

Why letting salmon escape could benefit bears and fishers

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Wild salmon are valued as a sustainable seafood option for humans, but can we consider how much salmon bears and ecosystems need when setting management goals? Image credit: Jennifer Allen.

New research suggests that allowing more Pacific salmon to spawn in coastal streams will not only benefit the natural environment, including grizzly bears, but could also lead to more salmon in the ocean and thus larger salmon harvests in the long term—a win-win for ecosystems and humans. In a new article and accompanying synopsis published April 10 in the online, open-access journal *PLoS Biology*, Taal Levi and co-authors from UC Santa Cruz and Canada investigate how increasing

"escapement"—the number of salmon that escape fishing nets to enter streams and spawn—can improve the natural environment.

"Salmon are an essential resource that propagates through not only marine but also creek and terrestrial food webs," said lead author Levi, an environmental studies Ph.D. candidate at UCSC, specializing in conservation biology and wildlife ecology.

Salmon fisheries in the northwest Pacific are generally well managed, Levi said. Managers determine how much salmon to allocate to spawning and how much to harvest. Fish are counted as they enter the coastal streams. However, there is concern that humans are harvesting too many salmon and leaving too little for the ecosystem. To assess this, the team focused on the relationship between [grizzly bears](#) and salmon. Taal and his colleagues first used data to find a relationship between how much salmon were available to eighteen grizzly bear populations in British Columbia, and what percentage of their diet was made up of salmon.

"We asked, is it enough for the ecosystem? What would happen if you increase escapement—the number of fish being released? We found that in most cases, [bears](#), fishers, and ecosystems would mutually benefit," Levi said.

The relationship between salmon and bears is basic, Levi said. "Bears are salmon-consuming machines. Give them more salmon and they will consume more—and importantly, they will occur at higher densities. So, letting more salmon spawn and be available to bears helps not only bears but also the ecosystems they nourish when they distribute the uneaten remains of salmon."

When salmon are plentiful in coastal streams, bears won't eat as much of an individual fish, preferring the nutrient-rich brains and eggs and casting aside the remainder to feed other animals and fertilize the land.

In contrast, when salmon are scarce, bears eat more of a fish. Less discarded salmon enters the surrounding ecosystem to enrich downstream life, and a richer stream life means a better environment for salmon.

In four out of the six study systems, allowing more salmon to spawn will not only help bears and the terrestrial landscape but would also lead to more salmon in the ocean. More salmon in the ocean means larger [harvests](#), which in turn benefits fishers. However, in two of the systems, helping bears would hurt fisheries. In these cases, the researchers estimated the potential financial cost—they looked at two [salmon](#) runs on the Fraser River, B.C., and predicted an economic cost of about \$500,000 to \$700,000 annually. This cost to the human economy could help support locally threatened grizzly bear populations, they argue.

While these fisheries are certified as sustainable by the Marine Stewardship Council (MSC), the researchers suggest that the MSC principle that fisheries have minimal ecosystem impact might not be satisfied if the fishery is contributing to grizzly bear conservation problems.

The researchers believe the same analysis can be used to evaluate fisheries around the world and help managers make more informed decisions to balance economic and ecological outcomes.

More information: Levi T, Darimont CT, MacDuffee M, Mangel M, Paquet P, et al. (2012) Using Grizzly Bears to Assess Harvest-Ecosystem Tradeoffs in Salmon Fisheries. PLoS Biol 10(4): e1001303.
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