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Land Use and Water Quality: Agricultural Chemicals in the Ottertail Watershed, Minnesota

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Manoomin (Ojibwe)/Psiŋ (Dakota), also known as wild rice, is a spiritually and culturally important plant species that grows in shallow lake beds and throughout the Great Lakes Region. Manoomin is an annual grass that is under threat from climate change as well as the impacts of land use change. The Ottertail River Watershed (OTRW) contains over 2,800 miles of streams and 1,300 lakes, located in west-central Minnesota, where land use is now predominantly agricultural. The northernmost headwaters of the OTRW lie within the White Earth Band of Ojibwe Reservation. The runoff of excess nutrients and chemical pollutants can lead to eutrophication and accumulation of nutrient anions and pesticides in surface and groundwaters, which could harm Manoomin. Indeed, there is great concern surrounding the observed decline of Manoomin in relation to agricultural runoff in the OTRW and beyond. In collaboration with tribal partners at White Earth, sampling of surface (rivers and lakes) and groundwater was conducted for five locations throughout the OTRW. Nutrient anion and pesticide concentrations were analyzed to determine the transient and lasting presence of agricultural chemicals in the watershed. Early results showed near ubiquitous elevated concentrations of Atrazine and 2,4-Dichlorophenoxyacetic acid in surface waters, including at our “control site” upstream of the majority of agriculture. Surface water concentrations of chloride and sulfate were elevated in the spring indicating a potential source of contamination from snowmelt or road salt, decreasing into the summer months. Sulfate levels exceeded the 10 ppm Minnesota state limit for ricing lakes at two sites. Analysis of historical OTRW data from the Minnesota Department of Natural Resources (MN DNR) and the Minnesota Pollution Control Agency (MPCA) has shown nitrate and phosphorus levels elevated above EPA standards for drinking water and aquatic life in some surface and groundwaters, with higher concentrations seen in groundwater, particularly in the past two decades. Results from this work will allow a better understanding of how agricultural land use in the OTRW impacts water chemistry and, subsequently, Manoomin health. This knowledge can be used to inform targeted and effective management strategies in protecting Manoomin and the communities that rely on it.