

SALT IN

HOW ORDINARY ROAD SALT IS DEGRADING



DAVID SLADKY

WHEN STEVE CORSI first measured salt levels in urban streams and storm sewers in Madison and Milwaukee, he expected to find more than the natural freshwater level of a few milligrams per liter. Both cities have used sodium chloride as a pavement de-icer for decades, and it's common knowledge that melting snow carries road salt into soil and water. But the research hydrologist for the U.S. Geological Survey in Middleton was surprised to find just how high the numbers could go.

According to Corsi, chloride levels near Milwaukee's Kinnickinnic River and Madison's Lake Mendota frequently rise to toxic levels. "In the [Madison] storm sewer . . . we

have regularly seen more than 5,000 milligrams per liter," he says. That's 20 times the maximum amount of sodium chloride the U.S. Environmental Protection Agency recommends for drinking water, and more than half the toxic level for bluegill and fathead minnows.

Between 1993 and 2003, the Wisconsin Department of Transportation put an annual average of 385,000 tons of sodium chloride on Wisconsin's 11,612 centerline miles of state and federal highways. Given that local jurisdictions maintain another 100,000 or so miles of road, the amount of road salt used throughout the state is certainly much higher. Milwaukee's annual average is 93,000 tons; Madison's is 8,200 tons.

OUR WOUNDS

OUR LAKES AND GROUNDWATER—AND PUTTING OUR WETLANDS AT RISK

BY KATHRYN KINGSBURY

Salt became a key weapon in Wisconsin's battle against ice- and snow-covered roads in the late 1950s. In terms of keeping roads safe, it has served us well. But now a growing number of scientists are raising concerns about the long-term, and surprisingly far-reaching, impacts of this de-icer on Wisconsin wildlife.

"It's kind of a sleeping giant right now," says Roger Bannerman, a water resources management specialist for the Wisconsin Department of Natural Resources. "Not many people are stopping to think that some generation down the road is going to have to deal with this."

Scientists and gardeners have long known that salt can be a death knell for plants. That's especially true for Wisconsin's native vegetation, which evolved under soil and groundwater conditions virtually free of sodium. Salt alters the way plants absorb and hold water, essentially coaxing moisture from roots and leaves. Stunted growth, witch's brooms, dead leaves and branches, and plant mortality are the results, as anyone can observe by visiting salt-browned pine stands along roadways in the northern part of the state.

Salt damages soil structure, too. Sodium alters minerals naturally present at high levels in Wisconsin's soils, like calcium and magnesium, that contribute to soil's ability to hold oxygen and drain water. Friable soils turn into hardpan, suffocating plant roots and becoming waterlogged after each rain. These structural changes persist even after sodium washes out.

And these problems may not be limited to roadsides. According to research by Carl Bowser, professor emeritus in geology at UW-Madison, road salt can reach relatively isolated areas by leaching into groundwater, feeding from there into lakes and ponds. By the early 1990s, for example, Sparkling Lake in Vilas County had sodium chloride levels of 15 parts per million and was increasing at a level of 0.15 mg/L annually. Compare this with a naturally occurring level of about 0.5 parts per million.

On the ecosystem level, salt-rich waters and soils favor invasive species like narrow-leaved cat-tail and Queen Anne's lace.

Stefanie Miklovic, a wetland ecologist with Cedarburg Science in Cedarburg, has conducted greenhouse and field research looking at the effects of road salt on plant diversity. In the controlled environment of the greenhouse, native wetland species didn't start to decline until they were exposed to steady sodium chloride levels of 500 mg/L, and levels had to reach 1,000 mg/L for narrow-leaved cat-tail to take over. By contrast, the highest chloride levels she found

when taking measurements at rural roadside marshes near Minnesota's Twin Cities were 100 mg/L of surface water and 300 mg/L in boggy soils.

But Miklovic believes that Wisconsin's wetlands can be harmed by a much lower level of salt than the research indicates. "Certain wetlands are already degraded from agricultural runoff and invasive species, so if there's salt added to those waters, it could further degrade them," she says.

Put another way, treating our roads with sodium chloride may be rubbing salt into our ecosystem's wounds.

Salt can be a **death knell** for plants, especially Wisconsin's native vegetation.

So what can we do about it? Alternative de-icers show promise, but have their own drawbacks. Magnesium and calcium chlorides don't harm soil structure or dehydrate plants, but they still cause problems for aquatic life. Organic de-icers like calcium magnesium acetate pose fewer direct threats, but may rob waterways of oxygen as they decompose. Even sand isn't innocuous. Its buildup can smother life at the bottom of waterways and reduce photosynthesis in aquatic plants.

And, of course, price comes into play. Salt is cheap; with the exception of sand, alternative de-icers aren't.

"The solutions are going to have to be creative," says Corsi. "It might be a combination of being more careful with salting or it might be changing to alternative de-icers. It might be using methods of physical removal." State law requiring that salt not be stored in the open reduces the harm it can cause, by reducing the flow of salt into sewers and groundwater. Limiting salt application to major thoroughfares is another option—one that's been in effect in Madison since the mid-1970s but hasn't caught on in many other municipalities.

Bannerman thinks that the current preference for 100 percent bare pavement may need to change. "We build more roads and we have a tremendous desire to keep all roads in summer driving conditions," he observes. Perhaps we can go back to the days before 1960, when passing lanes were left unsalted in winter. Or more cities could adopt salting policies like Madison's. Bannerman, for one, says he has no problem driving on his unsalted residential street in the winters: "It just means people have to slow down." ■

Kathryn Kingsbury writes about plants and ecology.