River Research

Scientists study how streams interact with floodplains to cleanse themselves

By Vince Devlin

Along a 10-kilometer stretch of the Middle Fork of the Flathead River, near the tiny town of Nyack on the edge of Glacier National Park, UM Professor Maury Valett studies the movement of water and materials.

It's important stuff. Left on their own, you see, rivers have the ability to clean themselves.

But humans tend to not leave them alone. We slow them with dams, confine them inside manmade embankments, spray chemicals on crops next to them and build homes exactly where they want to flood. "Every time I drive back to my house," Valett says, "I am reminded that I am 'them'" – the humans who fiddle with rivers – "just in the agriculture that feeds me."

Valett this year joined a team of scientists at UM's Flathead Lake Biological Station studying this section of the river, where the tight mountain topography opens up into a floodplain.

Their goals: to understand how the river works to cleanse itself, to learn how to restore other rivers so they can do the same and to figure out how to maintain rivers in the face of development.

"It's the field of 'sustainability science,'" says Valett, who came to UM from Virginia Tech, "and it involves conservation, restoration and stewardship. The University of Montana is strong in all those areas."

So he left a tenured position as a full professor at Virginia Tech to accept a half-time position at the biological station – he can make up the remaining income through his own research endeavors – and hasn't looked back.

"How many chances do you get to be a stream ecologist?" Valett asks. "I considered it an incredible opportunity to work with this team, on this landscape."

UM Professor Maury Valett studies how rivers and streams work to cleanse themselves. This creek flows into Yellow Bay near UM's Flathead Lake Biological Station.

Laypeople tend to think of streams as they see them – above ground – but what happens to water while it is underground is "hugely important," Valett says.

Think of a river as a string with beads on it, he explains. The beads represent the floodplains. The section of the Flathead the team is studying is one of those beads.

"As the river opens into the floodplain, it fills the aquifer," Valett says. "At the bottom of the floodplain, it comes back up."

At UM's test wells at the head of the floodplain, the water looks like a river, he says. At the test wells downstream, the river looks more like the water found in the aquifer.

"The sediments in the floodplain house microflora," Valett says – bacteria and fungi that cleanse the river by removing and transforming.

"The self-purification that river systems are renowned for depends on their links to the aquifer and floodplain," he says.

But that presents an obstacle.

"Where do people live?" Valett asks. "On the floodplain. The first instinct of humans is to stop the river from moving. To stop them from flooding. But floods are critical; they're the link to all the diversity found in the floodplain. Floods allow rivers to interact with the living things on the floodplain that clean the river. You shoot yourself in the foot if you do nothing but rein in floods and lock in rivers."

The important work being done by UM scientists is to understand how, exactly, rivers work here on the Middle Fork of the Flathead and how to restore other streams so that they can retain diverse floodplains and ecological cleansing systems in the face of inevitable development.

In some ways, taking the job at UM's Flathead Lake Biological Station was a homecoming for Valett.

He didn't grow up here – Richland, Wash., was home – yet he was born in nearby Polson and spent every summer of his childhood and beyond just a few miles south of the biological station, at his family's summer place on Finley Point.

"The first summer I missed, I was working on my Ph.D. in Arizona studying flash flooding," Valett says. "But I sat in Phoenix all summer, and it never flooded until September."

Still, Valett already had spent serious time studying at the biological station by that point, thanks to an "absent-minded" professor who wrote, but forgot to mail, a letter of recommendation for Valett for graduate school after Valett had earned a bachelor's degree from Western Washington University.

"Because of that I had no summer plans," Valett says. "As a graduation gift, my parents offered to pay for me to take a summer course at the biological station and live at our place on the lake."

The "summer" course turned into three years working toward a master's degree from UM under Jack Stanford, director of the University's biological station for the past three decades.

"My first summer with Jack was the first time I thought about streams as anything other than just water," says Valett, who became a teaching assistant under Stanford in 1982.

Valett went on to earn his doctorate at Arizona State University and taught and conducted research at the University of New Mexico and Virginia Tech before circling back to his old stomping grounds at the biological station.

He is, officially, professor of aquatic biogeochemistry, although it may be easier to think of Valett as a professor of systems ecology.

"The team has two major areas of interest," he says. "First, from the development perspective, is the socioecological system, and you can't separate them. We look at generalities that apply to ecosystems – whether they're forests, oceans, lakes, grasslands or rivers. Essentially, with these systems, the more diverse they are, the more stable they are."

The flip side, Valett says, are the environmental applications, where "we use known scientific principles to solve environmental problems. We're looking at new theories and putting them to use in today's landscape."

On this project Valett works with the rest of the biological station faculty: Stanford, Gordon Luikart, John Kimball, Richard Hauer, Bonnie Ellis and Mark Lorang, as well as Robert Crabtree of the Yellowstone Ecological Research Center.

As important as the research is, Valett says the most rewarding part is the involvement of UM students from the biological station.

"People like me have dual identities as researchers and educators," Valett says. "I don't get students for my research; I provide research for my students. Being a mentor is more important to me than any paper I've published."

Whenever new students apply to work with him, Valett asks them to take a piece of paper and draw what they think their relationship with their professor should look like.

"I tell them I'm going to go get a cup of coffee and to take all the time in the world – but to be done by the time I'm back with the coffee," he says. "It is always interesting to see what I'll get ... stick figures or flow diagrams?"

One of his favorites, he says, was from a woman who drew a stick figure with curly hair at the bottom of a flight of stairs. Her intent, she says, was to show the start of a journey that would change the curious person she was into a scientist.

"Where am I in the drawing?" Valett asked.

"You're the stairs," she answered.

"Does that mean you're going to walk all over me?" he says.

That's when the woman quickly sketched in a line next to the stairs and told him, "No, you'll be the handrail."

Together, Valett believes, the research team and their students have a "phenomenal opportunity" to affect how Montana ecosystems and resources are viewed and how policies are applied to them.

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An aerial view of the Flathead River floodplain, which has been studied intensely by UM scientists

Researchers Valett and Tyler Tappenbeck sample a well in the Nyack Floodplain near Glacier National Park.