Frequently Asked Questions

Salmon Hatchery Questions & Answers

In the late 19th century, elements of a hatchery system for Pacific salmon started to develop. Hatcheries are fish breeding and raising centers that have been built primarily to enhance harvest in commercial, sport, and Tribal fisheries, and reduce the impacts of development that destroys or degrades salmon habitat and blocks migratory routes.

Salmon have existed for millions of years and are a critical part of the Pacific Northwest's economy and culture. As the demand for salmon has grown, so has our dependence on hatcheries. Hatcheries currently contribute between 70-80% of the fish in coastal salmon and steelhead fisheries in the Pacific Northwest.

Over the past several decades, wild salmon populations have declined dramatically, despite, and perhaps sometimes because of, the contribution of hatcheries. Many salmon stocks in Washington and Oregon are now listed as either threatened or endangered under the U.S. Endangered Species Act. With this decline has come an increased focus on the preservation of indigenous wild salmon stocks.

Hatcheries have the potential to assist in the conservation of wild stocks, but they also pose some risks. At this time, scientists still have many questions about the extent to which hatchery programs enhance or threaten the survival of wild populations. Additional research and investigation is needed.

This list of Q&As provides some general information about hatcheries and the interaction of hatchery fish with wild stocks. The Q&As were prepared by scientists at the National Marine Fisheries Service's Northwest Fisheries Science Center. The answers provided do not represent the official views of the National Marine Fisheries Service or the National Oceanic and Atmospheric Administration. A list of references is provided for further information. We will update this site periodically and include additional questions and answers on related hatchery topics. For more information/references.

Q: Why is salmon conservation important?

A: Salmon conservation is important for biological, economic, cultural, and religious reasons. Salmon play a major role in aquatic and terrestrial ecosystems. When salmon return to their natal streams to spawn and die, they bring large amounts of nutrients from the marine environment into rivers and streams, where they enrich both plant and animal life.

Salmon are a part of Native American spiritual and cultural identity. Salmon
support religious ceremonies held by Pacific Northwest Indian Tribes and are a vital part of Tribal economies. Salmon also support the greater Pacific Northwest economy. In 1996, fish caught by Washington commercial fishers were worth an estimated $148 million. In addition, recreational anglers spent approximately $700 million on fishing related expenses, which translates into about $1.3 billion and over 15,000 jobs.

1. Life in the Pacific Northwest would be very different without salmon.

Q: Why are there hatcheries?

A: Hatcheries improve the survival of young salmon (eggs, fry, and juveniles). More young salmon survive in the hatchery than would survive in the wild because there are no predators in hatcheries, food is abundant, and the environment is relatively constant. Click here to learn about the potential benefits of this increase in survival.

Q: Why should we focus on conserving "wild" populations? Why not rely instead on hatcheries?

A: Wild salmon have existed for millions of years. The oldest salmon fossil dates back about 50 million years. Pacific salmon, as we know them today, emerged about 2 million years ago. Remaining natural salmon populations provide the best chance for long-term survival of salmon because they have had to evolve and respond to significant environmental changes over many thousands of years, and can be expected to do so in the future.

Salmon hatcheries can provide a number of benefits to society, but reliance on salmon hatcheries as a substitute for the conservation of wild populations is risky as a long-term conservation strategy. While wild salmon populations have existed for many thousands of years, most hatchery populations have only existed for several decades or less. We do not know if hatchery stocks have the same resilience as wild salmon populations. If hatchery stocks can't survive on their own in the wild, they will need a hatchery to sustain them forever. This can be problematic because:

- mechanical and technical difficulties occur periodically in hatcheries, such as disruption of power or water supplies or disease outbreaks; and
- hatcheries are expensive to operate, requiring a large and constant source of funds.

Q: Why worry about salmon conservation? Why don't we just wait until ocean conditions change?

A: Ocean conditions (e.g., air and sea temperature, currents, and productivity) fluctuate from year to year, as well as during periodic events, such as El Nino
and La Nina. Because salmon typically spend between 1-3 years in the ocean before returning to their natal streams to spawn, ocean conditions impact salmon survival and growth. It is true that even if we don't take any direct salmon conservation actions, we may temporarily see higher adult returns, as a result of more favorable ocean conditions. For example, adult salmon returns in many parts of the Pacific Northwest were higher in 2000 and 2001 than they had been for many years—a result that is primarily attributed to favorable ocean conditions. But waiting for improved ocean conditions is not a good conservation strategy for salmon because:

- No one is sure whether we are about to enter a more favorable period of ocean conditions for Pacific Northwest salmon or, if we are, how long it will last; and
- Even if salmon do experience a long period of better ocean conditions, if we don't address the underlying causes of salmon decline (habitat loss and degradation, hydropower, development, harvest, and hatchery propagation), any "recovery" the salmon experience will be temporary, and the next time ocean conditions decline we could see widespread extinction of salmon populations.

Q: Why are hatcheries controversial?

A: Hatcheries are controversial because:

1. For more than a century they have been viewed as a substitute for addressing the root causes of salmon decline, like loss and degradation of habitat, blockage of migratory routes, and over-harvest.
2. While it is not hard to identify risks that hatcheries pose for wild populations, it is not so easy to predict whether damaging effects to natural populations will occur in any specific case, and if they do, how serious the effects will be.
3. Critics of hatcheries sometimes disagree among themselves and don't always present consistent proposals for change.
4. They have strong support from groups that rely on them to provide fish for commercial, recreational, and Tribal harvest, as well as jobs.
5. There has been little effort to develop a comprehensive cost-benefit analysis that outlines the value and costs of hatcheries.

Q: Are there different types of hatcheries

A: Each hatchery program is unique. The easiest way to differentiate hatcheries is to look at their goals and how they implement those goals. Hatcheries have one of three basic goals:

6. To Produce Fish for Harvest

Some hatcheries strive to produce fish in order to maximize harvest and/or to mitigate for losses that would have occurred because of habitat degradation or blocked access. Hatcheries with this goal have been around
for over 100 years. Over the years, concern has developed about how to best integrate natural and hatchery production. To address this concern, most of these hatchery programs try to minimize the impacts of straying on natural populations. Some hatcheries also try to minimize interactions between hatchery and wild stocks (e.g., by establishing hatcheries in streams where natural populations no longer exist). Click here to find out more information about hatchery reform.

7. To Recover Wild Populations

Some hatcheries strive to conserve or recover natural populations of salmon. Hatcheries with the goal of recovery have not been around as long as those with the goal of production. In contrast to hatchery programs with the goal of production, these hatchery programs involve the intentional integration of wild and hatchery fish. Once hatchery fish have hatched and grown, they are reintroduced into the natural environment to become naturally spawning fish. In some programs, hatchery managers try to maintain genetic diversity and natural behavior in hatchery stocks. In these programs, hatchery fish may be reared in habitats that are more similar to wild environments (i.e., there may be areas for fish to seek cover, natural substrate, and currents for the fish to swim against).

8. Fish for Harvest and Recover Wild Populations

Q: What benefits can hatcheries provide to wild populations?

A: The primary goal of a hatchery is to ensure high survival of eggs, fry, and juveniles—life stages that typically experience high mortality in the wild. By collecting broodstock from the wild, a successful salmon hatchery can produce more returning adults than would have occurred in the wild.

Potential benefits to society include:

- Continued harvest
- Reducing the impacts of development or blockage of access to habitat
- Recovery of wild stocks

Potential benefits of hatcheries in wild stock recovery include:

- Minimizing short-term extinction risks for endangered populations
- Helping to maintain a population at a safe level until factors for decline can be addressed, such as habitat degradation and loss
- Speeding recovery by providing a demographic boost to an existing population
- Reintroducing salmon into vacant habitat
Q: What risks do hatcheries pose to wild populations?

A: Scientists have known for decades that salmon spawned and reared in hatcheries tend to become different from their wild ancestors. Risks to wild populations from hatchery fish include the following:

- Genetic
- Ecological
- Behavioral
- Overfishing
- Fish Health

Q: Have hatcheries improved in recent years?

A: Considerable improvements have been made in fish culture and fisheries management. Some of these improvements include:

- more focus on local broodstocks
- better broodstock collection and mating protocols
- more natural rearing conditions
- more natural release strategies

These changes have helped to reduce the direct and indirect effects of hatchery programs on natural fish populations (and in some cases have also increased hatchery productivity). It is important to note, however, that these changes can not make the risks that hatcheries pose to natural populations disappear altogether.

Q: What is genetic diversity and how is it important to the conservation of salmon?

A: Genetic diversity is a part of "biodiversity," which refers to our planet's wide variety of life forms. Genes determine the characteristics of living things. Variation in genes allows organisms to evolve and adapt to new conditions. Two components of genetic diversity are important to maintaining healthy salmon populations:

- Diversity within populations—that is, ensuring that not all individuals are alike and that there are differences between individuals in traits such as age, size, and migration timing.
- Diversity among populations—that is, ensuring that not all salmon populations are alike and that there are differences between populations.

Diversity within and among populations ensures that salmon populations have the ability to respond to changing environmental conditions (such as warmer or cooler sea temperatures). Without genetic diversity, salmon would be more susceptible to fluctuations because all individuals and/or populations would face the same environmental conditions, good or bad.
Q: Why is it important to conserve salmon in the Pacific Northwest if there are salmon in Alaska?

A: Diversity is not only important within and among populations but also at larger geographic scales. In the last decade, we have learned that, in general, salmon abundance in Alaska and in the Pacific Northwest is inversely related—that is, when salmon abundance is relatively high in Alaska, it is relatively low in the Pacific Northwest, and vice versa. This pattern appears to be driven by cycles in ocean productivity, lasting about 20-30 years. If we fail to conserve salmon in the Pacific Northwest, relying instead on salmon in Alaska, there would be no populations poised to take advantage of the next cycle of relatively good ocean conditions in the Pacific Northwest. Instead, all the remaining populations (in Alaska) would be exposed to relatively unfavorable conditions at the same time. This would greatly reduce the overall productivity of salmon, and increase the risk of extinction of the species as a whole. In addition, conserving salmon in Alaska but not in Pacific Northwest would ignore the major role salmon play in Pacific Northwest ecosystems, culture, economy, and religion.

Q: How do you get surplus hatchery fish?

A: Many variables influence the number of fish that return to a hatchery, including changing ocean conditions, food availability, fishing pressures, and disease. Because the outcome of all of these variables is not predictable, it is impossible to know exactly how many hatchery fish will return in any given year. In years of relatively good ocean conditions, it is not uncommon for more adult hatchery fish to return than can be used to produce the next generation of hatchery fish and fulfill other needs at a hatchery. When hatchery programs get back more fish than they can use, these fish are considered to be surplus.

Q: What is the maximum number of hatchery fish that can be incorporated into a wild population?

A: There is no universal upper limit to the number of hatchery fish that can be allowed to spawn in the wild. Each individual hatchery program will have its own threshold—a point above which the biological risks outweigh the benefits. For relatively healthy natural salmon populations, the optimal level of spawning by hatchery fish in the wild might be zero. In contrast, for natural salmon populations that are severely depressed, allowing a substantial number of hatchery fish to spawn naturally might be a reasonable approach to alleviate the short term risk of extinction. The optimal percentage of naturally spawning hatchery fish also depends on the history of the hatchery population and the characteristics of the ecosystem where they will be released (see carrying capacity issues). Hatchery populations that pose significant genetic risks (such as those where there is inbreeding or where non-native stocks are used as broodstock) can reduce the fitness and diversity of the natural population. In cases like this, few, if any, hatchery fish may be allowed to spawn naturally.
Q: Can anything be done to reduce the frequency or magnitude of surpluses?

A: Yes, some actions can be taken. It is important to note, however, that even though some things can be done to reduce the frequency and/or magnitude of the surpluses, surpluses cannot be eliminated entirely. The major reason for this is that the number of hatchery fish that survive after they are released as juveniles, can vary greatly due to fluctuating environmental conditions (e.g., warmer or cooler sea temperatures). Given this situation, one of the most important things a manager can do is to have a biologically sound plan in place to deal with hatchery surpluses. Each plan should comprehensively address the full range of scenarios that are likely to result.

Actions that can be taken to reduce the frequency and/or magnitude of surpluses include:

- Reducing the scale of the hatchery program
- Fixing the underlying issues
- Selectively harvesting surplus hatchery fish

Q: Is there anything that surplus fish can be used for?

A: There are a wide range of uses for surplus hatchery fish that don't increase risk to natural populations. As surpluses occur, hatchery managers must decide which options are the most appropriate, depending on available opportunities and the quality of the fish. Possibilities for using surplus hatchery fish include:

- Providing the fish to tribal governments for ceremonial and subsistence purposes.
- Increasing fishing opportunities by taking fish downriver where they are released and allowed to swim back upriver, giving anglers another opportunity to harvest them.
- Providing fish to charitable organizations, prisons, and/or the general public for consumption.
- Processing the carcasses to make fish food in order to raise the next generation of hatchery fish.
- Giving the carcasses to wildlife rehabilitation centers to use as food.
- Placing the fish carcasses in streams to enrich the environment.