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Is climate change and road salt salinization undermining nitrogen removal by freshwater urban/suburban wetlands?

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Freshwater urban wetlands are important ecosystems that filter out excess nutrients and pollutants from urban runoff that would otherwise degrade surface and groundwater quality. However, application of de-icing road salts coupled with extreme climate events like winter-freeze episodes and summer heat waves could undermine the nitrogen (N) filtering capacity and ecosystem services provided by urban freshwater wetlands. We investigated how soils from freshwater urban wetlands responded to varying salt concentrations (0 – 5 g/L) and temperatures (0 – 40 °C) and how N removal via denitrification versus N retention through dissimilatory nitrate reduction to ammonium (DNRA) was impacted. Our results from salt experiments revealed that N removal by denitrification significantly decreased ($p < 0.05$) while DNRA remained unaffected ($p > 0.05$) with increasing salt concentrations. In comparison, experiments on the combined effects of salt and temperature produced mixed results. Soils with higher salt concentrations had the lowest denitrification N removal at the highest temperature (40 °C), while soils with lower salt concentrations had the highest denitrification N removal. In contrast, N retention through DNRA was significantly lower ($p < 0.05$) in soil with lower salt concentration at higher temperature (40 °C). However, N retention was significantly higher ($p < 0.05$) in soil with higher salt concentration at higher temperature (40 °C). These observations suggest that the magnitude of salt concentrations could influence the N processing by urban wetlands – elevated concentrations may undermine the valuable N removal ecosystem service provided by these ecosystems.