



Death By A Thousand Cuts

The decline of wild salmon

Death by a thousand cuts refers to a method of torture where an individual is subjected to a multitude of tiny cuts. Normally a minor cut would not significantly impact the health of an individual, but the cumulative effect of many small cuts is death. Currently, wild Pacific salmon populations are facing death by a thousand cuts.

Today, salmon face impacts from a range of human activities. Each activity by itself will not decimate wild Pacific salmon, but the cumulative stresses that wild Pacific salmon face are daunting. Seldom, if ever, does the regulatory permitting or the management decision making process consider the cumulative effects of human activities on salmon populations or the ecological processes which sustain them.

Habitat

The amount and quality of river habitat is important to sustaining wild Pacific salmon populations. Dams physically limit habitat by serving as migration barriers and covering productive river floodplains under vast reservoirs. Dams also alter the timing and magnitude of water releases and downstream river flow, changing behavioral cues to salmon. Changes in flow can interfere with the timing and homing ability of upstream spawning migrations, scour out fragile eggs in salmon nests, and influence the success of seaward smolt migrations.

Salmon not only face changes in flows, but they also face deteriorated conditions, from activities such as farming

and urbanization. Runoff from fields and streets contains sediment and chemicals. The clearing of vegetation for agricultural fields and the paving of cities destroys vital riparian vegetation which would usually help filter these pollutants and slow surface water runoff. These activities also destroy lateral habitats which are important areas of the river for juvenile salmon. Lastly, urbanization and agricultural development severely limit the historical shifting habitat mosaic.

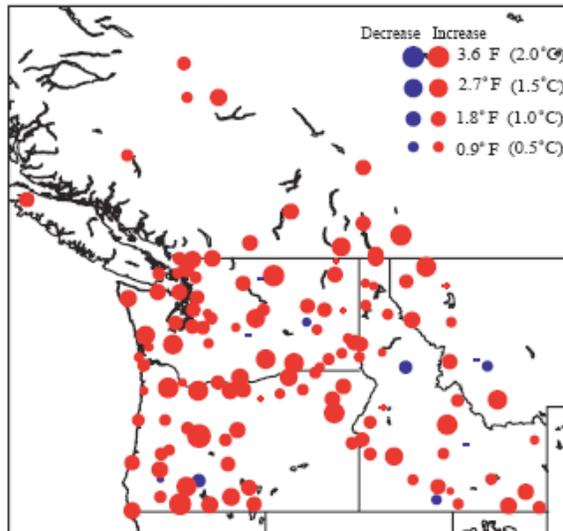
Climate change

Temperature and stream flow are some of the most important factors influencing the distribution of salmon in the shifting habitat mosaic. The International Panel on Climate Change (IPCC) predicts that average global temperatures will increase by 1.5° Celsius to 5.8° Celsius by 2100 (Climate Impacts Group, University of Washington). This is a big change in a short period of time for populations which have evolved over thousands of years.

Rising temperature will also change the flow of water in rivers. As temperature increase, less precipitation will fall as snow and more will fall as rain.

Figure 1. Changes in temperature in the Pacific Northwest from 1950 – 2000 (from Climate Impacts Group, University of Washington).

(a) Temperature trends (1920-2000)



As rivers change to rain dominated water sources, rivers will become much flashier, with flows rising and falling with each precipitation event. This will cause larger but shorter flood events and lower base flows later in the summer relative to current conditions.

Harvest

Salmon are subjected harvest in commercial, subsistence, and sport fisheries. Commercial fishing removes the greatest number of fish. This method indiscriminately takes fish from weak as well as healthy populations. So while money is being poured into conservation of weak stocks in rivers, they might be harvested when they are in the ocean.

Even more harmful is illegal harvest of salmon, or poaching. Often, poachers just harvest the fish's eggs and discard the rest of the fish. This has a double impact, not only is that fish removed but it also does not have the opportunity to spawn, depositing thousands of eggs and potential future salmon. The World Wildlife Fund estimates that trade in illegally harvested Pacific salmon in Russia alone is valued at \$5 billion a year (Wachter, 2006). This is over 4 times the legal quota.

Hatcheries

Salmon managers have tried to counteract population declines by

supplementing wild stocks with hatchery fish. However, hatchery stocks are seldom derived from the same populations that they will be supplementing. Over time, local populations have developed specific adaptations to local conditions. Hatchery fish have not. This actually reduces the fitness of wild populations by diluting or eliminating genetic adaptations to specific local conditions.

Hatchery fish can also indirectly affect wild salmon stocks. Hatchery fish compete with wild fish for food and space, both in the rivers and in the ocean. The addition of a large number of individuals to a particular area may exceed the number that an area can support with its given resource base. Furthermore, the presence of hatchery fish can mislead managers about the levels of harvest which salmon populations can support. Managers will set harvest levels based on the abundance of both hatchery and wild salmon in a fishery. A higher exploitation rate means that more wild fish will be caught artificially increasing harvest pressure on wild fish.

Consequences

Wild Pacific salmon are resilient organisms. However, the cumulative stresses are wiping out wild salmon. Currently, they are experiencing death by a thousand cuts. Sustainability of this valuable resource requires that managers address the underlying problems from population stressors and not merely try to cover up the symptoms.

References

- Climate Impacts Group.
http://cses.washington.edu/cig/pnwc/FS_CC_WaterSalmon04.pdf. Accessed on March 16th, 2009.
- Wachter, Sarah. 2006. Illegal Fishing Empties the Russian Sea. The International Herald Tribune.
<http://www.pacificenvironment.org/article.php?id=1929>. Accessed on March 18th 2009.