Article on Salmon Carcasses

February 8, 2000 Salmon decline hurts many other species

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GRANTS PASS, Ore. -- A growing body of scientific evidence is showing that salmon are more than just a majestic sport fish, a tasty entree, an economic resource or a cultural icon.

From Alaska to California, they serve as a huge natural recycler, responsible for transporting organic material they eat in the oceans and store in their bodies before swimming to the headwaters of watersheds, leaving their rotting carcasses to feed insects, bears, plants, trees and particularly baby salmon.

A recent study published in the journal Fisheries figures that as little as 5 percent of the historical biomass of salmon are returning to their native watersheds, creating a dramatic shortage of nutrients derived from the ocean.

The recycling role is so important that restoration of wild salmon in the Pacific Northwest "is hinging on recognition of this issue," said Jeff Cederholm, a fisheries scientist with the Washington Department of Natural Resources.

Historically, salmon management has been based on allowing the maximum catch in the ocean and rivers while allowing just enough fish to return to their native streams to spawn a new generation.

"We have essentially starved our freshwater systems," said Bob Bilby, a fisheries scientist with the National Marine Fisheries Service in Seattle.

Based on historical cannery records and published accounts, researchers estimated the annual biomass of salmon returning to rivers before the arrival of settlers in Washington, Oregon, Idaho and California.

They found that salmon runs totaling between 352 million pounds and 497 million pounds had declined to between 26 million pounds to 30 million pounds.

"This means that just 5 percent to 7 percent of the marine-derived nitrogen and marine-derived phosphorous once delivered annually to the rivers of the Pacific Northwest is currently reaching those streams," the researchers say in their study.

"This nutrient deficit may be one indication of ecosystem failure," they wrote.

Jim Lichatowich, an independent fish biologist, Ted Gresh, a graduate student in

planning and public policy at University of Oregon, and Peter Schoonmaker, executive director of the Institute of the Northwest published their findings in the latest issue of Fisheries, the journal of the American Fisheries Society.

"This is sort of like the erosion of genetic diversity," Lichatowich said in an interview. "It is something you don't see, but accumulatively it probably could have a big impact."

The key to this research has been equipment that can identify individual isotopes of chemicals such as nitrogen, phosphorous and carbon, and track them to their source. Using it, scientists have analyzed leaves, plants, young fish and even grizzly bear bones. All showed high levels of nutrients coming from the ocean.

On Washington's Olympic Peninsula, Cederholm observed 22 different animals feeding on salmon carcasses.

"We have been finding marine carbon and nitrogen in leaf matter of trees growing along river corridors," Cederholm said. "The only way for it to get there is through salmon swimming up streams, spawning in rivers."

The trees in turn drop their leaves, branches, and eventually their trunks into the river, where they serve as hiding and resting places for the fish, and decompose to feed insects, which in turn are eaten by salmon.

"They are a keystone species," Cedarholm said of salmon. "All the other wildlife or plant communities have, in some way, some dependency."

Working on the Snoqualmie River in Washington, Bilby found that as much as 40 percent of the nitrogen in the bodies of young coho salmon and 60 percent of the nitrogen in young steelhead came from marine sources.

When they dumped salmon carcasses on streams running into Willapa Bay, they found higher densities of young fish around the carcasses. The young fish were feeding on the carcasses and eggs laid in the river.

The extra food meant juvenile fish grew bigger before migrating to the ocean. Bigger fish survive better, so more fish come back to the river. And so on.

It appears that salmon evolved this as a survival strategy because the streams in the Northwest were generally low in nutrients. So they brought their own lunch.

"If you don't have the subsidy provided by salmon, those systems gradually decline," Bilby said. "You'll still have aquatic life occurring in those streams, but there won't be much of it."

The Oregon Plan for restoring dwindling salmon populations recognized this research, and for the past two years volunteers have been tossing salmon carcasses from five

hatcheries along coho rivers on the northern Oregon Coast. Washington has a similar program.

But there is a long way to go, the authors of the Fisheries article concluded.

Research has indicated that between 93 and 155 carcasses per kilometer are needed to provide the maximum ecological benefit on coho streams. While Oregon's goal for coastal coho streams is 26 fish per kilometer, only two to seven fish per kilometer were found in 1997.