NATIVE FISH SOCIETY
CONSERVATION REPORT
Number One
2008

By Bill Bakke, Director

IS THERE A RULE FOR WILD AND HATCHERY STEELHEAD MANAGEMENT?:
Refining what is known about the impact of hatchery steelhead on wild steelhead is seldom available, but a recent conclusion was provided by a biologist with the Washington Department of Fish and Wildlife. It is simple, based on the science, and reminds us that responsible management requires a decision. Depending on what perspective the decision maker has is an important ingredient in the outcome.

One outcome is to mix hatchery and wild steelhead in a watershed. This outcome is based on the 150 year history of steelhead management, university training, ignoring the science, and serving politics.

Another outcome is less popular and relies on management being shaped by science rather than conventional wisdom and politics. This outcome concludes that mixing wild and hatchery fish is not a good idea biologically and gets in the way of productive and interesting sport fisheries.

Fish management agencies are advocates of the first outcome and have organized themselves accordingly. Biologists that hold a biologically sound science based perspective can and do find themselves marginalized so that they seldom have influence over management decisions. The following rule, therefore, is not to be found in management policy by any fish agency, but it is a sound process for making decisions if conservation were a priority.

THE RULE

I saw some interesting work about steelhead recently. Staring at ground zero, as I understand the situation:

1. In most, but not all, cases, hatchery fish do not successfully introgress genetically with wild fish. The probability of introgression declines with increasing ecological differences between the wild and hatchery stocks.

2. Hatchery-origin fish can and do successfully spawn in the wild. Their progeny compete ecologically. This competition may/can be limited by stocking the hatchery fish low in the watershed as they generally do not penetrate all that far past the planting site for spawning.

3. Wild fish taken into a hatchery are less productive even as F1s (first generation). For a variety of reasons, hatcheries are not good environments for wild steelhead.

Which leads me to my current **"Rule"**

You can have wild steelhead in a watershed or you can have hatchery steelhead in a watershed. You cannot have strong populations of both in the same watershed. Choices must be made.

MARMOT DAM REMOVAL IS NOT WHAT IT MAY SEEM: Prior to the heavy fall rains Marmot Dam on the Sandy River was blown up by Portland General Electric. It was done with great fan fare by environmental groups. It is true that the Sandy River is now free flowing from Mount Hood to the Columbia; a major part of the flow is no longer diverted into the Bull Run River and juvenile fish passage is improved. Those are good things worth celebrating.

With Marmot Dam gone there is no longer a barrier to hatchery fish migration into the upper river. The dam was used as a block to hatchery fish while wild spring chinook, coho, and steelhead were passed upstream through the fishway. The wild fish are listed under the Endangered Species Act and the dam was used to protect them from interbreeding, and competing for food and rearing space from hatchery fish. Now that the dam is gone, there is no barrier to hatchery fish, and the wild fish have less protection.

In an effort to control the hatchery fish, the Oregon Department of Fish and Wildlife proposed to expand the fishery upriver 7.3 miles from Marmot Dam site to the mouth of Salmon River. They say that this change would increase the harvest of hatchery fish. This fishery would allow the use of bait and barbed hooks. It would likely mean more wild steelhead and salmon caught, and even though they would have to be released, there would be additional mortality sustained by those fish than prior to Marmot Dam removal. ODFW biologists estimated the incidental kill of wild steelhead would be two percent in the legal fishery, but locals say that poaching will remove even more wild fish.

In the last two years about 650 wild winter steelhead were counted over Marmot Dam. A two percent incidental kill will reduce the number of wild steelhead spawners and reduce the number of adults in the next generation. This fishery allows for a slow attrition of wild spawners. The ODFW commission concluded that adding risk to the wild steelhead population to increase harvest opportunity for hatchery spring chinook is justified.

The Sandy River Fish Management Plan of 1992 says that the wild steelhead run of 4,900 fish is the management goal above Marmot Dam. This was the run size in the 1950s. Since then the ODFW has added hatchery winter and summer steelhead to the river to expand fishing opportunity. The angler was provided the opportunity to kill hatchery and wild fish. Eventually, the wild run declined and has been listed as a threatened species. This new regulation adds to further depletion of the wild run.

In 2008, the Willamette spring chinook run is expected to be so low that the impact of a commercial fishery would endanger the run, so it is proposed to move the commercial boats upstream of the Willamette River. This commercial fishery is allowed a two percent harvest impact on wild steelhead in order to harvest hatchery spring chinook. The problem is that this two percent will come from only a few rivers rather than the many rivers between Bonneville Dam and the ocean. It is likely that if the fish managers allow a two percent wild steelhead harvest in the 2008, confined fishery rivers such as the Washougal, Sandy, Wind, Hood River, and Fifteenmile Creek among others will suffer a higher harvest impact rate than in previous years.

The ODFW commission was not told about the increased impact of the gill net fishery on this run when they decided to increase the sport harvest impact on wild steelhead in the Sandy River.

It is easy for the ODFW staff and commission to dismiss all these issues. The spawner goal in the Sandy Basin plan of 4,900 wild steelhead is a goal, a guideline, rather than a management mandate. Habitat degradation in the basin and declining ocean productivity are the primary limiting factors not the hatchery program or the kill fishery. Besides, when the wild run is small there is an increased survival of juveniles because they do not have competition for food and rearing space. It is easy for

the agency to explain away conservation management for wild fish because their administrative rules and state law are flexible, requiring little accountability for conservation.

There was sense of victory among the environmental community when Marmot Dam was removed. The spokesman for one group said at their banquet it was a good thing to get rid of the dam and open the river up to salmon again, not realizing the dam did not block passage. The river is now free flowing but there is less protection for wild salmonids because the dam is gone. The first fish management change was to increase the kill of wild fish in what used to be sanctuary water above the dam.

MAKING WILD SALMON USING HATCHERY FISH. The N.W. Power Planning and Conservation Council members were provided scientific information disputing this claim. The following is a conclusion of Eric Loudenslager of the Independent Scientific Advisory Board:

"In this analysis the total (hatchery + wild) abundance in the Imnaha was increased by supplementation, but the wild component was not. The productivity in the Imnaha was lower following supplementation when contrasted to the reference locations. There was no demographic benefit but there was a fitness decline."

A major justification for using hatchery fish to help wild salmon is to boost the numbers of wild spawners. This may sound illogical and it is. This comment does a good job of summing it up with facts. The major uncertainty is whether the so-called policy deciders will pay any attention and stop trying to justify using the hatchery tool to save wild fish.

CONFLICTING GOALS: THE ABSENCE OF A BIOLOGICAL LINE FOR MANAGEMENT OF MOLALLA RIVER WILD STEELHEAD.

Watersheds have a finite capacity to produce salmonids. When that capacity is reached, density intrudes and competition for rearing space and food limits smolt production. Each year and each season presents a new habitat capacity because each year presents new environmental conditions. This fluctuating environment can come in many long-term and short-term forms from a flood, to prolonged drought and increases in water temperature.

Salmonids home to their birth streams and are therefore locally adapted to the environmental conditions and changes in their home river. Their numbers may fluctuate in response to habitat changes, so a river may produce more juvenile salmonids one year than in the next, depending on whether the ecological conditions of the watershed favor or challenge survival. Therefore it is difficult to calculate the capacity of a watershed to nurture salmonids.

Ecological conditions are constantly changing and the fish are constantly adjusting. Change is the only constant.

With this ecological variation in mind, fish managers would be more successful in their craft if they focused on maintaining the reproductive capacity of the fish as well as the habitats that support it.

An informed estimate of a watershed's capacity to produce salmonids - its carrying capacity - is important, but this information is lacking for most steelhead and salmon streams even though this information is needed to develop criteria for long-term productivity of native, wild salmonid populations.

By having an estimate of a watershed's carrying capacity for steelhead, it is possible then to estimate the egg deposition needed to fully seed the available habitat. This can be translated into the number of spawners required and the number of females needed. This information can be used to determine

the number of redds. Since we do not usually have the ability to count how many spawners a river receives annually, redd counts are used as a surrogate for spawners. For example, in the 1992 Molalla River basin plan, the Oregon Department of Fish and Wildlife estimated that at least 3,500 native winter steelhead were needed to fully seed the available habitat. They determined that the female to male ratio was 1:0.8 and each female has 4,000 eggs and each redd has one female. They estimated that there were 110 miles of spawning habitat . Based on this estimate the biologists determined that 18 redds per mile of stream would produce 3,500 adult steelhead in the next generation.

In the 1992 Molalla River Steelhead Plan, the ODFW biologists were concerned about wild steelhead. Their primary objectives in this plan were to maintain the "genetic integrity and productivity of the native late steelhead stock" and to "maintain an average annual escapement of at least 3,500 late run steelhead." A conservation requirement was established for the river.

A production goal was based on an ecological estimate of the river's capacity to produce wild steelhead and an institutional commitment to securing the needed spawners. A production goal depends on maintaining the reproductive success of the steelhead. This means the health (abundance, distribution and diversity) of the wild fish population has to be maintained and the habitat that supports that population must be protected.

It is a two -part management strategy that includes both the naturally produced fish that rear in the river for two to three years and the habitat that makes it possible.

By 1992, the native, wild steelhead in the Molalla River had already declined. It is reasonable to expect the Molalla River can produce 4,000 to 5,000 wild steelhead per year, given the historic record. In 1965-1966 the wild winter steelhead run size was 4,454 (Clady 1971).

Hatchery winter steelhead were not released into the Molalla River until 1971, so the winter steelhead population in the mid-1960s were naturally produced wild fish, representing 32 percent of the steelhead run above Willamette Falls. The Molalla River was one of two major spawning areas for wild steelhead in the upper Willamette River.

In 1971 there were 44 wild steelhead spawners per mile, but by 1993 wild steelhead spawners declined to a low of 7 fish per mile. (Lichatowich 1999). In 1999 the Molalla wild winter steelhead were given federal protection as a threatened species under the Endangered Species Act.

What happened? The Oregon Department of Fish and Wildlife had developed a conservation requirement for wild steelhead but it was not enough to prevent the downward slide of this wild population. The department adopted a policy that gives "native winter steelhead priority over all other non-native stocks and species...," the agency also said, "Winter steelhead in the Molalla subbasin shall be managed for natural and hatchery production." (ODFW 1992)

In 1971, the Oregon Department of Fish and Wildlife began releasing non-native Big Creek Hatchery winter steelhead and in 1984 Skamania Hatchery summer steelhead into the Molalla River. The agency said that the hatchery winter steelhead were introduced to "extend the winter steelhead fishery by providing an early-run fish." (ODFW 1992)

The agency rationalized the introduction of hatchery summer steelhead because it would "increase angling opportunities in the Molalla River, which formerly consisted only of the four-month winter steelhead fishery and the two-month hatchery trout fishery. Through the introduction of summer steelhead, angling opportunities now exist year-round."

The ODFW achieved its goal to provide angling opportunities year-around with the addition of non-native hatchery steelhead. But what was the impact of these hatchery fish on their priority concern, the native, wild winter steelhead?

In its plan for the Molalla River the agency admits that "interbreeding and competition between introduced stocks such as the Skamania summer steelhead and Big Creek winter steelhead and the native winter steelhead stock is unknown." What is known is that the wild, native winter steelhead declined from over 4,000 adults and 44 redds per mile before stocking hatchery fish to less than a thousand fish at 7 redds per mile after stocking.

Other factors were also operating in the Molalla watershed during this period of time. Logging in the basin was intense and destructive to watershed health in the 1960s. The native winter steelhead productivity was affected by the conversion from old growth conifer to second growth and the effects of heavy sediment loads, major rain-on-snow flood events, lack of large wood stream structure, culvert passage barriers, and high summer water temperatures. All contributed to the decline of wild steelhead.

The Oregon Department of Fish and Wildlife introduced non-native hatchery fish to the Molalla basin when the native steelhead were struggling with habitat degradation.

The ODFW biologists were concerned about the impact of hatchery fish on the wild steelhead and designed their releases of hatchery fish in areas of the watershed they believed would maximize their harvest and minimize impacts to the native winter run. Because there is no barrier to prevent hatchery fish from spreading throughout the basin, they spawned in areas used by wild steelhead. In addition, the winter and summer hatchery steelhead adult runs overlapped with the native run, so the increased fishery for hatchery fish also harvested more wild fish.

The combination of factors, ranging from ecological impacts on wild steelhead from hatchery fish such as competition for food and rearing space in the river, to the increased kill of wild adults in hatchery-based fisheries, contributed to their decline. These management impacts came at the same time the wild steelhead were trying to cope with a degraded habitat.

ODFW emphasized conservation of wild steelhead in the written plan, yet it focused management on expanding harvest opportunity.

Annual releases of 75,000 Big Creek Hatchery non-native winter steelhead were made to create a fishery on early-run steelhead. On average 500 hatchery winter steelhead and 600 wild steelhead were harvested annually. Fish managers did not evaluate the effect of hatchery fish and fishery on wild steelhead.

In 1984, the ODFW began releasing 70,000 non-native hatchery summer steelhead in the Molalla to create a year-around fishery. The goal was to create a run of 4,900 steelhead. The hatchery fish spread throughout the basin, but ODFW said they did not know the extent of natural production of these non-native fish in the basin or the extent of competition with wild winter steelhead.

Introduction of hatchery winter and summer steelhead increased the risk to wild steelhead from interbreeding, competition, harvest, and reduced productivity.

Following the release of 145,000 non-native hatchery fish into the basin to increase fishing opportunity, the wild run declined from 44 wild spawners per mile to seven fish per mile. The hatchery program was a success, but the agency's number one objective, to protect the wild steelhead, was not.

When the wild steelhead were listed as a threatened species under the federal Endangered Species Act in 1999, ODFW stopped releasing hatchery steelhead in the Molalla River.

Recent spawning ground surveys by the Native Fish Society show an average of 12 redds per mile, indicating that the wild steelhead are beginning to rebuild after nine years or about two generations.

The Molalla is the only watershed in the upper Willamette River with a strong wild late-run of winter steelhead. Even though stray hatchery steelhead, non-native coho salmon and releases of hatchery spring chinook compete with steelhead for habitat, the resident trout and steelhead fisheries are managed for catch and release. So the impact on ESA-listed steelhead has been reduced.

The Native Fish Society is working to determine the abundance of wild steelhead in the basin and their distribution.

As the wild winter fish begin to increase in number, the ODFW is suggesting this run is strong enough to withstand some impact and has floated the idea that hatchery summer steelhead could be added to the river again.

Their own research indicates that hatchery summer steelhead suppress the productivity of wild winter steelhead by competition for rearing space and food (Kostow et al.). Once again the agency is pressing to increase fishing opportunity and if they do, this action would be inconsistent with their own rules and the ESA that set the protection and recovery of the late-run wild winter steelhead as the first priority.

(Note: there are additional reviews on our webpage which will be included in future Conservation Reports.)

References

Clady, M.D. 1971. The biology of the winter steelhead of the Willamette River, Oregon. Oregon State Game Commission, Progress Memorandum, Fisheries Number 5, Portland, Oregon.

Kostow, Kathryn, Anne R. Marshall, and Stevan R. Phelps. 2003. Naturally spawning steelhead contribute to smolt production but experience low reproductive success. Trans. Am. Fish. Soc.132: 780-790.

Lichatowich, Jim. September 1999. Recovering salmon and healthy watersheds in the Willamette basin. Review of the Willamette River Initiative. Prepared for the Oregon Business Council. Portland, Oregon. 22p.

ODFW. !992. Molalla and Pudding subbasin fish management plan. Oregon Department of Fish