCRIPTION

This program is only one or two years old. The eggs involved are taken from the Nemah River and Forks Creek hatchery stocks; this is described under the Nemah River and Forks Creek coho programs. 230,000 unfed fry are released (40,000 at Lewis Creek remote site incubator [RSI]; 40,000 at Porter Point RSI; 50,000 at tributary 24-0321; 50,000 at Butte Creek RSI; 50,000 at Elk Creek RSI). Adult collection, spawning and egg incubation to the eyed stage for the Lewis Creek and Porter Point RSIs occur at Nemah. Adult collection, spawning and egg incubation to the eyed stage for the other three RSI sites occur at Forks Creek.

OPERATIONAL CONSIDERATIONS

- This is a reintroduction program intended to repopulate previously-blocked habitat.
- Eyed eggs for outplanting via the RSIs are not otolith marked. This means that fish returning from these releases will be indistinguishable from natural-origin fish.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?
RSI outplants are a recognized means of contributing to the productivity of stocks; they are therefore consistent with the conservation goals for this stock.

B. Likelihood of attaining goals?
The program could provide a conservation benefit, but this would have to be evaluated.

C. Consistent with goals for other stocks?
Considering the size of the fish at release, any risk to native stocks would most likely be competition for habitat and food. But the size of the program is likely too small to result in significant competition.

RECOMMENDATIONS

- Continue releases for one or two cycles (three to six years), then discontinue the program and evaluate the results using spawning ground and fry surveys.

COMMENTS

- None.

MANAGER RESPONSE

WDFW supports the recommendations of the HSRG.

Naselle River Late Coho

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	At Risk	At Risk	At Risk
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Harvest		
Type	Integrated		

PROGRAM DESCRIPTION

This stock was introduced from Bingham Creek Hatchery on the Satsop River in the 1970s. It is comprised of mixed hatchery and wild production. 100,000 yearlings are released on-station at Naselle Hatchery. Adult collection, spawning, incubation and rearing occur at Naselle.

OPERATIONAL CONSIDERATIONS

- 50 females and 50 males are spawned per year.
- Spawning protocols are similar to those used for Naselle "normal coho."
- These fish return and spawn later than "normal" coho.
- The intent is to include ten percent natural origin fish into the broodstock. However, this does not seem to always be achieved.
- All released fish are adipose fin clipped.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?
The program is consistent with the goal of providing harvest.

B. Likelihood of attaining goals?
The contribution of this program to harvest is not quantified. The extent to which a naturalized population is established in the Naselle River is unknown. This raises questions regarding the likelihood that an integrated hatchery population of late coho can be maintained in the river.

C. Consistent with goals for other stocks?
There is a potential predation risk on chum and a potential competition risk to normal-timed coho. Straying risks are not quantified.

RECOMMENDATIONS

- Address the need for adult collection capabilities at this facility.
- Follow HSRG System-Wide Recommendations for integrated hatchery programs. If a naturally spawning population of late coho does not exist in the Naselle River, or if the abundance of this natural-origin recruit stock is too low to support a properly integrated hatchery population, consider: 1) managing late coho as a segregated hatchery stock with no natural component, or 2) developing a naturalized, late-spawning coho population.
- Under the goal of maintaining an integrated hatchery program, and if there is a naturalized spawning population, then limit the number of naturally-spawning, hatchery-origin adults to one-third of the total number of natural spawners in the Naselle River and include 10–20% natural-origin adults in the broodstock.
- Increase the use of jacks to ten percent of the males used for spawning.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).
- Quantify escapement and abundance of natural-origin recruits.
- Increase the number of adults retained for broodstock (e.g., twice as many) and cull a fixed proportion of eyed eggs from each family (e.g., 50%), to increase the effective population size of the broodstock and maintain long-term genetic diversity (100,000 fingerlings => 50 females + 50 males). This increase in the number of hatchery spawners may not be necessary if there is a viable natural population in the Naselle River.
- Continue mass marking.

COMMENTS

- The HSRG notes that WDFW has deferred a great deal of maintenance at this facility. Bringing this facility up to proper operational standards, improving adult capture, as well as implementing the proper monitoring and evaluation necessary to develop a successful integrated program will require a significant investment (see facility recommendations for Naselle Hatchery). The Department will need to weigh this cost versus the benefit of a revised late coho program at this facility.
- It is not clear whether the intent of including ten percent natural-origin fish in the broodstock is being achieved.
- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGER RESPONSE

WDFW has proposed closure of this facility in July 2004.

Willapa River Late Coho

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	At Risk	At Risk	At Risk
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Harvest		
Type	Integrated		

PROGRAM DESCRIPTION

This stock was introduced from Bingham Creek Hatchery on the Satsop River in the 1970s. Records indicate that Satsop coho were introduced in 1971. For most years, fish derived from this introduction satisfied the needs of the program. However, for brood years 1991 and 1996, eggs were imported from Satsop to fill the void cycles. Each subsequent returning cycle has had adequate numbers of adults returning to allow a hatchery egg take. 100,000 late-run coho yearlings are released on-station at Forks Creek Hatchery. Adult collection, spawning, incubation and rearing occur at Forks Creek.

OPERATIONAL CONSIDERATIONS

- 50 females and 50 males are spawned per year.
- These fish return and spawn later than "normal" coho.
- Spawning protocols are similar to those for Willapa River "normal coho."
- The intent is to include ten percent natural-origin fish into the hatchery broodstock each year
- All released fish are adipose fin clipped.
- The number of adults trapped at the hatchery has ranged from 268–2,081 adults from 1998–2002, respectively.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?
The program is consistent with the goal of providing harvest.

B. Likelihood of attaining goals?
The contribution of the late coho program to harvest is not quantified. The extent to which a naturalized population is established in the Willapa River is unknown. This raises questions regarding the likelihood that an integrated hatchery population of late coho can be maintained in the river.

C. Consistent with goals for other stocks?

There is a potential predation risk on chum and a potential competition risk to normal-timed coho. Straying risks are not quantified.

RECOMMENDATIONS

- Improve the adult collection capabilities at this facility during high flows.
- Follow HSRG System-Wide Recommendations for integrated hatchery programs. If a naturally spawning population of late coho does not exist in the Willapa River, or if the abundance of this natural-origin stock is too low to support a properly integrated hatchery population, consider: 1) managing late coho as a segregated hatchery stock with no natural component; or 2) developing a naturalized, late-spawning coho population.
- Under the intent of maintaining an integrated hatchery program and if there is a naturalized spawning population, then limit the number of naturally-spawning, hatchery-origin adults to one-third of the total number of natural spawners in the Willapa River and include 10–20% natural-origin adults in the broodstock.
- Increase the use of jacks to ten percent of the males used for spawning.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).
- Quantify the escapement and abundance of natural-origin, late-run fish.
- Increase the number of adults retained for broodstock (e.g., twice as many) and cull a fixed proportion of eyed eggs from each family (e.g., 50%), to increase effective number of breeders each year to approximately 175–200 fish to maintain long-term genetic diversity (100,000 fingerlings => 50 females + 50 males). This increase in the number of hatchery spawners may not be necessary if there is a viable natural population in the Willapa River or Forks Creek.
- Continue mass marking.

COMMENTS

- It is not clear whether the intent of including ten percent natural-origin fish in the broodstock is being achieved.
- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGER RESPONSE

WDFW generally supports the recommendations of the HSRG, but notes that additional funding will be required to:

- improve adult collection facilities;
- quantify the escapement and abundance of natural origin recruits;
- integrate natural origin adults in the broodstock; and
- cull a fixed proportion of eyed eggs from each family.

Naselle River Chum

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	Healthy	Healthy	Healthy
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Conservation		
Type	Integrated		

PROGRAM DESCRIPTION

A large chum program at Naselle River Hatchery in the mid-1980s used mainly Nemah fish for brood stock. One release of Hood Canal chum occurred in 1980. Interbreeding between native and non-native chum likely occurred. This stock is part of the South Coast fall chum GDU. The broodstock is now derived from natural volunteers to Naselle. Eyeing occurs at Naselle. 50,000 unfed fry are released from remote site incubators (RSIs).

OPERATIONAL CONSIDERATIONS

- The spawning protocol is five females pooled and five males pooled.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?
This program could provide conservation benefit by encouraging natural spawning and local adaptation in the Naselle River.

B. Likelihood of attaining goals?
Escapement monitoring for chum salmon occurs on Ellsworth Creek and one of its unnamed tributaries in the Naselle system. No evaluation of the program currently occurs, so success can only be determined anecdotally.

C. Consistent with goals for other stocks?
Information on the status and trends of the naturally-spawning stock in the Naselle River is lacking, so the risks are unknown.

RECOMMENDATIONS

- Continue the program for four to eight years and annually evaluate adult returns. Then, continue the program only if benefits are measurable and risks to the naturally-produced stock are manageable.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).

COMMENTS

- The HSRG was asked if chum production should be increased and treated as a priority for conservation purposes in the Willapa Bay region, given the natural chum habitat. A strategic plan for chum, as well as for all salmonids, should be developed to evaluate conservation, escapement and harvest goals within Willapa Bay (see Regional Recommendations).
- Catch information dating from the 1920s indicates that chum were historically three to five times more abundant than in recent decades. There was no evidence from available routine escapement monitoring that chum populations have significantly decreased since the 1970s. Harvest numbers in the last few years would also not indicate a decline.
- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGER RESPONSE

WDFW has proposed closure of this facility in July 2004.

North River Chum

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	At Risk	At Risk	Healthy
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Education and Conservation		
Type	Integrated		

PROGRAM DESCRIPTION

During the early 1990s, Nemah River stock were introduced to the North River system, but it is unclear to what extent these releases may have influenced the genetic composition of North River chum. This stock is considered native with natural production. More recently, chum brood stock have been collected in the field for later release back to the North River system. This stock is one of eight stocks within the South Coast fall chum GDU. 200,000 fry are released from the Fred March cooperative project on the North River. Adults are collected by snagging/gaffing on Bitter Creek (a tributary to the North River). Spawning takes place on-site. Eyeing occurs at Forks Creek Hatchery. Hatching and rearing occur on-site.

OPERATIONAL CONSIDERATIONS

- 80 males and 80 females are gaffed for broodstock.
- Eggs are taken upriver to an area historically decimated by logging, where the population's viability is at risk.
- The property is owned by Fred March near Brooklyn on the Upper North River (river mile 56.5).
- The purpose of the program is to supplement natural chum, using controlled and semi-natural rearing.
- The spawning protocol is five females pooled and five males pooled.
- Habitat is expected to improve over the next 10–50 years.
- There has been no routine escapement enumeration in Bitter Creek, but Lower Salmon Creek is enumerated. In 2002, escapement to Lower Salmon Creek was at a level in the higher end of its 30-year range. Bitter Creek is enumerated only every fifth to sixth year.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?

This program could provide a conservation benefit by encouraging spawning in the upper watershed. Escapements appear to be healthy in Lower Salmon Creek, which is routinely enumerated. Educational opportunities appear to be limited; the site has restricted access.

B. Likelihood of attaining goals?
Anecdotal evidence suggests that fish are present, but there is no marking or evaluation so the contribution to conservation is unknown. Educational goals are unlikely to be achieved under the current program.

A. Consistent with goals for other stocks?
There is no evidence that this program presents risk to other stocks.

RECOMMENDATIONS

- Clarify the educational benefits provided by this program.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).
- Continue the program for four to eight years and annually evaluate adult returns. Then, continue the program only if benefits are measurable and risks to the naturally-produced stock are manageable.

COMMENTS

- The HSRG was asked if chum production should be increased and treated as a priority for conservation purposes in the Willapa Bay region, given the region's natural chum habitat. A strategic plan for chum, as well as for all salmonids, should be developed to evaluate conservation; escapement and harvest goals within the Willapa Bay region (see Regional Recommendations).
- Catch information from the 1920s indicates that chum were historically three to five times more abundant than in recent decades. There was no evidence from available routine escapement monitoring that chum populations have significantly decreased since the 1970s. Harvest numbers in the last few years also do not indicate a decline.
- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGERS RESPONSE

WDFW generally supports the recommendations of the HSRG, but notes that additional funding will be required to evaluate the return of adults to natural spawning areas.

Willapa River Chum

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	Healthy	Healthy	Healthy
Habitat	Inadequate	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Conservation and Education		
Type	Integrated		

PROGRAM DESCRIPTION

This stock is considered native with natural production. There may have been some historic introductions of Hood Canal stock through Ellsworth Creek, from the Naselle River. Hatchery releases of chum salmon to the Willapa River occurred in 1957–61 and 1968. The stock origin of these releases was listed as Nemah River "wild stock." Since 1968, releases have occurred sporadically with Nemah River stock. During the 1980s, Ellsworth Creek/Naselle stock was also used. Due to the nature of releases in the Willapa River system, no significant genetic influence has occurred to the native stock. However, it is possible that the use of Ellsworth Creek stock could have introduced recruits of Hood Canal origin to the Willapa River system. There have been no introductions of other outside stocks. This stock is one of eight stocks within the South Coast fall chum GDU. For this program, 50,000 unfed fry are released from Mill Pond Creek remote site incubators (RSIs) and 50,000 fed fry are released on-station at Forks Creek Hatchery. Adult collection is by gaffing natural returns to the South Fork Willapa River, or returns to Forks Creek. Spawning, incubation and eyeing (for the RSIs) or rearing (for the on-station releases) occur at Forks Creek.

OPERATIONAL CONSIDERATIONS

- The habitat includes low-lying streams with low flows and high water temperatures in summer.
- An average of 50 females and 50 males are used annually.
- The spawning protocol is five females pooled by five males pooled.
- Escapement data are minimal; spawner escapement surveys occur only every fifth or sixth year. Escapements are extrapolated from returns to Willapa Bay in other years.
- There is no marking or evaluation.
- The Mill Pond Creek project is a community and educational project designed to show the life cycle of salmon. Mill Pond Creek was restored in 2001. A trail system and informational center were constructed to demonstrate salmon spawning habitat. The South Bend School District monitors the stream.

BENEFITS AND RISKS

A. Consistent with short- and long-term goals?
The conservation need is questionable, as the stock is currently deemed to be healthy. The program does provide educational benefits at Mill Pond Creek.

B. Likelihood of attaining goals?
No evaluation or escapement monitoring of the Willapa system currently occurs, so success can only be determined anecdotally.

C. Consistent with goals for other stocks?
Information on the status and trends of the naturally-spawning stock in the Willapa River is lacking, so the risks are unknown.

RECOMMENDATIONS

- Continue the program for four to eight years and annually evaluate adult returns. Then, continue the program only if the benefits are measurable and risks to the naturally-produced stock are manageable.
- Focus this program on educational goals.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).

COMMENTS

- The HSRG was asked if chum production should be increased and treated as a priority for conservation purposes in the Willapa Bay region, given the natural chum habitat. A strategic plan for chum, as well as for all salmonids, should be developed to evaluate conservation, escapement and harvest goals within Willapa Bay (see Regional Recommendations).
- Catch information dating from the 1920s indicates that chum were historically three to five times more abundant than in recent decades. There was no evidence from available routine escapement monitoring that chum populations have significantly decreased since the 1970s. Harvest numbers in the last few years would also not indicate a decline.
- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGERS RESPONSE

WDFW generally supports the recommendations of the HSRG, but notes that additional funding will be required to evaluate the return of adults to natural spawning areas.

Independent Tributaries Chum

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	Healthy	Healthy	Healthy
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Conservation and Education		
Type	Integrated		

PROGRAM DESCRIPTION

The Nemah River chum stock originates from wild fish collected at Nemah Hatchery and from gaffing in the river, and is one of eight stocks within the South Coast fall chum GDU. 50,000 eyed eggs are released at the Headquarters Creek and Long Island egg tubes. 100,000 fry are released from Lewis and Porter Point Ponds on the Willapa Bay Refuge. Adult collection, spawning, and incubation (eyeing for remote site incubators or RSIs) occur at Nemah.

OPERATIONAL CONSIDERATIONS

- An average of 60 females and 60 males are used annually.
- The spawning protocol is five females pooled by five males pooled.
- There is often insufficient water in the river when chum return.
- When chum return, the rack at the hatchery is not opened to allow passage upstream without first going through the ponds. This is done to ensure hatchery coho do not escape upstream. Chum are removed by seine or other means when there are large returns of other species.
- Natural populations, the broodstock source, are not routinely monitored.
- Natural chum returns to the hatchery appear to be decreasing. Run size decreased from 1,211 in 1998 to 237 in 2002.
- A large chum hatchery program that had been conducted for many years ended in the early 1990s. Releases ranged from 286,520–3,135,000 during the period 1974–94.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?

This program is consistent with providing conservation and education benefits for the Willapa National Wildlife Refuge.

B. Likelihood of attaining goals?

No evaluation currently occurs, so success can only be determined anecdotally. There is no marking or evaluation, so the contribution to conservation is unknown.

C. Consistent with goals for other stocks?

Information on the status and trends of the naturally-spawning stock in the Nemah River is lacking, so the risks are unknown. There is a loss of chum adults at the holding area, creating an additional risk to the naturally-produced stock (see Facility Recommendations).

RECOMMENDATIONS

- Monitor naturally-spawning populations in the Nemah annually for stock status and trends, to ensure there is no risk to the naturally-spawning stock.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).
- Continue the program for four to eight years and annually evaluate adult returns. Then, continue the program only if the benefits are measurable and risks to the naturally-produced stock are manageable.

COMMENTS

- Information is lacking concerning the stock status and trends of chum in the Nemah River. Monitoring is necessary to ensure the program does not have a negative impact on the naturally-spawning stock.
- This program addresses a reported growing desire by the public to experience fish in the streams.
- The HSRG was asked if chum production should be increased and treated as a priority for conservation purposes in the Willapa Bay region, given the existence of natural chum habitat in the region. A strategic plan for chum, as well as for all salmonids, should be developed to evaluate conservation; escapement and harvest goals within the Willapa Bay region (see Regional Recommendations).
- Catch information dating from the 1920s indicates that chum were historically three to five times more abundant than in recent decades. There is no evidence from available routine escapement monitoring that chum populations have significantly decreased since the 1970s. Harvest numbers in the last few years also do not indicate a decline.
- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGERS RESPONSE

WDFW generally supports the recommendations of the HSRG, but notes that additional funding will be required to evaluate the return of adults to natural spawning areas.

In the fall of 2003, WDFW implemented the HSRG recommendation to discontinue the pooling of gametes.

Willapa Basin Hatchery Winter Steelhead

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Low	Low	Low
Population Viability[28]	Low	Medium	Medium
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Harvest		
Type	Segregated		

PROGRAM DESCRIPTION

This is an introduced, locally-adapting stock originating from Chambers Creek via Forks Creek, Lake Aberdeen and Bogachiel hatcheries. For this program, 40,000 fish are reared and released as yearlings on-station at Forks Creek Hatchery: 10,000 are reared at Forks Creek and outplanted as yearlings into the South Fork Willapa River; 10,000 are reared at Forks Creek and outplanted as yearlings into Smith Creek; 10,000 are initially reared at Forks Creek and transferred to the North River cooperative program for final rearing and release as yearlings into the North; and 10,000 are reared and released at Nemah Hatchery. The program also includes 50,000 fish released on-station as yearlings at Naselle Hatchery. Adult collection, spawning, incubation and rearing for these fish occur at Naselle. All of the above originated from Forks Creek broodstock.

OPERATIONAL CONSIDERATIONS

- Fish are released at 5.0-7.5 fish per pound, from early April to early May.
- All releases are adipose fin clipped.
- The program uses a five-by-five pooled mating protocol.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?

The program is being operated in a manner consistent with the managers' short- and long-term goals for the stock. It is providing a valuable harvest opportunity. Interbreeding of the hatchery stock with naturally spawning stock is minimized by the differences in spawn time, but the lack of adequate adult collection facilities increases the potential for interbreeding.

B. Likelihood of attaining goals?

The program is achieving the managers' harvest goals.

[28] *In the case of a segregated harvest program, population viability ratings are low, medium and high and refer to the stock's ability to sustain itself in the culture environment.*

C. Consistent with goals for other stocks?

There is the potential for genetic interaction with naturally spawning winter steelhead for the reason stated in A, above. There is also a potential risk to chum and coho fry, and zero-plus Chinook.

RECOMMENDATIONS

- Implement System-Wide Recommendations regarding establishing a regional system of wild steelhead management zones, where streams are not planted with hatchery fish and are instead managed for native stocks. Fishing for steelhead in these zones would not be incompatible with this approach, but no hatchery-produced steelhead should be introduced. Such zones would reduce the risk of naturally spawning fish interbreeding with hatchery fish, and provide native stocks for future fisheries programs. To meet harvest goals, hatchery releases may be increased in those streams selected for hatchery production.
- Select both wild and hatchery streams based on stock status and a balance of large and small streams and habitat types.
- Use locally-adapted stock (of Chambers Creek origin) for those streams. Decrease reliance on other facilities (such as Tokul Creek or Bogachiel hatcheries) to backfill shortages in locally adapting hatchery stock. Actions such as harvest restrictions should be implemented to achieve 100% local broodstock.
- Manage the hatchery stock to maintain its early spawn timing and reduce the likelihood of interaction with naturally spawning steelhead.
- Include adult collection capability wherever steelhead are released, to capture as many adults from the returning segregated population as possible. Discontinue releases (included trucked releases) where adults cannot be collected at return.
- Release hatchery yearling steelhead smolts between April 15 and May 15 at target size of six fish to the pound, and a condition factor of less than 1.0.
- Conduct a workshop to implement this wild steelhead management zones concept.
- Implement monitoring and evaluation as a basic component of both wild steelhead management zones and hatchery harvest streams.
- Investigate the reasons for the recent decline in adult winter steelhead returns, formulate a working hypothesis for the decline, and take appropriate actions.
- Discontinue the pooling of gametes and adopt spawning protocols that maximize the effective population size of the hatchery component (see HSRG System-Wide Recommendations).

COMMENTS

- Consider culturing and rearing integrated stocks in the Willapa Basin, since most, if not all, current steelhead release sites in this region do not have adequate adult collection capabilities.
- Current conditions in the Palix and Bear rivers fit the wild steelhead management zone concept for small streams. The larger streams to be set aside could include the North, Nemah, Willapa and/or Naselle rivers.
- The HSRG was asked to comment on the feasibility of recycling steelhead adults back into the Willapa River to increase harvest opportunities. A well-designed study to verify the risks and benefits from recycling is needed in order to make an informed decision on this issue. In the absence of this information, the HSRG is concerned that the risk from recycling might outweigh the benefits, especially in light of inadequate adult collection facilities in the Willapa River.

MANAGERS RESPONSE

WDFW appreciates the HSRG recommendations on Wild Steelhead Management Zones, but believes that a "white paper" on this topic could increase our understanding of HSRG concerns and recommended remedies. In particular, it would be helpful to include an explanation of why adult collection is required for all segregated hatchery steelhead programs. WDFW conducted a steelhead workshop in 2003 to discuss recent research, performance of the hatchery programs, and management options (including integrated and segregated programs). Information gathered during this workshop and HSRG recommendations will be used in 2004 to develop an implementation plan for improved steelhead programs.

Willapa Bay Coastal Cutthroat

Washington Department of Fish and Wildlife

Stock Goals:	Current	Short-Term	Long-Term
Biological Significance	Intermediate	Intermediate	Intermediate
Population Viability	Healthy	Healthy	Healthy
Habitat	Limiting	Limiting	Healthy
Harvest Opportunity	Each Year	Each Year	Each Year
Hatchery Program:			
Purpose	Conservation and Education		
Type	Integrated		

PROGRAM DESCRIPTION

This is a native stock with wild production. Under this one-time program, 65 adults were released at Headquarters Creek and 40 adults into Cedar Groves Creek. Adults were taken from fish that had volunteered into the Naselle and Nemah hatcheries. There are no releases of hatchery cutthroat into Willapa Bay streams. In 1981, 135 adult cutthroat trout were trapped at Nemah Hatchery for a broodstock project. These fish were taken to Lake Aberdeen Hatchery for use as broodstock for a program of releases in lakes and streams in Grays Harbor. It is believed that no resulting progeny were planted to Willapa Basin streams or tributaries. In recent years, wild cutthroat adults have been trapped at Willapa, Naselle and Nemah hatcheries for transfer to streams on the Willapa National Wildlife Refuge.

OPERATIONAL CONSIDERATIONS

- This is intended to be a restoration program for cutthroat trout in the Willapa Bay National Wildlife Refuge.
- Coastal cutthroat trout were extirpated from several small streams in the Refuge because of tidal dikes and other habitat modifications.
- The Refuge manager has an aggressive program to restore habitat to natural conditions.
- All adults were adipose fin clipped upon transfer.
- The majority of released fish are believed to have exited these streams before spawning. The amount of natural spawning is unknown because of the lack of adequate monitoring.

BENEFITS AND RISKS

A. Consistent with short-term and long-term goals?

Re-establishing naturally spawning populations of cutthroat trout in the Refuge is consistent with short- and long-term goals for the stock.

B. Likelihood of attaining goals?

The lack of imprinting and/or the stress of transferring mature adults may preclude successful reproduction of transplanted adults.

C. Consistent with goals for other stocks?
Cutthroat trout spawn in very small streams. Restoring these fish as part of a normally functioning ecosystem is consistent with the goals for other species and stocks.

RECOMMENDATIONS

- Develop a cutthroat restoration plan for the Willapa Bay National Wildlife Refuge. The US Fish and Wildlife Service should lead this, in collaboration with the Washington Department of Fish and Wildlife and the Willapa Bay Fisheries Enhancement Group. The restoration plan should explore a variety of cutthroat life history stages for transfer to streams in the Refuge. The plan should consider an artificial propagation component. Adults trapped at the Naselle and/or Nemah hatcheries would be held until sexually mature, spawned and then those progeny reared to various life history stages prior to release (e.g. remote site incubator release from eyed eggs, sub-yearling releases, and yearling releases).
- Include a monitoring and evaluation plan, to understand successes and failures and for achieving goals and objectives.

COMMENTS

- Like all integrated hatchery programs, success will depend on good habitat being available to both the hatchery- and natural-origin components of the integrated population (see HSRG system-wide recommendation about productive habitat).

MANAGER RESPONSE

WDFW supports the recommendations of the HSRG, but notes that no pond space is currently available to implement a cutthroat restoration program.

Facility and Regional Recommendations

Assembled below are the Hatchery Scientific Review Group's recommendations that involve capital improvements at hatchery facilities in the Willapa Bay region. Also included are several region-wide recommendations.

FORKS CREEK HATCHERY

- Modify the adult holding pond to allow for large numbers of returning adults and to accommodate various species and run timing.
- Improve the facility's adult collection capabilities to permit collections during high flows.
- Improve pollution abatement.

NEMAH HATCHERY

- Modify or replace the adult pond and adult trapping capability, to allow for improved sorting and upstream passage.

NASELLE HATCHERY

- Substantial capital investment is needed at Naselle to accomplish current programs and recommendations. If this investment is not made, current programs should be discontinued.
- Improve the facility's adult collection capabilities.
- Modify the ponds so that each becomes two or three raceways, to allow better control of fish populations and better disease management.
- Upgrade the water valves and supply lines.
- Fix the intake to avoid taking juvenile fish into the hatchery.
- Provide a portable raceway for cutthroat.

ALL FACILITIES

- Provide screening and fish passage at all regional facility intakes.
- Provide predator control at all regional facilities.
- In order for hatcheries to adequately follow the general principles of scientific defensibility and informed decision making, the HSRG supports the need for increased monitoring and evaluation capabilities. This would include the acquisition of the equipment necessary for these activities. Examples would include the following:
    - Equipment for adult handling to improve both the recovery of evaluation data and to facilitate safe passage upstream of natural-origin fish.
    - Equipment to facilitate adult collection for inclusion in integrated hatchery brood stock population management.
    - Equipment for monitoring and evaluating the population status of integrated hatchery stocks and associated natural spawning populations.
    - Equipment for improving hatchery inventory, monitoring and predator control.
    - Opportunities to process data collections such as otolith reading, genetic sampling and mark recovery activities.

REGIONAL RECOMMENDATIONS

- Develop a region-wide strategic plan for managing all stocks. This will require developing a better understanding of stock structure and identifying core populations for each species, and designing hatchery programs and strategies around this structure.
- For Chinook, focus on developing properly integrated stocks on the Naselle and Willapa rivers. Straying to Nemah by these stocks would pose little risk. Given the limited potential for Chinook habitat in the Nemah River, the uncertainty of the stock structure, and the history of hatchery releases in this watershed, developing viable stocks in the Naselle and Willapa Rivers may better meet the stock goals for the region than attempting to create a properly integrated Nemah River Chinook stock. Consider either operating a Chinook program at the Nemah Hatchery that is segregated from both the Willapa and Naselle stocks, to maintain the harvest benefits from this program or using Nemah as a release site for the Naselle and/or Willapa Chinook programs.