

SCIENCE

When Dams Come Down, Salmon and Sand Can Prosper

By **CORNELIA DEAN** AUG. 10, 2015

When people urge the removal of dams they say are strangling rivers in the West, it's usually fish they're worried about. Studies of dam-removal projects show that migratory species like salmon respond quickly to improved conditions once a dam is removed.

But the removal of a dam on the Elwha River in northern Washington State — the largest such project in the United States — is demonstrating that there can be another beneficiary: the beach.

The Elwha runs northward to the Strait of Juan de Fuca, which separates the United States and Canada, just west of Port Angeles, Wash. The removal of the Elwha and Glines Canyon dams, which was begun in 2011, was finished last summer.

By then, scientists from the United States Geological Survey, the National Park Service, the Lower Elwha Klallam Tribe and other organizations and agencies could see not just that the flow of water had been altered, but also that immense amounts of sediment were heading to the coast and accumulating at the river's mouth.

“We are seeing the rebuilding of an estuary and coast that were rapidly

eroding prior to dam removal,” said Jonathan Warrick, a scientist at the geological survey and the lead author of a paper synthesizing the research, one of five on the project published in a recent issue of the journal *Geomorphology*.

The scientists estimate that millions of cubic yards of sediment (an ordinary dump truck holds about 10) had accumulated behind the dams. Once they were removed, this sediment began moving toward the river’s mouth.

In the first two years of the project, Guy Gelfenbaum of the U.S.G.S. and his colleagues wrote, about 2.5 million cubic yards of sediment had accumulated in the river delta. As a result, the beaches there, long starved of sand, began growing. The delta expanded hundreds of yards into the strait and spread more than half a mile to the east.

Since then, Dr. Warrick said, another 1.5 million cubic yards of sediment have been added to the delta.

“Walking on this new land form that extends hundreds of meters toward the sea and changes every day — it’s fantastic,” he said. “It blows your mind.”

The finding is particularly important on the West Coast, where rivers carrying eroded sediment from inland were once major sources of sand for the region’s beaches.

Twentieth-century development changed all that. Engineers dammed rivers and lined creeks and streams with concrete, turning them into culverts. The work provided electric power and reduced damage from floods, but cut off much of the flow of sediment to saltwater beaches.

The problem is particularly acute in California, where, by most estimates, dams and other river projects have cut sand flow to the coast by two-thirds, contributing to worsening coastal erosion.

Eventually — in a decade or more, Dr. Warrick said — all of the sediment

that had accumulated behind the dams will be gone. Then, the researchers predict, the river will revert to its pre-dam pattern, moving about 300,000 cubic yards of sediment downstream each year to the beaches.

Though the geology of California differs from that of the Pacific Northwest, Dr. Warrick said, this project demonstrates that dam removal may remedy beach erosion in both regions.

The idea is popular among some environmental lawyers and legal scholars who have long argued that beaches have “sand rights” — a right to sand that would naturally flow to them if people and their infrastructure had not gotten in the way. Advocates of sand rights say anyone who interferes with the flow of sediment to and along the shoreline should be required to mitigate the effects.

According to Katherine Stone, a lawyer in Ventura, Calif., who was an early exponent of the idea, there are a number of plans to remove dams and improve the flow of sediment to the coast.

But success depends on how much water is moving through the river, and the West Coast is in the grip of a terrible drought. “We don’t have the water,” Ms. Stone said in an interview. So it remains to be seen not just how many dams will be removed but how big a difference the removal work will make.

So far, Dr. Warrick said, the evidence from the Elwha is encouraging.

“We have had historically low flows since the dam removal started,” he said. Even so, almost 10 million tons of sediment have been carried down the river. “That’s pretty staggering,” he said.

The intended beneficiaries of the dam removal are also doing well.

“The salmon have been coming back,” Dr. Warrick said. “They are spawning in portions of the river where they have not been for 100 years. And their numbers have increased a bit, too.”

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