Red Flags IN THE Great White North

The impact of climate change on Arctic thaw lakes—and the people who depend on them

By John Bach and Wendy Beckman

Photo: Ben Jones

Photo: Dottie Stover

Wendy Eisner, PhD, is adding another element to the formal discovery process on climate change and landscape evolution on Alaska's North Slope: native knowledge.

RECENTLY DRAINED THAW-LAKE BASIN photographed in mid-August. This lake, dated by its lack of vegetation and extreme "muddiness," drained one year ago.

THOUSANDS OF SHALLOW LAKES, KNOWN AS THAW LAKES, dot Alaska's North Slope. Usually less than 8 feet deep, thaw lakes form when ice and snow melt on top of the permafrost, the thick frozen subsoil beneath the Arctic plain. Roughly 20 percent of the land is covered by thaw lakes. Another 50 percent of the land is made up of drained thaw-lake basins—explaining why satellite images of the area resemble "Swiss cheese."

To many, a satellite image of Alaska's North Slope looks a lot like "Swiss cheese." That's because a majority of the land is made up of thaw lakes and drained thaw-lake basins.

The lakes—formed when ice and snow melt on top of the permafrost, the thick frozen subsoil beneath the Arctic plain—and the drained basins, have been the subject of more than 20 years of exploration by University of Cincinnati researchers into climate change and landscape evolution.

Led by UC geography assistant professor Wendy Eisner, PhD, the team is now adding another element to their formal discovery process: native knowledge.

Recognizing the Inupiaq Eskimo's intimate knowledge of the evolution of their land, Eisner and her team recently began interviewing the elders as part of the formal discovery process.

"I like to think of it as human or social geography," says Eisner.

"Our research has turned into something with a more humanist approach as opposed to pure Western science," she says. "The Inupiaq don't just see a lake or a drained lake. They also see qualities of the lake. And they understand it so much better than we do. It seemed the way to enhance our science was to become more involved and more respectful of this native knowledge."

For the UC team—Eisner, Ken Hinkel, PhD, Chris

A satellite image of Alaska's North Slope.

Cuomo, PhD, and graduate students Ben Jones and John Hurd—the facts are clear.

In the drained thaw-lake basins covering 50 percent of the land, the permafrost is thawing. As it thaws, peat in the frozen subsoil can decompose, releasing greenhouse gases into the atmosphere—impacting global warming. Improved understanding of the thaw lakes themselves—covering 20 percent of the land—will help them to better understand and predict future environmental changes.

Both the scientists and the Inupiaq are desperate for answers. The thaw lakes near Atqasuk, a community of 249 Inupiaq, are crucial not only to their economy but also to their livelihood. So the Inupiaq stay attuned to climate change. It's a science for them—their existence depends upon it. When things become unpredictable, they become concerned—and rightly so.

"The people are worried," says Eisner. "Some still earn subsistence from hunting, fishing and gathering, but especially fishing—which is tied directly to the lake drainage. Everything else must come from the lower 48, and it's very expensive. They receive subsidies, but the subsidies don't match their needs, so they really depend on hunting and fishing. It's a marginal existence for many."

Eisner and her team have applied for a new grant to continue their work. The new project would include taking the elders, most over the age of 70, up in helicopters to get their first bird's-eye view of the land that they know so intimately

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Members of the UC research team with children from the Inupiaq community of Atqasuk.

Working Together

Researchers from UC are combining "hard"—that is, natural—science with "soft" science: the traditional knowledge of the Inupiaq elders who live in the far north.

All faculty in the McMicken College of Arts & Sciences, Wendy Eisner, PhD, (geography and women's studies), Chris Cuomo, PhD, (philosophy and women's studies) and Ken Hinkel, PhD, (geography), the team has applied for a new grant from the National Science Foundation to study climate and environment on Alaska's North Slope.

"Ken is a pure physical scientist," Eisner says. "I have a background in archaeology, anthropology and paleoecology. Chris adds her expertise in environmental ethics and philosophy."

The research has become more and more interdisciplinary with time.

"When you study climate, you need people who understand rivers and lakes and hydrology. You have to have people who do what I do, which is study past evolution of the landscape. You need people who are dealing with the soils. So it always was interdisciplinary, but then adding this extra component of dealing with the people brought us to a whole new level."

DRAINED THAW-LAKE BASIN photographed in mid-August. Still considered a "young basin," this lake drained about 20 years ago.

A Way of Looking at the World

The UC team spends a great deal of time mapping northern Alaska using Geographic Information Systems (GIS) technology—a rapidly growing field that incorporates graphical features (such as those found on standard maps) with scientific information.

An image is then built to represent the area under study. It's more than a map and yet more than just tables of data. Using satellite images and remote-sensing techniques, maps are created with layers of information that reflect and record information provided by the Inupiaq elders and the data provided by core samples. Researchers tape their interviews with the Inupiaq elders, who sit with the maps and satellite images in front of them. The elders are excited about the satellite images.

"It's a way of looking at the world that they have not been able to do before," says Wendy Eisner, PhD.

Once the research team returns home, the information all gets entered into the GIS. "It's really quite cool," says Eisner while demonstrating the software's capability to drill down to different layers of information on a satellite image.

"All of this information is accumulated over their lifetimes and generations of lifetimes and it gets added to this map."

from the ground.

"It's a nice combination of physical geographic research and sampling of the lake basins," says Eisner. "And we can actually corroborate back and forth between the elders' stories and our information: you can date the timing of the lake drainage. Then as you do this across the whole North Slope, you can see if there are patterns. For example, did a lot of these lakes drain at the same time? If that's the case, then you would think that there would be some external force going on, some major change that could be related to climate change.

"The Inupiaq are in the part of the United States most affected by climate change right now. They're the canary in the coal mine," says Eisner. "Add onto that the whole issue of global change—these are the last Inupiaq speakers and they have a great deal to tell us."

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During field work in April, researchers conducted ground-penetrating radar surveys, which can reveal the underlying sedimentary structures and features associated with permafrost terrain.

Photo: Ben Jones