**Published in the San Jose Mercury News**
*Posted on the San Jose Mercury News website:*
*6:42 p.m. PDT Saturday, April 24, 1999*

# Jammin' for the salmon

## *wood, critical to survival of fish, is being put back into rivers*

Jan. 26, 1999

BY GLENNDA CHUI

Mercury News Science Writer

ON THE NORTH FORK OF THE STILLAGUAMISH RIVER, Wash.

PEOPLE spent millions of dollars and most of the past century stripping driftwood, snags and fallen trees out of nearly every major river and stream on the West Coast -- at first to make way for boats, and later because they thought it was good for the fish.

Now, in a stunning reversal, they're throwing the wood back in.

Once thought a nuisance and a barrier to migrating salmon, wood turns out to be an essential part of the ecological mix that allows the fish to thrive.

It creates shade, cools the water and feeds the bugs and small fish that salmon like to eat. And where it piles up in log jams, it shapes currents so they scour deep pools -- ideal places for salmon to rest and hide from their enemies.

"It was a really good lesson in humility," said Aldaron Laird of Arcata, an environmental planner who spent many years ripping wood out of California rivers before he and his fellow restorationists realized their mistake.

"The salmon and steelhead were in dire straits, and we were running around trying to do whatever we could," he said. "We thought we were doing a good thing by getting logging debris out of rivers. What we didn't realize is that the fish didn't view it that way. They viewed it as habitat.

"Everybody pretty much had egg on their face."

Although efforts to reverse the damage started in the early 1980s, researchers at the University of Washington are just starting to understand the dynamics of log jams. For the first time, they think they can engineer logjams to work for decades on end like the natural article.

All along, people have been experimenting with ways to get wood back into rivers -- everything from simply leaving fallen trees where they fell to tossing logs into the water to building artificial log jams, especially in areas where there no longer are enough big trees growing near the water to do the job naturally.

Typically, they try to tie the logs together with cables or bolt them into rock to keep them in place. But the log jams tend to wash out in the first good flood.

The relative merits of these approaches will be discussed next January when about 500 experts meet at Oregon State University for the first international conference on the ecology and management of wood in rivers.

## Studying patterns

In what may be the most sophisticated approach to date, Tim Abbe of the University of Washington spent three summers walking a pristine river on the Olympic Peninsula, studying the way natural logjams are put together. Abbe is a geomorphologist -- a scientist who studies land forms and the processes that create them.

He noted where logjams occurred on the Queets River and how many logs were in them. Some of those logs were ancient, up to 1,000 years old. And some of the jams apparently had been around for hundreds of years; they had trapped so much sediment that trees were growing on top of them.

How could log jams persist so long, through strong currents and flooding? They're based on enormous trees that had fallen into the water with their roots, and the soil between them, intact.

These "root wads" give the tree a shape like a golf tee; when stacked in layers, the trees interlock and hang together, forming a base on which additional logs and bits of driftwood can gather.

Abbe wasn't the first to notice this. River restorationists have known about the power of the root wad for years and tried to incorporate it into their log jam designs.

But Abbe went further. He classified logjams into 11 distinct types, based on their position in the river and their effects on the flow of the water. And working with engineer Tracy Drury, he analyzed the physical forces that hold a tree in place once it's fallen into a river.

## Applying technique

The team has just started to put these ideas to the test in places such as the north fork of the Stillaguamish River, a 90-minute drive northeast of Seattle.

On a recent morning in finger-numbing cold, the Stillaguamish presented a stunning natural scene. Wisps of cloud floated across the snow-flecked face of Mount Higgins. A dozen bald eagles clustered on a gravel bar, hoping for fish.

And along the banks, Engineered Log Jams One through Five -- spread out along about a half-mile of the river -- were doing just fine, despite having been inundated by four strong floods over the early winter.

The jams don't look artificial, piled as they are in careless jumbles against the river banks.

But each of the more than 500 logs bears a metal tag the size of a quarter, with a number identifying its position in the pile.

Some of these logs are so big that they had to be cut in half for the trip to the site. The researchers glue them back together and reinforce the joint with bands of steel, like the ones used on wine barrels.

The giant trees at the bottom of each pile were dug 15 feet into the river bottom with the aid of heavy construction equipment. They're oriented in such a way that when the current tries to pull them along, their root wads dig in like anchors.

## A model of stability

Abbe, Drury and George Pess, a stream ecologist with the National

Marine Fisheries Service in Seattle, inspected the logjams late last month and noted with satisfaction that very few of the layered logs had been carried away by floods.

One logjam had snagged enough passing wood to grow substantially. Mud and gravel were starting to wash into the piles of wood; eventually, the researchers hope, trees will start to grow there, stabilizing them further.

So far, the logjams were carrying out their two primary jobs: protecting the river banks from erosion and capturing driftwood so it doesn't hang up on the supports of a bridge downstream. The researchers plan to watch the river to see whether deep pools form around the log jams and attract an increasing number of fish.

"It's almost textbook, how beautifully things are happening," Abbe said."I'm happy."

Mike Napolitano, an engineering geologist with the Regional Water Quality Control Board in Oakland, has been corresponding with the Washington researchers and looking into the possibility of doing a demonstration projecton the central California coast. "It certainly is an exciting idea," he said.

Not everyone is convinced that a logjam is a good thing. Property owners tend to get nervous when they see one building up, said David Hope, a forester who manages watersheds and fisheries for the Santa Cruz County Planning Department.

"They're afraid it's going to wash out their deck, flood their house" or break up and send logs hurtling downstream to wash out a bridge -- something that very rarely happens, he said. He estimates that last winter the county got 400 calls from people who wanted logjams removed.

There are pitfalls

The potential liability makes restorationists wary. They have to consider not only the stretch of stream directly involved but also the potential effects upstream and down. Most restorationists don't think they'll ever bring back the vast logjams the first European settlers found along the coast, and in rivers throughout North America. These jams could stretch for miles; it is said that you could ride a horse across some of them.

One enormous jumble of old-growth redwoods in the lower Mad River, near present-day Arcata, "created a huge bend in the river, actually deflected the course of the river to go around it," Laird said. He said the enormous pools created by the jam attracted salmon and sturgeon, prompting Wiyot Indians to build their villages nearby. The logjam apparently persisted for generations.

The same was true of the Willamette, the Russian, the Eel and countless other rivers, Laird said.

But once settlers arrived, the jams were history.

"You couldn't navigate above them and you couldn't float logs below them," said Brian Collins, a geomorphologist at the University of Washington who works with Abbe's team. He's been studying the history of the eight large rivers that flow from the Cascade Range into Puget Sound, looking for explanations for the decline of salmon there.

As far back as the late 1800s, the Army Corps of Engineers sent "snagboats" out onto the rivers to break up jams and remove wood. The captains kept detailed records of how much wood they took out.

## Thousands removed

Those records show that in just one decade starting in 1898, 30,000 snags were removed from the lower Skagit River in Washington, which had been so clogged with wood that it flooded the entire surrounding valley. Once the jams were removed, settlers drained the valley and moved in.

The snagging continued for a century, on rivers big and small all along the Pacific Coast. Between 1880 and 1980, the Corps took 150,000 snags from the Skagit and two other big rivers, the Stillaguamish and Snohomish.

Not even Yosemite National Park escaped the zeal of the snag removers, said James Sedell, an ecologist with the U.S. Forest Service in Corvallis, Ore., who is considered a pioneer in the area of wood in rivers.

"Here is our cornerstone national park," he said, "and boulders were blasted and wood was pulled out so (the Merced River) would all stay in one channel."

These removals, combined with logging, had a profound effect on the

way the rivers look today. In fact, most people have no idea what a wild river should look like.

"People have grown for generations now with cleaned rivers, and they have no comprehension," Abbe said. "Old-timers will say, 'There were never any snags in this river.' "

Logging also has an impact because it takes out trees that otherwise would grow to maturity and fall into the river, either in landslides or as a result of the river's undercutting its banks. Big rivers need big trees to initiate logjams because the small ones get swept away by the current.

A free-flowing river that was never hemmed in by levees or riprap develops a number of channels plaited together like loose braids. It jumps from one channel to another during floods, taking out trees in the process. New logjams form, and they in turn redirect the current in an ever-changing pattern.

Ideally, the researchers said, people will learn to move back from rivers and give them room to meander and flood. And restorationists will build enough logjams to give salmon a place to flourish.

But they doubt that they will ever be able to recreate the humongous jams of the past.

"Politically, it's not likely that they'll ever come back," Collins said." And for most of the large rivers, there haven't been big trees along them for nearly a century."