Organized Chaos

by David Montgomery, Writer, University of Washington Professor

Speak to the earth, and it shall teach thee. — Job 12:8

I had lived in the state for all of a week and here I was, leading my first two graduate students along in the dark, hand on shoulder in front, the three of us struggling to keep to the trail and avoid running into the giant trees that dominated the floodplain. We came to the Hoh River to walk the ridges and streams of a landscape unaltered by human agencies, to get a feel for the land in the heart of the Olympic Peninsula.

And did we ever get more perspective than we bargained for. It took us hours longer than planned to descend the valley wall on the way down the ridge to the west of Mount Tom Creek and to our ford back across the river. One giant tree after another lay jackstrawed across the slope, forcing us to use the trunks of the fallen giants as elevated causeways on which to navigate downhill, something much easier than trying to climb up and over one 10- to 15-foot diameter log after another. So we kept scampering like squirrels along each massive trunk to where we could jump over to another and continue on down the slope. Eventually, we made it back across the river at sundown and stumbled back to camp in the dark, feeling our way along the trail, weary and bedraggled.

The Hoh River is many things to many people, but to my graduate students and me the river proved quite a teacher, a natural laboratory full of surprises and insights about what rivers of the Pacific Northwest were like before they were cleared of wood and logjams to open the region for navigation and commerce. Over the 15 years since we first naively ventured up the river, the Hoh and neighboring Queets have yielded insights into floodplain ecology and geomorphology that have provided a new understanding of how the region's giant trees structured the rivers and streams of the Pacific Northwest. The story that emerged is one not

Hoh's most important tributaries, where wild fish migrate.

yet in textbooks, but central nonetheless to both understanding the human footprint on the Pacific Northwest and planning for long-term stewardship of the region's fish and wildlife that depend on riverine habitats.

One of the lessons of the Hoh and Queets is that the groves of colossal ancient trees on the floodplain grow in the lee of giant logjams founded on huge logs that anchor the remains of previous generations of large trees. Perhaps this should not be surprising given that the river sweeps back and forth across its floodplain over decades or centuries, but the big trees can live for 500, a 1,000, or more years. For if the valley floor forest was taken out each time the river moved across the valley bottom, the oldest growth wouldn't get much more than a few hundred years old. Yet there are patches of ancient giants dotted across the floodplain. How can we explain these colonies of old growth attaining maturity on a dynamic, disturbance-prone floodplain?

When one of these leviathans falls into the river, it can ground out and dig itself in if its massive root wad snags the riverbed like an anchor, pivoting the tree so that a wall of roots faces upstream like an arboreal catcher's mitt poised to snare other logs floating downstream. And do these anchored giants ever catch stuff. Some will eventually accumulate hundreds or even thousands of logs in a single jam intricately woven into complex structures as smaller logs floating downstream pile up on the massive obstruction. Once a stable logjam begins to grow, it can deflect the river, providing a protected area where sediment can accumulate and bury the jam-initiating logs in the floodplain. There the giant logs stay wet and can last for centuries, providing the foundation for an erosion-resistant island of stable habitat protected behind a logjam revetment. Radiocarbon dating of logjams exposed in the banks of the Queets River shows that some can remain stable for more than 1,200 years. But the jams not only catch other logs; they also slow the river flow enough to create local depositional zones where gravel and sand build up behind the jams, creating a patchwork floodplain as the individual scraps of topography piled up behind these stable jams coalesce to form the valley bottom.

"Organized chaos" is how Tim Abbe describes the logjams of the Olympic Peninsula. He should know; for his Ph.D. research at the University of Washington

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he spent several years tramping up and canoeing down rivers in Olympic National Park, studying the ways that logjams form, how long they persist, and what influence they have on the river. Over the course of his studies he discovered that not only do logjams have systematic structure themselves, but they indirectly structure the floodplain as well by providing stable refugia where trees mature into the old growth capable of providing logs large enough to anchor future generations of logjams.

The Hoh River was one of the first places where Abbe's insights into the mechanics of logjam stability were used to guide the design of engineered logjams for erosion-control projects. Basing his work on the natural architecture of stable logjams, Abbe designed engineered versions of certain jam types that he thought could prove useful to prevent riverbank erosion and protect houses, highways, or other human infrastructure. Now such artificial logjams are being built across the state as an environmentally friendly alternative to more traditional methods of river engineering. I never imagined as we trudged back to our camp in the dark on my first day in the Hoh Valley that years later, the state Department of Transportation would be installing engineered logjams to protect the road into the Hoh River trailhead. But that's the beauty of research: you never know where it's going to lead you—just like a professor without a flashlight stumbling through the forest in the dark with a couple of graduate students in tow.

Still, just a single visit tells you that the Hoh River is much more than a laboratory. It is a symbol of both the region's natural heritage as the last domain of the giant trees that once covered the region and the working forests that surround Olympic National Park. It is a neighbor and a home to communities of people, animals, and plants. And above all, it is a wild river untamed by dams, free to wander across its floodplain and define a corridor through which the sandstone of the Olympic Mountains will eventually be returned to the sea. Yet to me, still working to better understand the rivers of the Pacific Northwest, the Hoh is foremost a teacher that offers perspectives on how to see the order in chaos and how hidden connections can structure our world.