Tribal scientists snorkel rivers to help save freshwater mussels

Threats from climate change, habitat destruction

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Alexa Maine surveys the Middle Fork of the John Day River, searching for freshwater mussels.

When someone talks through a snorkel, it can sound a lot like talking through dental apparatus – all the words mumbled together. But, Alexa Maine is an expert mumbler.

"There's a Gonidea. There's another one," Maine said as she pointed out mussels while she snorkeled. These freshwater mussels are commonly known as western ridged mussels.

The U.S. Fish and Wildlife Service is considering adding the western ridged mussel to the endangered species list, a potential designation that has brought more attention to mussels in the West, where freshwater mussels are imperiled, Maine said.

On the Middle Fork of the John Day River in Oregon, where Maine surveys, she continued talking through her snorkel, scanning the riverbed for freshwater mussels as she slowly moved upstream.

"I could spend all day here. The light is so good right now," Maine said.

As the lead biologist for the Confederated Tribes of the Umatilla Indian Reservation's Freshwater Mussel Research and Restoration Project, Maine has spent many hours snorkeling rivers, searching every square inch for healthy mussel populations.

In the last few years, the job has gotten much harder.

"We don't know if we're watching them blink out or just watching them decline to a lower level of existence in these rivers at this point. It's hard to tell," said Christine O'Brien, who has worked with the tribe for 18 years on its mussel project.

The Confederated Tribes of the Umatilla Indian Reservation is the only group in the West that's actively surveying mussels and working to protect them, she said.

"There's nobody else beating a drum for them," O'Brien said.

"Nope," Maine agreed.

O'Brien added, "They're overlooked a lot of times. They're not flashy. They're not cute and cuddly. You'll donate to save a panda. But the mussels, you know?"

"Until you really know them," Maine said, of the creatures she's quickly come to love.

Harvest

Historically, Indigenous people ate mussels as a part of their food roundtable, said Donna Nez, a fisheries technician and member of the tribe.

Now, mussels are often full of toxins, so people don't eat them as much, Nez said. However, the tribe would like to be able to harvest mussels at some point, she said.

"They're part of the river ecosystem. We need clean water. Water is the main component in our life cycle," Nez said.

Mussels can filter up to 10 gallons of water in 30 minutes. Most of what they filter isn't digested. That pseudo-feces, as Maine called it, ends up on the streambed, where invertebrates and fish can eat it.

In addition to helping clean river water, mussels stabilize streambeds, Maine said.

"Mussels act like little boulders for the tiny pebbles and sand around them, stabilizing them," Maine said. "They can go really deep, especially Gonidea, which have a really big foot and can really anchor themselves down and anchor everything around them."

On the Middle Fork of the John Day River, Maine, O'Brien and three colleagues surveyed several sites where they knew freshwater mussels once lived.

The snorkeling surveys help the scientists immerse themselves in the mussels' world, Maine said.

"You kind of lose the external sound. You have a better focus with your eyes," Maine said.

The first different world the scientists immersed themselves in was the Cottonwoods survey site. The site was the farthest upstream, with the coolest water of the day, roughly 66 degrees Fahrenheit.

The water was cool enough to need wetsuits, even on a recent blistering hot day.

"Let me lock you in," Maine said, as she helped O'Brien velcro her wetsuit.

After snorkeling for around 40 minutes, the researchers had found the largest number of mussels they'd see on this day of surveying. The researchers counted three genera of mussels: 383 Margaritifera, 51 Anadonta, and 27 Gonidea.

Maine said the Cottonwoods site is her favorite place to survey mussels in the entire world.

"It's kind of like a nursery. One year we saw juveniles of all three genera, which is very unusual. Those guys have grown up now, and they're making their own babies," Maine said.

Mussels can live 60 to 100 years, which means when they're not doing well, something is likely wrong with the river, Maine said.

"They are the granddaddies of the river," Maine said. "They're very resilient. It gives you a better appreciation for how hard of a time they're having and how much it matters to care about them and help them when you see this whole little connected world when you're snorkeling underwater."

In the Northwest, there are only a handful of freshwater mussel types. Whereas, across the Continental Divide, around 300 species can be found in the Eastern United States.

When surveying for mussels, there are certain things you shouldn't do, Maine said. For one, don't swim upstream of someone who's counting mussels. Sediment will kick up, making it hard for them to see.

"Don't be kicking around in there," Maine joked with her colleagues.

As Maine snorkeled upstream, her hand clutched large rocks so that she could stay in place and count each mussel she saw.

"You have to get your head up in this bank here because there were a lot of Anadonta in the fine sediment in the bank," Maine said.

It's a lot to track while in the water. To do so, Maine uses both her hands to count two genera of mussels.

"For this site, I keep Margaritifera in my head. I keep Gonidea on one hand and Anadonta on the other. So then I only have to remember one number, and I'm counting here," she said, pointing to her hands.

Maine also noted a few sculpin, which are small bottom-feeding fish that freshwater mussels need to reproduce. It's a parasitic relationship that's very dependent on timing.

To reproduce, female mussels release larvae called glochidia, which then attach to the sculpin. Female mussels can produce up to 4 million larvae, with one making it to adulthood in the best-case scenario, Maine said. It's a slow and intricate process.

The glochidia are around the size of a grain of sand and don't affect the fish, Maine said.

"Then they drop off randomly and float to an area of low velocity and fine sediment, and then they burrow and become an adult," Maine said.

However, if the fish aren't there at the correct time, or if the mussels don't release the glochidia when the fish are present, those mussels lose a chance to reproduce.

And, time may be the one thing these mussels don't have. They face threats from climate change that warms the water, habitat destruction, and nonnative fish species.

Threats

At the second survey site on the Middle Fork of the John Day River, the researchers spot a nonnative smallmouth bass.

"Bass!" Maine yelled across the river.

"Uh uh. No!" O'Brien moaned through her snorkel.

Invasive fish, such as smallmouth bass, feed on young mussels and native fish, such as sculpin, which mussels need to reproduce. In addition, O'Brien said, invasive fish aren't good host fish to help mussels reproduce.

"As the rivers warm with climate change, we're seeing bass move farther and farther upstream, so we're really getting worried that they're going to displace the native fish population. And then, the mussels will go soon after that," O'Brien said.

It's not just smallmouth bass that are making mussel habitat less hospitable. People have trampled streambeds, even as they try to help the environment with habitat restoration projects, O'Brien said.

Most projects are aimed at helping threatened or endangered salmon. Often, mussels aren't taken into consideration, Maine said.

"We work really hard to protect the very few mussels that are around, and then restoration projects, which generally are good, in the short term have really negative impacts on mussels," Maine said.

Heavy machinery rolls over sensitive mussel habitat, and mussels can't just pick up and move to another better location, like fish can, Maine said.

However, that's changing, as the Confederated Tribes of the Umatilla Indian Reservation spread the word about the importance of mussels.

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