

The Big Wax Off

The Science & Impact of Fluoro Wax

By Erik Ness

When we buy our cross-country ski gear and clothing, we expect them to last for years. And the places where we ski—the landscapes, trails, and traditions—we measure in decades, often generations. In contrast, ski wax provides fleeting adjustments to each day's conditions. Imagine the dismay, as snow-sport aficionados have discovered over the last decade, that waxes long in use contain persistent pollutants—fluorinated compounds called PFAS. And they may outlast us all.

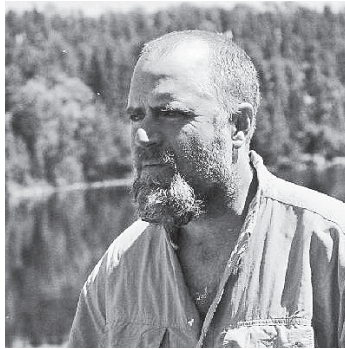
Concerns about PFAS' environmental longevity and health impacts are escalating, partly because of increasingly sophisticated detection technology. We can also thank Europe, which has tightened its scrutiny of synthetic chemicals, even as the Environmental Protection Agency has gone lax.

Around 2000, researchers in Northern Europe began noticing higher levels of PFAS in the environment. A 2015 analysis of PFAS found that "ski waxes had the highest concentrations ... compared to a wide range of other consumer products." Subsequent investigations of ski areas found detectable levels of PFAS in the environment.

In November 2019, the Fédération Internationale de Ski (FIS) announced a ban of fluorinated wax in competition beginning with the 2020/21 season. In October 2020, the ban was delayed a year

to develop testing technology. Stateside, U.S. Ski & Snowboard is going ahead with the ban this year, and the American Birkebeiner is also going fluoro-free. "This is where we're headed, and it's the right thing to do," said ABSF Executive Director Ben Popp. "When you're talking about the environment, and knowing that these last forever, you can't have

fluoros at the Birkie. We're going to discourage them from use, period, at our venues and on the trail."



Erik Ness has been backpacking since age 4 and spent three summers living and working on the Long and Appalachian Trails in Vermont. He has been writing about science and the environment from his home in Madison, Wisconsin for 30 years.

The Science

"PFAS" is an acronym that stands for Per and Poly-Fluoroalkyl Substances," said Christina Remucal PhD. She's the director of the Water Science & Engineering Laboratory at the University of Wisconsin-Madison and a member of the Wisconsin PFAS Action Council. PFAS are used to make things nonstick, or waterproof—like non-stick

pans, Gore-Tex jackets, and ski waxes. "These chemicals are fascinating," Remucal said. "They're used in a lot of things that we come in contact with every day. They really like to be in fats, and this helps some PFAS bioaccumulate."

A long carbon chain on one end makes PFAS fat-loving. On the other end is a group with a negative charge on it that helps the chemicals dissolve in water. This fat-loving and water-soluble dual nature make PFAS into a chemical Swiss Army knife, desirable for a lot of consumer products and industrial applications. "Unfortunately, the same properties that make them attractive for product applications," Remucal said, "are also problematic when they're out in the environment."

Highly mobile in the environment, PFAS tend to end up at surfaces between air, water, and soil. And that's where a lot of important activity takes place in nature. U.S. industrial policy allows nearly

endless production of complex chemicals in a largely self-regulated environment. Introduced in the 1950s, PFAS manufacturers were aware early on that health problems developed in workers exposed during production. There were corporate cover-ups which helped these chemicals avoid regulatory scrutiny. It wasn't until the last two decades when manufacturers voluntarily ceased production of PFOA and PFOS, early PFAS with the most problematic health history.

Among the adverse health outcomes: thyroid disease, decreased fertility, disrupted lipid metabolism, decreased immune response, and several forms of cancer.

PFAS also bioaccumulate, which means they build up in the food chain, with humans generally sitting atop the chain. Health effects happen at low concentrations. "Once they're in your body, it takes a long time for them to leave," Remucal said. "So that's concerning. We're really concerned about trace level concentrations in the environment."

Our Trails

Most studies of PFAS at ski centers have been conducted in Scandinavia. In January 2020, Gail Carlson PhD set out to examine a competition course in Colby, Maine. "I was interested in knowing what was happening in my own backyard," she said. Carlson, a Madison native, is now an assistant professor in Environmental Studies at Colby College where her research focuses on toxic contaminants in the environment. Her son was a Nordic skier and she would see little kids rolling around in snow, sometimes eating it.

Carlson and her team tested snow immediately after a race, where they knew fluoro waxes were used. Presence of PFAS was overwhelming at the start line, dropping off after a few kilometers. In May, the snow gone, they found long-chain PFAS associated with ski wax in soil samples they collected. "Our study was pretty small," Carlson said, but I'm planning to go back and do a follow-up where we can look at a lot more places, and after subsequent races where supposedly there aren't going to be fluoro

waxes.”

While encouraged by voluntary bans pursued by the snow sports community, Carlson would like to see broader action. With thousands of these chemicals, she’s worried about the thousands of variations in chemical form. “There aren’t any we know for certain that are non-toxic, not persistent, or not bio-accumulative,” she said.

While Europe is working towards a possible ban, the US is proceeding state by state. Carlson said: “We just have to have the guts to ban the whole class of them.”

PFAS in the Upper Midwest

The Environmental Working Group maintains a dynamic map of known

PFAS contamination [See: www.ewg.org/interactive-maps/pfas_contamination/map/]. Viewing this map, compared to Michigan or North Carolina, you might think Wisconsin has gotten lucky. “That map is completely dictated by the efforts that have been put in locally across the US to look for them,” warned Christopher Zahasky, Assistant Professor, Department of Geoscience at UW-Madison. “Because the more you look for them, the more you find. Very few people in the scientific community had really been focused on them ten years ago, or even five years ago.”

The work from Europe and the development of better analytical methods at places like the University of Wisconsin and the Wisconsin State Hygiene Lab

have raised the alarm. With multiple state agencies and researchers now on the job, that map will soon change. The Wisconsin PFAS Action Council, formed by Gov. Evers, will have submitted its recommendations in December. “We’re definitely a bit behind but I think we’re rapidly catching up,” Remucal said. “I think we’re moving in the right direction. I do think the choices we make add up. If we can pick a ski wax, a carpet, a jacket, or whatever, that doesn’t have these chemicals, I think that’s important. There are ski waxes that don’t have these chemicals. So why not use the ones that aren’t harmful for the environment? Once they’re out in the environment, it’s difficult to actually do anything about it.”

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