

**W3 What is the Role of Hatcheries in Salmon
Recovery and in Maintaining
Viable and Fishable Salmon Populations?**

**Draft Platform Statement
1- 20-05**

Shared Strategy Summit 2005

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Introduction to Platform Statements

This “platform statement” is one of nine papers drafted to stimulate discussion and make progress on topics related to salmon recovery that cross all the Puget Sound watersheds. This paper on the role of hatcheries was developed by the Washington State Department of Fish and Wildlife and is intended to describe the ideas and questions that have been identified to date by a variety of people working on these issues.

The expectation is that together, Shared Strategy participants will be able to forge a regional consensus on how to make progress on the ideas and questions identified in the papers and that these ideas will be incorporated into the draft regional recovery plan submitted to NOAA and U.S. Fish and Wildlife Service this June.

Under the Endangered Species Act, a recovery plan must identify the threats to survival, the actions necessary to address the threats, measures for delisting, cost of the actions and a schedule for implementation. In the Shared Strategy, all governments and interest groups agreed to add to the federal requirements by including commitments to implement the plan to ensure its success. This will be the first recovery plan ever developed through a partnership of affected parties that includes commitments for implementation.

The Puget Sound recovery plan will be a living document that evolves and improves over time through implementation. Parts of it will be well defined by June, and other parts will need more work in the future, due to limited knowledge, resources or current political or public commitments. Where additional detail is needed to address a significant threat to salmon survival, the plan must provide a schedule with measurable decision points for how the gap will be filled.

We encourage your comments at the Summit or by contacting Shared Strategy staff directly. It will be most helpful for you to indicate where the draft statement is generally heading in the right direction and how to take it further to help achieve recovery goals, as well as to identify which questions or issues will need to be addressed at a future time.

**What is the Role of Hatcheries in Salmon Recovery and in Maintaining Viable
and Fishable Salmon Populations?
Draft January 20, 2005**

Summary:

The National Research Council (1996) concluded that:

"Hatcheries can be useful as part of an integrated comprehensive approach to restoring sustainable runs of salmon, but by themselves they are not an effective technological solution to the salmon problem."

This paper proposes that hatcheries are one tool of the integrated, comprehensive approach of the Shared Strategy, and that effective use of this tool recognizes the following:

- 1) Productive natural habitat is essential for healthy, harvestable salmon populations.
- 2) Hatcheries designed, operated, and evaluated in an ecosystem perspective are more likely to provide harvest and conservation benefits with reduced risks to natural populations.
- 3) A hatchery program is "successful" when it provides more benefits than risks when evaluated relative to watershed-specific objectives.
- 4) The design of a successful hatchery program begins with the careful selection of either an integrated or an isolated (also referred to as segregated) hatchery strategy. Integrated hatchery programs can be operated to increase the number and distribution of natural spawners, increase the productivity of the composite population, and provide fishing opportunities. Isolated hatchery programs can be operated to provide fishing opportunities while minimizing interactions with natural populations.
- 5) Habitat quality and quantity remain essential, regardless of the hatchery strategy, if hatchery programs are to be successfully implemented. In watersheds where social, economic, or funding constraints limit the feasibility of meeting conservation and harvest objectives strictly through habitat restoration and protection, hatchery programs using an integrated strategy and complementary habitat actions ("balanced portfolio" approach) could be implemented and tested.
- 6) Hatchery management improves through adaptive management - or making changes based on learning by doing. This process is enhanced by carefully defining and monitoring performance measures.
- 7) Hatchery programs are managed by the state, tribes, and federal government under the legal framework provided by the *United States v. Washington* decision.
- 8) *Hatcheries can provide harvest opportunities to partially mitigate for production lost due to habitat degradation. However, hatchery production can never fully replace the benefits of natural production.*

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Introduction

Hatchery reform is the ongoing, systematic application of scientific principles to improve hatcheries for recovering and conserving naturally spawning populations and supporting sustainable fisheries (Hatchery Science Review Group 2004). The roots of hatchery reform can be traced back at least to the late 1980s, but an influential report published by the National Academy of Sciences in 1996 may have been the first to promote a broad discussion of a new paradigm for hatchery programs. That report, “*Upstream: Salmon and Society in the Pacific Northwest*” (National Research Council 1996), concluded that hatcheries had generally failed to compensate for habitat degradation and recommended a broader, ecosystem perspective for hatchery management. The principles of hatchery reform have subsequently been refined (Brannon et al. 1999; ISG 2000; Williams et al. 2003; HSRG 2004), evaluation tools developed (WDFW and PSTT 2002; HSRG 2004), and program modifications initiated in Puget Sound (WDFW and PSTT 2002; PSTT and WDFW 2004).

In its review, the National Research Council (1996) concluded that:

“Hatcheries can be useful as part of an integrated comprehensive approach to restoring sustainable runs of salmon, but by themselves they are not an effective technological solution to the salmon problem.”

This paper proposes that hatcheries are one tool of the integrated, comprehensive approach of the Shared Strategy. Drawing from the extensive work on hatchery reform during the last decade, eight principles are proposed to guide the effective use of this tool. Detailed discussion of these principles is beyond the scope of this paper; substantive discussion of hatchery reform may be found by reviewing documents identified in the reference list at the end of this paper.

Principles

1) Healthy Habitat Provides Greatest Biological Certainty. *Productive natural habitat is essential for healthy, harvestable salmon populations. However, restoring and protecting habitat to the extent necessary to achieve population restoration and harvest goals is often a long-term process and social, economic, or funding constraints may make it infeasible for some populations.*

Four alternative types of habitat management strategies are to protect, restore, rehabilitate, or substitute (NRC 1996). As the strategy moves from protection to substitution (including hatchery production), the certainty of achieving viable salmonid populations declines because of the complex interaction between the environment and salmonid populations and our limited ability to predict the effects of anthropogenic intervention (NRC 1992; 1996). Although protection and restoration strategies provide the greatest biological certainty, habitat within the range of listed species of salmonids is typically substantially degraded and the restoration of natural processes may not be feasible within a 10-20 year time frame. In some watersheds, social, economic, and funding constraints may limit our ability to provide the habitat conditions necessary to meet the objectives of the Shared Strategy (see for example, NMFS’ consideration of economic impacts in the proposed rule for critical habitat, 69 FR 74572; December 14, 2004).

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2) Ecosystem Perspective Promotes Improved Performance. *Hatcheries designed, operated, and evaluated in an ecosystem perspective are more likely to provide harvest and conservation benefits with reduced risks to natural populations.*

A fundamental change from the historical paradigm for hatchery programs is required to achieve the conservation and harvest objectives of the Shared Strategy. Rather than viewing a hatchery as an isolated fish production factory, numerous scientific reviews have recommended that hatchery programs should be integrated and evaluated as part of the environmental and ecological systems in which they operate (NRC 1996; Brannon et al. 1999; HSRG 2004). Viewing a hatchery as a tributary to a watershed expands hatchery assessments from a simple examination of fish culture practices to a broad investigation of demographic, ecological, evolutionary, and fishery interactions (Williams et al. 2003).

3) Successful Programs Achieve Watershed Specific Objectives. *A hatchery program is “successful” when it provides more benefits than risks when evaluated relative to watershed-specific objectives. The characteristics of a successful program will differ among watersheds because of the varying status of natural populations and policy decisions regarding the rapidity and extent of habitat protection and recovery.*

Hatchery programs can provide substantial economic, cultural, and conservation benefits, but potentially they can also pose risks to natural populations of salmon and steelhead (for a summary, see 69 FR 31356; June 3, 2004). Often, hatchery programs focused on preventing extinction and promoting recovery must consider tradeoffs between different biological risks in the short-term to achieve long-term recovery. The risks and benefits of a hatchery program should be evaluated relative to the ability of the habitat to support viable natural populations and meet other policy objectives – currently and in the future. This evaluation should take into account the abundance, productivity, diversity, and spatial structure of the population (referred to as the parameters of a viable salmonid population, see McElhany et al. 2000), and how the hatchery program affects these population characteristics.

As habitat improves to levels that support viable natural populations, hatchery programs can often be modified to reduce potential risks while maintaining harvest and conservation benefits. A hatchery program may be visualized as following a trajectory from the current operation to the expected operation at recovery (Fig.1). The speed and direction of the trajectory will depend on the current conservation value of the population, the current productivity of the habitat, and policy decisions that define region-wide recovery.

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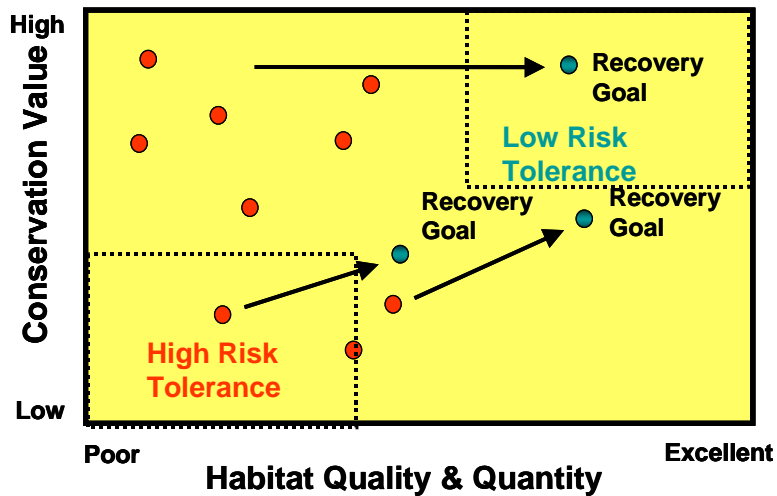


Figure 1. Conceptual representation of relationship between habitat quality and quantity, population conservation value, and risk tolerance for hatchery programs (revised from Currens and Busack, In Prep.).

4) Goal and Strategy Drive Program Protocols. *The design of a successful program begins with the careful selection of either an integrated or an isolated (also referred to as segregated) hatchery strategy. Integrated hatchery programs can be operated to increase the number and distribution of natural spawners, increase the productivity of the composite population, and provide fishing opportunities. Isolated hatchery programs can be operated to provide fishing opportunities while minimizing interactions with natural populations.*

A hatchery program can be succinctly described by identifying the management objective and the reproductive strategy (Table 1). The two primary management objectives of hatchery programs are recovery or harvest. The strategy describes the degree of reproductive interaction between natural and hatchery-origin adults in the hatchery and in natural spawning areas. Integrated programs intend that fish of natural- and hatchery-origin become fully reproductively integrated as a single population. This will always require that natural-origin adults are incorporated in the broodstock for the hatchery program, and hatchery-origin adults may spawn in natural areas. Isolated programs intend for the hatchery population to represent a distinct population that is reproductively isolated from naturally-spawning populations. Strategy selection is program and watershed specific, and depends on the status of the natural population and habitat, the ability to collect natural-origin broodstock, the ability to control the number of hatchery-origin adults in natural spawning areas, and other factors.

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Table 1. Artificial production strategies and their primary uses (from PSTT and WDFW 2004).

Primary Management Objective	Demographic relationship to natural population(s) in watershed	
	Integrated Production	Isolated Production
Recovery	<ul style="list-style-type: none"> • Prevent extinction • Increase natural origin recruits using the local stock • Reintroduction • Research 	<ul style="list-style-type: none"> • Prevent extinction • Create 'reserve' population in case other recovery options fail • Gene banking until reintroduction • Research
Harvest	<ul style="list-style-type: none"> • When isolated approach is not feasible • Maintaining local stocks • During rebuilding • Mitigation • Research 	<ul style="list-style-type: none"> • Create new or enhance existing fishing opportunities • Mitigation • Allocation • Research

Hatchery operating protocols should be consistent with the management objective and the strategy. The protocols describe the daily operation of the hatchery program, and include the program size, broodstock source and collection procedures, rearing conditions, and time, size, and location of release. Guidelines for hatchery protocols have been developed by the Hatchery Science Review Group (2004) and PSTT and WDFW (2004).

The HSRG (2004) provided several examples of Puget Sound hatchery Chinook programs that are: 1) helping to recover and conserve naturally spawning populations or 2) supporting sustainable fisheries. While further improvements to these programs can and are being made, the HSRG concluded that, overall, the programs were in keeping with the “key principles of operating hatcheries in the context of clear goals, scientifically defensible programs, and informed decision making.” These examples are summarized below to provide tangible examples of the role hatchery programs, if properly managed, can play in the Shared Strategy for salmon recovery.

Recovery

“White River Chinook. In 1977, fewer than 50 naturally-spawning spring chinook returned to spawn in the White River. Responding to this crisis, a multi-agency recovery effort ...developed the White River Recovery Plan. This plan has used captive breeding and multiple juvenile rearing and release strategies to increase the number of adults returning to spawn. As a direct result of this program, nearly 1,000 adults returned to spawn naturally in the last two years. Without intervention, this unique stock of Chinook would be extinct today.”

“Elwha Chinook. This cooperative effort between WDFW, the Lower Elwha Tribe and the National Park Service is a good example of a long-term gene banking program. It is

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successfully maintaining a naturally spawning population of Elwha Chinook until recolonization of the upper watershed can occur, after the scheduled removal of the two dams on the Elwha River that have blocked this unique Chinook stock's access to pristine habitat for nearly 100 years."

Harvest

"Green River Hatchery Fall Chinook. The Washington Department of Fish and Wildlife's Green River Hatchery has propagated Chinook and provided harvest on these fish for 100 years. Harvest goals are consistently achieved within Washington waters. Significant numbers of natural-origin adults are used each year for broodstock, integrating this hatchery stock with the natural stock. As a result, the hatchery stock also contributes to meeting natural production goals for fall Chinook in a compromised habitat."

Providing harvest opportunities consistent with conservation is an important, legally defined role for hatcheries. In the *United States v. Washington* the court concluded:

"The hatchery programs have served a mitigating function since their inception in 1895. 506 Supp. at 198. They are designed essentially to replace natural fish lost to non-Indian degradation of the habitat and commercialization of the fishing industry." *United States v. Washington*, 759 F.2d 1353m 1360 (9th Cir)(en banc), cert. Denied, 474 U.S. 994 (1985).

Both integrated and isolated hatchery strategies can help achieve this goal.

5) Productive Habitat is Essential. *Habitat quality and quantity remain essential, regardless of the hatchery strategy, if hatchery programs are to be successfully implemented. In watersheds where social, economic, or funding constraints limit the feasibility of meeting conservation and harvest objectives strictly through habitat restoration and protection, hatchery programs using an integrated strategy and complementary habitat actions ("balanced portfolio" approach) could be implemented and tested.*

An outgrowth of the new, ecosystem paradigm for hatchery operations is the renewed recognition of the critical importance of habitat. Hatchery programs can only be successful if habitat conditions are conducive to the survival of salmon throughout their entire life cycle. This is particularly true for programs relying on an integrated strategy, since natural-origin broodstock must be incorporated into the hatchery in each generation. This means that the risks and benefits of a program of fixed size will be directly related to the productive capacity of the natural habitat.

In watersheds where social, economic, or funding constraints limit the feasibility of meeting conservation and harvest objectives strictly through habitat restoration and protection, hatchery programs using an integrated strategy and complementary habitat actions could be implemented and tested. Where applied, this "balanced portfolio" approach should be carefully designed, monitored, and evaluated during the next 10-20 years. Scientific decision support tools

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developed by the comanagers, HSRG, and other can help identify scientifically defensible combinations of habitat improvement, harvest constraints, and hatchery program size that are consistent with policy objectives and constraints.

6) Manage Hatchery Programs for Success. *Hatchery management improves through adaptive management - or making changes based on learning by doing. Adaptive management is enhanced by carefully defining and monitoring performance measures.*

Continued review, evaluation, and modification of hatchery programs is essential to assure that fishing-related economic and cultural benefits are maximized and region-wide recovery objectives achieved. Adaptive management is a process that allows managers to make informed decisions while operating in the face of uncertainty, including future circumstances and consequences. It is likely to be most effective if it is driven by clearly defined goals and objectives, performance measures are identified and monitored, and results are readily available, communicated, and evaluated in a defined decision making framework.

7) Legal Framework Defined by *United States v. Washington*. *Hatchery programs are managed by the state, tribes, and federal government under the legal framework provided by the *United States v. Washington* decision.*

The Puget Sound Salmon Management Plan (PSSMP) under *U.S. v. Washington* provides the legal framework for managing hatcheries to provide harvest and meet recovery objectives. It also identifies tools for making changes in hatcheries. These tools include 1) descriptions of standard modes of operating hatchery programs developed under regional planning by the co-managers (goals, production objectives, description of facilities, species cultured, brodstock source, hatchery protocols, and contingency plans); 2) annual descriptions and review of the operating objectives and changes from the standard program that can be used for annual planning; 3) regional management plans to coordinate co-manager activities and priorities; 4) exchange of technical information and analyses through coordinated information systems; and 5) dispute resolution.

8) Relationship Among Hatcheries, Harvest, and Habitat. *Hatcheries can provide harvest opportunities to partially mitigate for production lost due to habitat degradation. However, hatchery production can never fully replace the benefits of natural production.*

While natural populations are recovering, hatchery programs will provide important harvest opportunities. This allows all groups to maintain the knowledge and culture of fishing and, in particular, provides treaty tribes with the ability to retain a portion of their treaty-reserved fishing rights in the face of habitat degradation. Because harvest opportunities on hatchery fish are only available in restricted times and places, they cannot fully make up for the harvest that would be available from restored natural populations. Hatcheries will provide a necessary source of harvest opportunity while natural populations recover, but restoration of habitat function is required to restore natural production, which in turn is necessary for harvest and other benefits.

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Steps to Success

The sustained implementation of the principles discussed in this paper will lead to hatchery programs that are an effective tool in the integrated, comprehensive approach of the Shared Strategy. The comanagers have made substantial progress in implementing hatchery reform in Puget Sound, but significant work remains to be accomplished. What are some of the key steps to success?

- 1) Watershed Goals and All-H Integration. Additional discussion may be needed in some watersheds to more carefully define the role of habitat restoration and hatchery programs in meeting short- and long-term harvest and conservation objectives. Is the current position and trajectory for hatchery programs (Fig. 1) clear for your watershed?
- 2) Adaptive Management. Implementation of performance measures, analysis and reporting tools, and a decision framework is essential to maximize the fishery-related economic, cultural, and conservation benefits of hatchery programs. The principles identified in this paper should be used to help guide the development and implementation of adaptive management.
- 3) Funding. Success of the hatchery reform initiative is critically dependent on new and sustained federal, local, and state funding. Funds are required for both improved operating procedures, monitoring, and for capital improvements to facilities.
- 4) Communication. Watershed planning has fostered an improved understanding of habitat, harvest, and hatchery integration opportunities and issues. Building on this shared understanding in the years ahead is important to further tighten the integration of all-H actions and assure that no opportunities to hasten recovery are missed.

Questions

- 1) Are there any concerns or issues in regard to the use of the principles described in this paper to guide the effective use of hatcheries in the integrated, comprehensive approach of the Shared Strategy?
- 2) What is needed to implement hatchery reform and what strategies should participants in the Shared Strategy pursue to address those needs? (e.g. resources, education, etc.)
- 3) How do we measure success? What tools can help to evaluate the results integrated hatchery programs?

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