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In Alaska, navigating frozen rivers has become a science

Study of why Tanana River freezes as it does may help backcountry habitués in any winter wilderness.

By [TIM MOWRY](#)
Fairbanks Daily News-Miner

FAIRBANKS, Alaska — After mushing dogs on the Tanana River for 20 years, both for trapping and recreational purposes, Knut Kielland decided to figure out why the river freezes — or doesn't freeze — the way it does.

Over the course of four winters, Kielland, a researcher at the University of Alaska Fairbanks' (UAF) Institute of Arctic Biology, solicited the help of other scientists, oral historians, and locals who live in villages along the river, to study changing ice conditions on the Tanana River.

"After running around on bum ice for 20 years, we decided to look at things a little more systematically, and that's what this project was all about," Kielland said.

During the winters of 2005-2007 and 2010-2013, groups of river travelers and scientists traveled to potentially hazardous places on the Tanana River near Fairbanks, Manley Hot Springs and Tanana to document ice conditions and/or measure air temperature, ice thickness and water temperature, depth and chemical composition. Specifically, Kielland and other scientists were interested in the dynamics of the river system and the influence of groundwater upwelling on ice conditions.

While Kielland and other researchers are still digesting the data they collected, to be presented later in the form of scientific papers, they did take the time to put together a booklet called, "On Dangerous Ice — Changing Ice Conditions on the Tanana River" that is available to the public. A byproduct of the study, the 66-page book serves as a sort of travel guide and is chock full of tips,

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UNIVERSITY OF ALASKA / AP

What can happen on iced-over rivers: Knut Kielland, left, and Sam Dementieff pull on the front of a snowmobile as Dave Norton tries to drive the snowmobile over a broken ice shelf in the Tanana River in Alaska.

Tips on navigating dangerous ice

Here are 10 tips for traveling on iced-over rivers such as Alaska's Tanana River, extracted from "On Dangerous Ice."

- 1) Look out for frost on trees and rising steam as signs of open water ahead.
- 2) Ice crystals (commonly known as hoarfrost) in a crack may be caused by rising water vapor, which means that open water may exist beneath. This is often a sign of unstable ice conditions below.
- 3) Windblown silt on ice accelerates melting from the sun in the spring, which weakens the ice. This is common on the lower Tanana River.
- 4) The heat from warm groundwater can melt ice from below, causing open areas to form even in very cold weather.
- 5) Travel on existing trails may be safer, because packed

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color photos, diagrams and graphics about traveling on and identifying dangerous ice.

The guide covers everything from dealing with open water and overflow to the dangers of steep cutbanks and sandbars to the effects of groundwater upwellings on ice and all sorts of stuff in between.

"It's a really cool book," Charlie Campbell, a trapper and musher in Tanana who was one of the local experts who helped with the project, said. "We put a lot of work into it."

While the book is specific to the Tanana River, Campbell said the principles covered in it can be applied to river travel throughout Alaska.

Local experts like Campbell provided historical perspective, personal experience and traditional knowledge about ice conditions on the Tanana River that were recorded and documented by Bill Schneider and Karen Brewster, a pair of oral historians at UAF.

The study, a joint project between Elmer E. Rasmuson Library and the Institute of Arctic Biology, was funded with \$360,000 in grants from the National Science Foundation. The project had several components, said Schneider, who has since retired as curator of oral history at the UAF library. In addition to the scientific papers that will be written and the booklet, a website was set up that contains hundreds of photos and tape-recorded excerpts of scientists and locals talking about different ice conditions and how they were formed.

Getting input from local experts, many of whom were multigenerational natives, was key, Kielland said. While they may not look at things scientifically, their observations are usually rooted in science, whether they realize it or not.

"A lot of those people are very knowledgeable," Kielland said. "They're very interested in this stuff and they have a wealth of experience."

The book and website are part of the project's public outreach and an attempt to make the information that scientists gathered "more palatable to the public," Kielland said.

"Most people aren't going to read our scientific papers," he said.

The information contained in the book is basic nuts and bolts, said Kielland. Principles such as sticking to packed-down trails because the ice is thicker than on unpacked snow, looking for steam rising off the river to identify open water, sticking to sandbars when possible, always testing questionable ice with a pole or ax and never traveling alone may seem obvious to most people who regularly travel on rivers but not those who are inexperienced in such travel.

"It's a good reminder of what some people might consider obvious but for a large segment of the public cruising around in the wintertime this is pretty novel to them," Kielland said.

The university printed 500 books, which are available for free at the Elmer E. Rasmuson Library on campus, and the book can also be downloaded from a website on the project.

Sam Demientieff, a second-generation river pilot who lives along the Chena River in Fairbanks, helped with the project. Demientieff, 74, said it was interesting listening to others who have lived and

snow is a poor insulator compared to undisturbed snow, allowing the ice under these packed areas to grow thicker over the course of a winter.

6) No matter how competent you are, it is always a good idea to travel with a partner. You may unexpectedly find yourself in an emergency situation where you need help.

7) Always test areas of questionable ice with an ax or a long pole. The pole also can be used to keep yourself from falling through the ice by creating a brace support across a hole. Hollow-sounding ice is not supported below by water or the river bed.

8) The sound of running water may indicate thin ice or areas of open water.

9) "Frost flowers" (ice crystals growing from the ice surface due to moisture) are frequently found on new ice or recently refrozen overflow. On newly formed ice, frost flowers are warnings that the ice still may be thin and not strong enough to support the weight of a person or snowmobile.

10) Sandbars with steep cutbanks can be problematic on the downwind side where drifting snow accumulates. This deeper snow insulates the ice and can keep it from freezing thickly. Southern exposure may accelerate surface melting. Care needs to be taken when approaching or exiting sandbars due to these areas of potentially thin ice.

Download booklet, see more photos

To download a pdf version of the book or to look at photos and listen to recordings related to the Dangerous Ice Research Project, go to www.jukebox.uaf.edu/dangerice.

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traveled on rivers much of their lives explain how they identified dangerous ice and what signs they looked for.

"We think the river freezes over when it gets cold and that's it but the river keeps running all winter under ice," he said. "It was a good experience for us to see and focus our attention on how the river freezes and how ice forms on the river."

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