UAF student monitors health of local waterways

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FAIRBANKS — Most people carry a spare tire or a tool kit in their trunk. La’Ona DeWilde’s is filled with assorted containers of river water, rain boots and a water-quality meter that is worth more than her car.

DeWilde, a biologist and doctoral student at the University of Alaska Fairbanks, spends much of her time traveling to sites around the Tanana Valley Watershed — the system of waterways that includes the Tanana and Chena Rivers as well as the Noyes and Chena Sloughs — collecting water samples to test in the lab for pollutants and contaminants.

So far, her samples have revealed E-coli, arsenic, lead, iron, chlorides and human and animal feces, as well as a number of bacteria and other organic pollutants. While most of these substances are not dangerous in low levels, DeWilde said it is important to continually monitor for them. She has already found areas with unusually high concentrations of arsenic, fecal coliform and chlorine that she intends to research further.

According to DeWilde, many of the contaminants she has found may be related to the increasing human population on and around local waterways. Highway road runoff and destructive lawn care and waste-removal habits are among the suspected sources of the pollution she has found so far.

Growing up green

DeWilde said her interest in environmental issues stemmed from the way she was raised in rural Alaska. She grew up with 13 siblings in the village of Huslia, living a subsistence lifestyle on the banks of the Koyukuk River.

“We just ate off the land and drank water straight from the river,” she said.

As a student at UAF, she pursued her interest in biology and said a particularly interesting course in global climate change cemented her interest in environmental science.

“That one really struck me as one of my most interesting classes ... that’s when I really decided to start to focus on environmental issues,” she said. “Now I’m pursuing that dream of working in biology and science and continuing to understand how the ecosystem works.”

DeWilde developed an interest in water-quality monitoring after receiving a grant from the Yukon River Inter-tribal Watershed Council to analyze water samples from sites along the Yukon River. Her results showed high levels of nitrates, which she began to trace back to the Interior.

“I did mapping of the contamination sites,” she said, “and started to realize that Fairbanks is actually probably one of the most likely points to be polluting the watershed.”

In January 2007, DeWilde decided to investigate her hunch and began focusing her thesis research on water quality in Fairbanks. In addition to documenting patterns of pollution in and around Fairbanks, she resolved to develop and implement a volunteer-based water-monitoring program in the Interior.

According to DeWilde, her goals for the program were to observe the basic health of local waterways, monitor for long-term trends and pinpoint sources of pollution and contamination. She said she tried to design the program in a way that would allow various local organizations and individuals to work together in hopes of creating the first long-term water-quality monitoring program in the Interior.
‘Adopt-A-Stream’

When developing her program, DeWilde came to Michelle Corrigan, Environmental Program Specialist at the Department of Environmental Conservation, for help coordinating with existing environmental groups interested in water quality monitoring. Corrigan put her in touch with the Fairbanks Stormwater Advisory Committee and the Tanana Valley Watershed Association, a nonprofit organization that seeks to promote and improve the health of the Tanana Valley watershed.

The two groups developed a partnership to provide funding for DeWilde’s project, which has become the TVWA Adopt-A-Stream program. “State and federal agencies do not have the time or money to monitor water quality as often and in as many places as would be ideal,” said Christy Everett, TVWA president. “We hope to be able to help fill that gap.”

In addition to water quality monitoring, the Adopt-A-Stream program includes litter pickup, stream bank preservation, beaver dam management and bioassessment monitoring — the process of collecting, identifying and counting insects, snails and worms at each site.

Everett said that fostering community engagement and educating the public about the issues that affect the waters of the Interior are an overarching goal of the AAS program.

“As volunteers from the community learn more and become involved … they become more aware of the threats to water quality and what that could mean to our quality of life,” she said. “They can help improve water quality through their actions and spreading the word throughout the community.”

Before getting out in the field, volunteers are required to complete a training session to learn proper sampling procedures. The volunteers are taught about the physical, chemical and biological aspects involved with water monitoring and trained to test water samples for a variety of basic nutrients to create a complete, accurate record of the water’s overall health.

The sampling kits are about the size of a child’s lunchbox, according to DeWilde, and have the materials needed to test for bacteria, dissolved oxygen, acidity, nitrates, phosphorus, conductivity, temperature and color. A sampling session takes about 90 minutes, following a 1 1/2-hour training day.

“It’s really straightforward,” she said. “The kit comes in a little plastic box and has instructions inside of it.”

Volunteers are asked to make about six trips between mid-May and October to get water samples at key points in the season, typically at times where there is an influx of water into the watershed, such as after a period of heavy rainfall or during the spring breakup.

Currently, DeWilde said she and her volunteers monitor about 30 sites in the watershed and has distributed 15 volunteer kits so far.

Delving deeper

While volunteers are looking mainly at basic nutrients and a limited range of contaminants, DeWilde’s research extends to include more technical tests for organic pollutants, trace metals and antibiotic-resistant bacteria.

One contaminant she is interested in is fecal coliform, which can come from human sewage, animal waste or agricultural runoff. DeWilde is attempting to trace the origin of the bacteria from each sample to find the source of the contamination.

She is also interested in pollution due to road runoff and is testing for a number of trace metals, like iron, zinc, lead and copper, and which may be washed off of highways and into nearby rivers and streams. By getting an accurate measurement of the amount of trace metals present in the water, DeWilde said she could estimate potential effects of further transportation development.

“I can project it out and show how … if we continue to develop roads and parking lots in the same way, what we are going to find,” she said.

According to DeWilde, most monitoring programs do not perform tests for trace metal or hydrocarbon pollution because paying analysts to process every sample would be too expensive. Instead, she is attempting to develop a more economical method to screen for the list of pollutants using bacteria culturing.

The process of bacteria culturing involves pushing a water sample through a filter, placing the filter on one of eleven different antibiotics and monitoring the number of colonies that grow on each sample. “I’m trying to find the best correlation,” she said. “For example, take one of the sites with arsenic pollution; if there are specific types of bacteria that are antibiotic resistant growing there, they can serve as
indicator species.”

Such indicator species would direct analysts to samples where pollutants would most likely be present, potentially saving them time and money.

Taking a long-term view

According to DeWilde’s advisor, Professor Terry Chapin, her focus on volunteers is strategic, as it helps ensure sustainability.

“Ph.D. work lasts only a few years,” he explained. “By educating the community and getting volunteers involved, she is laying the foundation to ensure that her work with carry on in the years to come.”

By monitoring the water quality over time, DeWilde hopes scientists will better understand the effects of pollution in and around local waterways and monitor for trends like climate change, melting permafrost and sea level increase. She said that her findings of high nitrate levels in the Yukon River, for example, might eventually be traced back to the growing human population around Fairbanks, as nitrates and phosphorus commonly come from fertilizers and grass clippings.

“One of the things I noticed on the Chena River and the Noyes Slough is there’s a lot of houses that just throw their lawn clippings directly in the water,” she said.

High nitrogen and phosphorus levels cause microbes to grow faster and use up the oxygen, she explained, which could affect fish health and spawning habitats where high oxygen levels are critical.

“It’s important to educate the public about things like this because a lot of people don’t even know that nitrates are coming off of the grass into the water or that they’re not good for it,” DeWilde said.

Ultimately, DeWilde hopes her work with the Adopt-A-Stream program will lead to positive changes in waterways within the Tanana Valley Watershed and in the habits of the general public.

“Water quality is something that we can’t see with our eyes, yet it is ultimately critical to our well being,” she said. “I feel that once people understand the effects of the things they are doing … they will want to do things differently so that we can continue to enjoy our rivers, fish and wildlife for a long time to come.”