saving salmon

Baylor-Smithsonian team studies Alaskan wetlands

BY MATTHEW WALLER

Baylor University ecologists working in Alaska this summer noticed at least one literal bright side to hiking at 2 a.m.: the sun never sets.

For two months, Baylor researchers partnered with world-class organizations: the Alaska Fish and Game Department and the Smithsonian Institution and spent hours hiking in the pristine wilderness of Southern Alaska's Kenai Peninsula to discover new knowledge about the relationships among salmon, wetlands and streams.

"Much of the land on the Kenai Peninsula is private and could eventually be turned into housing developments or businesses or used in other ways that could be detrimental to salmon," says Ryan King, an assistant professor in Baylor's Department of Biology and a co-investigator for the Alaska project. "So the first thing they need to know is where salmon are in the region, do these streams even support salmon and are there certain types that are better for supporting them?"

King hopes that Alaska's state officials will be able to use maps that show the types of wetlands and then determine whether there are salmon in that area. "When they have that information, they can start identifying priority areas for conservation in developing management plans that protect these headwater streams, because right now there's very little protection for them. It's not uncommon to see someone clearing land right up to the edge of these streams or even pushing soil into them, which obviously has major implication for juvenile salmon."

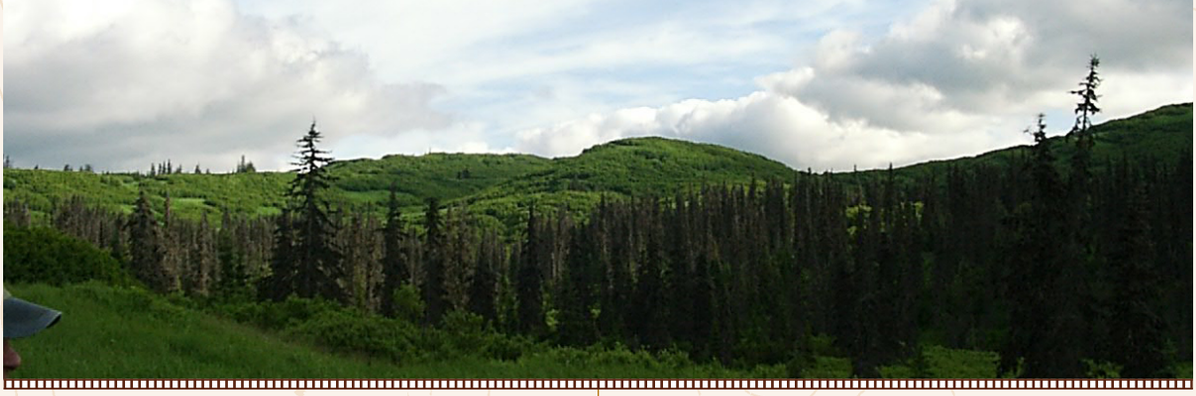
King's motivation for science goes deeper than creating tools for the government. He is influenced by his beliefs.

"Fundamentally, I have a very strong conservation slant," King says. "I'm very concerned about environmental stewardship. I see our role as Christians is to help create a sustainable place for future generations."

Feeding an economy

Alaska's economy thrives on fishing during salmon runs, when salmon return from the ocean to spawn in the streams where they were born.

Commercial salmon's harvest value in 2005 was $305 million, and the 2001 National Survey of Fishing, Hunting and Wildlife-Associated Recreation estimated that U.S. citizens more than 16 years old spent about $537 million dollars on Alaskan fishing trips.

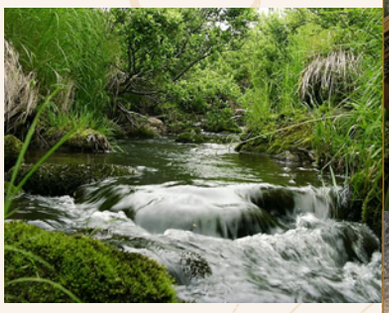


Coowe Walker, a watershed specialist with Alaska's Kachemak Bay Research Reserve and coordinator for the research, said that residential growth in the Kenai Peninsula has increased 20 percent in the last 10 years, and that development's encroachment on streams might affect salmon population.

"Salmon is our life and economy," Walker said. "This area is growing rapidly and this project is key to developing our understanding of headwater stream habitat. Most runs of salmon [in Alaska] are endangered, but we have a healthy run of salmon, and we want to keep it that way."

Dennis Whigham, a senior scientist at the Smithsonian Environmental Research Center, contacted King about the project because they worked together at the Smithsonian before King started teaching at Baylor in 2003.

Whigham, a wetlands expert, proposed that he would analyze water and plant samples collected from alongside the streams, and King and his graduate student would develop protocols for the experiment and analyze the fish and insects in the streams.



The researchers arrived in the field mid-May, and King and Whigham stayed for the first three weeks and left Jeff Back, a Baylor graduate student associated with King's research lab, to continue the work until he returned to Texas in late July.

"In each stream, we attempted to characterize stream habitat characteristics and watershed characteristics that might give us some insights about what type of stream is important for juvenile salmon," King said. "And if we could do that, particularly looking at a broad scale, a landscape scale, the ultimate goal was to find linkages between watersheds and the types of landforms that occur — the land that drains to these streams — and does that influence the abundance of juvenile salmon."

Of the four-person crew, which consisted of Whigham, King, Back and a rotation of volunteer students and Kachemak Bay Research Reserve workers such as Walker, two team members would gather plant and water samples and find the stream's dimensions and flow rates. Back, King and others collected insects in the stream and sampled 250-meter lengths of stream at each site with an electrofisher, a device that creates an electric current by placing an anode and cathode at different ends of the stream.

The electricity caused fish to swim involuntarily toward the electrofisher, and the team then would net floating fish that the instrument had dazed. They also used large nets to catch fish that escaped the netter and to sweep the stream after the electrofishing. They revived the fish in a bucket of cold water, and they classified, measured and weighed them.

After several hours of sampling, the crew returned to the lab, and Back analyzed the samples.

Looking for numbers

"This was a fact-finding mission," Back said. "They don't have information for many of these streams. At least half had salmon in them, and they didn't realize that."

The group looked for intersections of different wetland types and streams in an 810,000-acre land area that covers five different rivers. They plotted into a hand-held GPS device coordinates they obtained from a Geographical Information Systems map, and then looked for the research site.

Every member of the group carried 30- to 40-pound backpacks into the field. They drove for about an hour and four-wheeled into some sites. They almost always hiked for a couple of hours or more, Back said.

"The most difficult part of the entire summer was hiking into some of these streams," Back said. "We would be in the field and we would say, 'Ok, the point is over this way. It's a straight line two kilometers from right here.' So you'd look over that way, and there's not necessarily a trail or anything. And sometimes we would walk literally maybe a mile and it would take at least an hour, sometimes two to three hours. Willow trees in particular make it unbelievably difficult to walk. It was tough going."

Whigham and Back both said they lost about 40 pounds hiking through the forest, or more appropriately, hiking over the forest. Back said Alaska's woods suf-

Ryan King (left) operates a backpack electrofisher while Jeff Back nets dazed juvenile salmon. *Photo by Amy Alderfer*

fered from a bark beetle outbreak 10 years earlier that destroyed 90 percent of the forest, so the researchers had to climb over countless dead spruce trees. When fallen trees blocked their four-wheelers, the group either cut through them with bow saws or lifted their vehicles over them.

They usually took six hours to arrive at the stream, fish the site, gather other samples and return to the lab, except for the 19-hour expedition. The day before that trip, the group spent 12 hours searching for a way to reach the site.

After the official sunset at 11 p.m., the sun went just beneath the horizon so that a melded dusk and dawn lit the researchers' way back home.

Life in the wilderness

Even amid grueling treks, the team found ways to have fun. Some bungeed by grabbing onto dead spruce trees. Back took pictures of wildflowers, valleys of fallen forests and the expansive wetlands.

"We worked hard, but we tried to enjoy ourselves," Back said. "Good attitudes prevailed up there; that was the main thing."

The crew frequently encountered wildlife. A black bear and her two cubs passed near the researchers; a grizzly bear fled from out of an old logging company's woodpile at the sight of their vehicle; and the group had to abandon a stream because a bear left a half-buried moose nearby to eat later, and no one wanted to be there for the omnivore's return.

A moose and her calves also regularly wandered near Back's lodging and the lab. Local people told him moose were the most dangerous animals to encounter. "And if you get between the female moose and her calves, then that's very bad," Back said.

The group sampled 30 streams instead of 40 as originally planned due to heavy rain, difficulty in reaching the sites, and sites with streams that were either underground or that ended up being too small to sample. They also found streams where no fish could be found. They suspected blockages like beaver dams might have been the cause.

Nevertheless, team leaders consider the trip a success. "We've clearly demonstrated that the tiny streams are supporting juvenile salmon. Why in some streams and not in others? Those are some questions that we still have to answer," Whigham said.

King, Whigham and Back hope to finish their data analysis by summer 2007, present the research at international and regional conferences and submit manuscripts for peer review by the following winter and spring.

"Science really isn't done until it's published," King said. "Anytime we do research, our goal is to advance science and publish a work." B