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[HOME](#) [WHO WE ARE](#) [SERVICES/EXPERTISE](#) [RENEWABLE ENERGY](#) [BLOG](#) [CONTACT US](#) [JOBS](#) [PETS OF PFS](#)

Documenting Dangerous Ice



Dangerous ice conditions in Davis Slough off the Tanana River in early December. Ice conditions like this make traveling along rural Alaska's icy lakes and rivers hazardous.

Photos courtesy Knut Kielland

Each winter as the temperatures in Alaska dip well below zero, the frozen rivers and lakes become highways and byways for many rural Alaskans. Just a short distance outside Fairbanks, one of Alaska's largest cities, the lack of traditional roads and bridges reminds one just how rural and rugged a large part of Alaska is. With few traditional roads, many rural Alaskans navigate the seemingly frozen bodies of water on snowmobiles and dog sleds. And all too often they come in contact with dangerous ice.

This is something ecologists Knut Kielland and his colleague Bill Schneider, an oral historian, know all too well. Kielland and Schneider, both avid dog mushers and researchers at University of Alaska, Fairbanks (UAF), have been criss-crossing the Alaska countryside along the Tanana River outside of Fairbanks for nearly 25 years. During that time the two have certainly run into their fair share of dangerous ice, but there were several unusual phenomena associated with dangerous ice that piqued their interest.



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Categories

Select Category

Archives

December 2011 (1)
November 2011 (2)
October 2011 (1)
September 2011 (8)
August 2011 (5)
July 2011 (3)
June 2011 (2)
May 2011 (4)
April 2011 (2)
March 2011 (5)
February 2011 (10)
January 2011 (17)
December 2010 (10)
November 2010 (14)
October 2010 (17)
September 2010 (24)
August 2010 (20)
July 2010 (19)
June 2010 (22)
May 2010 (15)
April 2010 (24)
March 2010 (20)
February 2010 (13)
January 2010 (13)
December 2009 (14)
November 2009 (14)
October 2009 (13)
September 2009 (20)
August 2009 (20)
July 2009 (12)
June 2009 (27)
May 2009 (4)
April 2009 (6)

Search

Search for:

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Alaska **Alicia Clarke**



Knut Kielland came up with the idea to study the phenomena behind dangerous ice while dog mushing. Here he is guiding his team through overflow on the Anaktuvuk River on Alaska's North Slope.

Degrading Ice

At 584-miles long, the Tanana River is a natural force that cuts through the landscape of central Alaska. During the winter the Tanana River exhibits a wide variety of dangerous ice conditions, ranging from overflow (water on top of the ice surface covered by dry snow) to shell ice (ice with air pockets underneath). "The most insidious ice condition is degrading ice," Kielland said. "This condition refers to ice that forms normally during freeze-up and represents a safe travel surface in early winter. However, as the name implies, degrading ice exhibits dangerous thinning during mid-winter even at very cold (-30°C) air temperatures. The physical mechanisms behind this phenomenon and the distribution of such ice conditions are a major focus of our project."

With support from the [National Science Foundation](#), Kielland, Schneider and a multidisciplinary team of researchers set out to study and map the physical conditions behind winter dangerous ice conditions, as well as document local knowledge and observations across a 200-mile study area near the Tanana River. The data from the project will help scientists understand the forces behind dangerous ice, and give rural Alaskans tools that may improve public safety.

A Complex Issue Needs a Complex Approach

Kielland wanted to study dangerous ice from multiple angles, including human interactions with this natural force. To do that, Kielland paired teams of natural scientists with oral historians and ethnographers to take a holistic approach.

"In terms of the multidisciplinary approach, we're talking about climatology, hydrology and the physics of snow and ice—that's the natural science part. In terms of the social science, it's both the science of going about how to collect oral histories and learning about how residents view and experience their environment, and more directly in terms of how they experience the changing winter conditions, particularly in regard to snow and ice conditions," Kielland explained.

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January 2009

August 2008



Sam Demientieff of Fairbanks inspects ice degradation in Moe Slough, February, 2010.

[June/July 2008](#)

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[April 2008](#)

[March 2008](#)

[February 2008](#)

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Meta

[Register](#)

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Community Involvement

Involving local communities in the study area has been a key part of the dangerous ice project. Many of the villagers and townspeople have traveled the frozen rivers and lakes for decades and have valuable knowledge and insight that machines and computers simply can't duplicate.

To gather data on how locals call upon years of experience and training to frame their descriptions and evaluate ice conditions, Kielland looked to his longtime friend and oral historian Bill Schneider to record interviews with locals. Having lived and worked in Alaska for decades, it was relatively easy to tap the wealth of knowledge about rural Alaska's frozen highways.



Residents of Manley Hot Springs meet to discuss the ice conditions along the river trail between Manley and the village of Tanana. LPictured from left oto right: are, John Dart, Espen Jervsjö, and Frank Gurtler (Manley), and Charlie Wright (Tanana).

“Because we’ve lived here for a while, we have friends and acquaintances—and acquaintances of acquaintances—in a variety of communities. We were very fortunate that we could pretty much come into a community and establish a rapport with them,” Kielland said.

Ice Interviews

The team worked with communities in Fairbanks, Manley and the village of Tanana to gather their observations on the distribution and abundance of dangerous ice phenomena and how they impact subsistence activities and travel throughout the winter. With help from Karen Brewster, a research associate for the Oral History Program at UAF, the team has hosted several workshops and interviews in the field with river travelers, the results of which are now being posted online.



Research associate Karen Brewster films interviews with Sam Demientieff (left) and Wally Carlo (right) on the Tanana River, March 2011.

“We do semi-direct interview [s], take a lot of photographs and videotap[e]ing of areas and interviews,” Kielland said. Interviews and photos from the dangerous ice project are made publicly available through the University of Alaska Fairbanks’ Project Jukebox.

The combination of physical data and recorded oral histories has started to crack some of the mysteries of dangerous ice, shedding new light on the phenomena and how rural Alaskans deal with it.

Cracking the Ice

Some of the initial findings are a bit of a surprise to Kielland and his colleagues. Initially, he hypothesized that dangerous ice occurrences were tied to shallower (< 1 m) portions of the river more susceptible to melting from below due to ground water upwelling. However, that’s not always the case. The team has observed cases of dangerous ice in deeper waters (> 3 m).

Kielland has also documented very localized instances of dangerous ice where, “it’s almost like somebody sat down at the bottom [of the river or lake] with a laser and shot a

hole in the ice. Hydrologists on the project are still working to understand the physics behind such localized events.

“We’re learning about the phenomena, about how wide- spread it is, and we’re learning about how people deal with it—though mostly they just want to stay far away from it,” Kielland said. “We don’t know much about how it has changed through time yet, but we hope our conversations with local residents can shed further light on that.”

Although winters in Alaska are getting warmer on the whole, dangerous ice phenomena aren’t necessarily a direct consequence of climate change.

“Winters in Alaska are getting warmer and climate predictions call for more snow. Both of those factors will probably exacerbate the situation, if anything, but we don’t consider this a direct consequence of warming. As I mentioned, we see the phenomenon even when it’s very cold out,” he said.

Lessons Learned

With the second year of the dangerous ice project now coming to a close, Kielland and Schneider hope to extend it for one more year to continue unraveling the mysteries behind dangerous ice.

The lessons learned from this project will not only tell us where dangerous ice is located and it’s potential causes, they will also help rural Alaskans avoid a wintertime problem that claims lives every year.

“We hope that at the end of the day, there will be an improved understanding from both our and their [rural Alaskans] point of view about the nature of the phenomenon and how it’s distributed along the length of the Tanana that many of them travel,” Kielland said. For more information about the Dangerous Ice project (still under construction), visit:

<http://jukebox.uaf.edu/dangerice/start.htm>. —Alicia Clarke

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