Clackamas River Wild Winter Steelhead On the Road to Recovery Due to Cessation of Hatchery Summer Steelhead Release

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Introduction

The publication of a paper whose conclusion is that release of hatchery produced non-native summer steelhead in the Clackamas River had no negative effects on wild winter steelhead has been greeted by swooning headlines of salvation for those who do not believe that hatchery production of salmon, trout and steelhead is harmful to wild or native populations of fish throughout the Pacific Northwest.

Careful review of the publication and its findings reveal that while the analysis and methodologies of the research are sound, specific assumptions about the effects of hatchery practices and their resultant impact on wild steelhead in the Clackamas River are inconsistently applied, ignored or not even evaluated.

This paper discusses those shortcomings.

While we do not agree with the analysis in Courter et al, we do support the recommendations in their paper. Nevertheless. Our review also notes current data that Clackamas River wild winter steelhead continue to show positive trends in abundance and productivity - which are the best empirical data debunking the Courter et. al findings and its premature claims that hatchery releases caused no harm.

The Setting and the Wild Fish

The Clackamas River wild winter steelhead population was listed through the Federal Endangered Species Act along with 23 other lower Columbia River populations as threatened with extinction in 1999.

Giving priority to wild steelhead conservation management has the benefit of no less than 125 scientific, peer reviewed studies since 1954 regarding the adverse hatchery influence on wild steelhead and salmon. Since wild steelhead were listed under the federal Endangered Species Act, the state of Oregon has benefited from hatchery impact reviews and recommendations by the Independent Multidisciplinary Science Team (IMST), the Independent Scientific Panels of the Power Planning and Conservation Council, of which Oregon is a member, as well as Oregon's own research and management.

The accumulated knowledge about hatchery influences on wild steelhead and salmon contributed to the management decision by the Oregon Department of Fish & Wildlife (ODFW) to exclude hatchery summer steelhead from the Clackamas River above North Fork Dam.

The Clackamas River steelhead studies on the ecological effects of hatchery summer steelhead on wild winter steelhead (Kostow et al. 2003, 2006, 2009) were initiated because wild threatened winter steelhead were in steep decline as indicated by merely 100 spawners in the late 1990s. The ODFW wanted to know the cause of this decline and if possible to reverse it before the wild ESA-threatened steelhead went extinct.

Hatchery summer steelhead were introduced in the Clackamas River and the Willamette River tributaries above Willamette Falls in the early 1970s to improve recreational fisheries. Initially coastal summer steelhead did not survive in the Willamette River due to a disease that killed coastal steelhead. However, a Columbia River source that can tolerate the disease was used for introducing hatchery summer steelhead into the

Clackamas River and tributaries above Willamette Falls.

The Source of the Decline

Summer steelhead are not native in the Clackamas and tributaries to the Willamette River above the falls. In rivers where they co-exist, summer and winter steelhead breeding is separated by falls or rapids that block winter steelhead migration, but which are passable by summer steelhead at lower flows (and often, vice-versa). These hydrological barriers are not found in the Clackamas, while the upper Willamette did not support summer steelhead (or fall chinook) because Willamette Falls became a natural barrier as the flows dropped and the natural falls became impassable and summer steelhead did not establish native runs.

The construction of a fish ladder and the introduction of hatchery summer steelhead to enhance recreational fisheries in the Clackamas and Willamette tributaries created ecological competition and genetic introgression problems influencing the reproductive fitness and competition for food and rearing space with wild winter steelhead. This was determined by two studies on the Clackamas by Kostow et al. 2003 and 2006. Furthermore, studies by Johnson (2013) provided scientific evidence of genetic impacts from interbreeding between hatchery summer steelhead and wild winter steelhead in the upper Willamette River. Harnish (2018) evaluated ecological competition between hatchery summer steelhead and wild winter steelhead and found that hatchery summer steelhead dominated in 84% of the interactions with wild winter steelhead and 62% of all interactions by the more aggressive summer steelhead. Unfortunately these recent studies were not included in Courter's (2018) findings.

The purpose for the initial studies by the ODFW was to identify the causes for the decline in ESA-listed wild winter steelhead in the Clackamas River above North Fork Dam. Kostow (2003 and 2006) identified ecological interactions between hatchery summer steelhead and wild winter steelhead to be a primary factor resulting in decline of wild winter steelhead. ODFW responded appropriately by eliminating releases of hatchery summer steelhead above the dam to protect threatened wild winter steelhead even though the summer steelhead recreational fishery represented an important contribution to license sales for the agency.

Assessing the Courter Study

The purpose of the Courter (2018) study was to identify other sources of decline for the threatened wild winter steelhead in the Clackamas River. His study concluded: "The summer steelhead hatchery program coexisted with the natural-origin winter steelhead population without negatively impacting adult winter steelhead recruitment." The authors chose to ignore the scientific evidence of four studies showing ecological and genetic impacts of hatchery summer steelhead on threatened wild winter steelhead in the Clackamas and Upper Willamette tributaries along with at the very least 125 scientific studies providing evidence that hatchery fish have a negative effect on wild salmon and steelhead.

The Courter (2018) study did suggest there were other impacts related to occasional spill at North Fork Dam and decline in ocean productivity. While these additional impacts to wild steelhead abundance are important, the negation of established ecological and genetic impacts from hatchery summer steelhead indicates the Courter study had an unstated purpose. In addition, the Courter study claimed that because wild winter steelhead "failed to rebound to abundances observed in years prior to the hatchery program" that factors other than hatchery summer steelhead interactions were the cause of wild winter steelhead decline. While other factors such as poor ocean survival rates, 2014 through the present, have an important impact on both wild winter and summer steelhead in the Columbia River basin, the scientific evidence shows ecological and genetic impacts cannot be discounted. In addition, the Courter study ignores evidence that the abundance of wild winter steelhead has increased since hatchery summer steelhead were removed from the Clackamas River in 2000. Lower ocean productivity and other sources of mortality would slow rebuilding of wild winter steelhead. But because this threatened population did not rebound to "abundances observed in years prior to the hatchery program" the authors reject scientific evidence showing ecological impacts of hatchery steelhead on the productivity of wild steelhead. See graphic below (DeHart 2018). This graphic shows that the wild winter steelhead increased from a few hundred to 2,000 fish in about 5 years and continue to increase.

For 29 years (1970-2000) the average release of hatchery summer steelhead per year was 151,830 smolts and the return of adults averaged 2,846 fish. The number of winter steelhead smolts began to decline in the mid-1970s and hit an estimated low of 4,368 wild smolts from brood year 1995. "Trends for winter steelhead adults and smolts began to increase after the removal of the summer steelhead hatchery fish in 2000. We found that when large numbers of hatchery were present, winter steelhead production measured as recruits per spawner was reduced by 50%" (Kostow and Zou 2006).

"[D]ecreased marine survival may have worked in concert with the impact of the hatchery program. A depression of recruits per spawner and low wild fish abundance due to competitive interactions with hatchery fish could have dire consequences for a population that has declined because of such factors as decreased marine survival." (Kostow and Zou 2006).

Courter et al. (2018) rejected the ecological effects of competition between hatchery and wild winter steelhead in the Clackamas River but accepted the ecological effects of poor ocean survival while Kostow and Zou (2006) provide evidence of both ecological factors having an impact on productivity of wild winter steelhead.

Historic Perspective:

In 1875 the U.S. Fisheries Commissioner, Spencer Baird, told the Oregon Legislature that it is no longer necessary to regulate salmon harvest or protect salmon habitat because hatcheries can replace the wild salmon and sustain the fisheries. (Lichatowich 1999).

In 1938 Craig and Hacker estimated the Columbia River steelhead harvest to be 992,074 fish in 1925. Soon after its formation in 1980 by Congress, the N.W. Power Planning and Conservation Council adopted a goal of 5 million wild and hatchery produced salmon and steelhead, but that goal has never been reached. In the last 10 years the Council has invested $3 billion in public funds, primarily on hatchery production, to rebuild the Columbia River salmon and steelhead. (NWPPCC 2019) Fisheries are now modified or closed to get enough hatchery adults back so that each hatchery can operate at full capacity, but wild steelhead spawner criteria by home stream are not required. In 1999 wild steelhead were protected as a threatened species through the Endangered Species Act.

The 150-year promise that hatcheries could replace wild salmon and steelhead abundance did not work out. Instead we now have depleted fisheries and fish populations threatened with extinction.

Examining the Current Trend

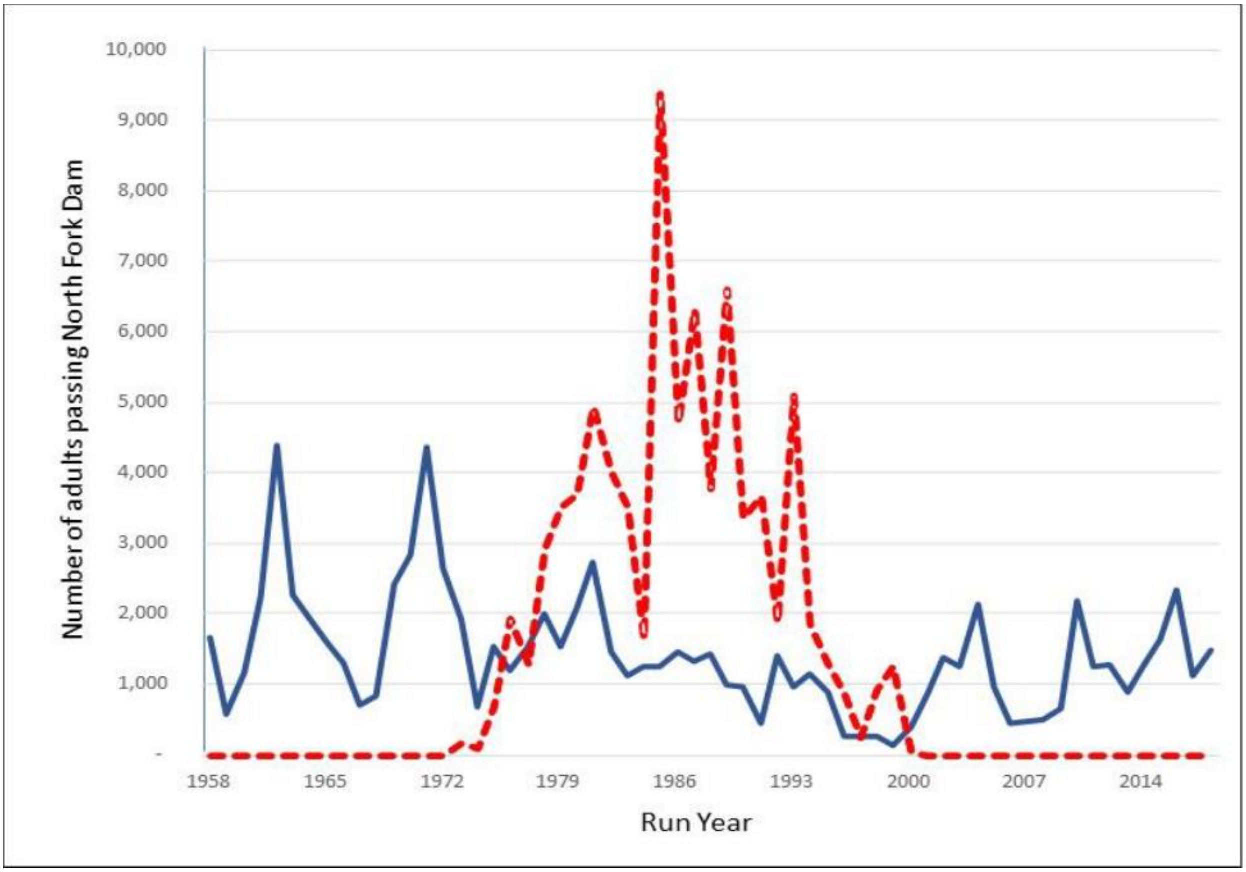


Figure 1. Number of adult wild winter steelhead (blue, solid) and hatchery summer steelhead (red, dashed) passed above North Fork Dam on the Clackamas River. Data provided by Portland General Electric dam counts. (personal communication, Kostow, 2012, updated 2018)

ODFW's Own Research Consistently Reveals Adverse Impacts of Hatchery Production

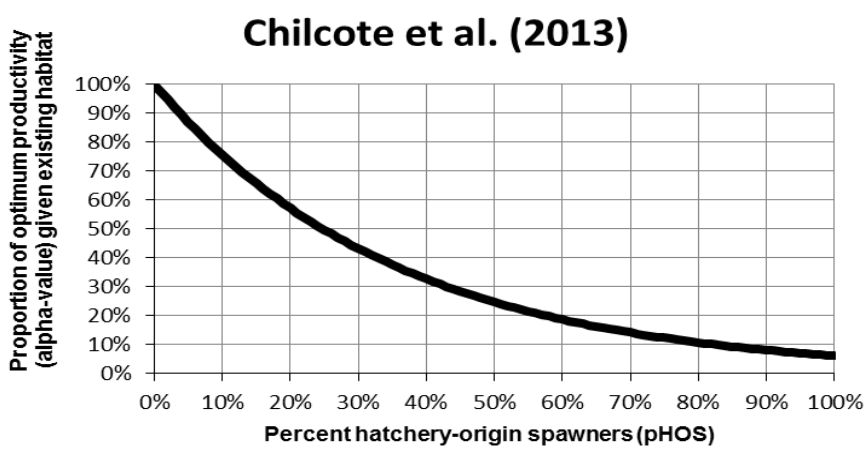
Recent ODFW research found that the hatcheries could not sustain salmon and steelhead production:

1. "We found a negative relationship between the reproductive performance in natural populations of steelhead, coho, and Chinook salmon and the proportion of hatchery fish in the spawning population.

2. "The magnitude of this negative relationship is such that we predict the recruitment performance for a population comprised entirely of hatchery fish would be 12% of that for a population comprised entirely of wild fish.

3. "The effect of hatchery fish was the same among all three species. Further, the impact of hatchery fish from 'wild type' hatchery broodstocks was no less adverse than hatchery fish from traditional, domesticated broodstocks.

4. "Measures that minimize the interactions between wild and hatchery fish will be the best long-term conservation strategy for wild populations." (Chilcote et al. 2013)



This graphic illustrates the decrease in productivity of wild salmonids as the proportion of naturally spawning hatchery fish increases. For example, this model shows a 13%, 24%, and 75% reduction in productivity when the proportion of naturally spawning hatchery fish increases from 5%, 10%, and 50% respectively. This model is based on a statistical analysis of 78 Pacific Northwest salmon and steelhead populations.

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