Road salt pollution in many US lakes could stabilize at or below thresholds set by the EPA

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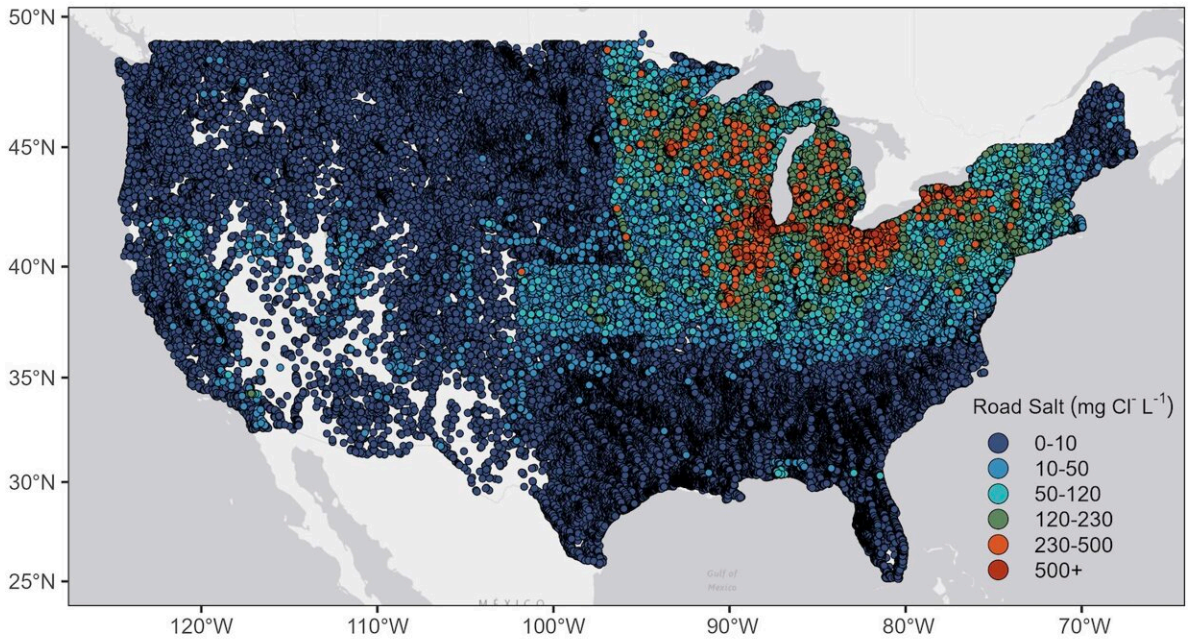

The model's predictions for where road salt concentrations will stabilize in 461,567 lakes and reservoirs larger than 2.5 acres. Each point on the map represents a lake or reservoir. The predictions assume that road density and salt application rate per unit of road remain constant at mean 2010-2015 levels. Credit: Solomon, C.T., Dugan, H.A., Hintz, W.D., Jones, S.E. (2023). Upper limits for road salt pollution in lakes. *Limnology and Oceanography Letters*.

Since de-icing with road salt began in the 1930s, the salinity of lakes across much of the US has been steadily increasing, posing a potential threat to aquatic life and drinking water supplies.

However, a cautiously optimistic new study in *Limnology and Oceanography Letters* concludes that if we can hold steady or decrease road salt use, levels in many lakes could stabilize below thresholds set by the US Environmental Protection Agency (EPA).

"For the majority of US lakes, road salt pollution could be a solvable problem, if we put our minds to it," said lead author Chris Solomon, who studies lake ecology at Cary Institute of Ecosystem Studies. However, he cautions that more research is needed to better understand what actually is a safe level of salt in a freshwater ecosystem.

The US applies an estimated 24.5 million tons of road salt on its roads every winter—mostly in the form of sodium chloride. Rain and melting snow carry this salt into local waterways and aquifers, where it can cause freshwater salinization syndrome. Not only is this salt harmful to many organisms, but it can leach toxic metals and radioactive materials from soil and water pipes.

Solomon saw the upward-trending lines of salt concentrations in US lakes and wanted to find out where they were headed. Would road salt levels continue to rise, or would they stabilize? With colleagues, he developed a model to explore controls on road salt concentration in lakes to reveal the concentration at which they might level off.

The model looked at road density in lake watersheds, the amount of road salt applied per road mile, and precipitation. Hydrologic fluxes were taken into account to predict how salt pollution flows into and out of lakes. The model calculated the levels at which road salt would be expected to stabilize if salt application was held at amounts reported in

2010–2015, for all of the 461,000 lakes and reservoirs larger than 2.5 acres in the contiguous US.

For lakes in areas with light to moderate road density, the authors found that holding road salt application rates steady could help lakes stabilize below 230 mg/l of chloride per liter of water, the threshold designated by the EPA to protect aquatic life. Reducing application could yield additional environmental and economic benefits without threatening road safety.

The authors note that more research is needed to determine if the EPA's 230 mg/l chloride threshold is too high. Solomon explains, "The EPA's chronic toxicity thresholds for chloride were developed with limited data, and there is growing evidence that negative impacts can occur at concentrations well below 230 mg/l." Even less is known about how salt mixtures from multiple sources affect aquatic life.

Some places have set much lower chloride guidelines, including 150 mg/L in Michigan and 120 mg/L in Canada. The model predicts that chloride concentrations will eventually exceed the 120 mg/L threshold in more than 9,000 US lakes, even if road density and salt application rates stay at current levels.

Unsurprisingly, lakes with predicted salt concentrations in excess of EPA's 230 mg/l thresholds were most common in the Northeast and Midwest. Most vulnerable were lakes with high road density and high road salt application in their watersheds. They included some 9-10% of lakes in Illinois and Ohio, as well as a smaller percentage of lakes (