Science Policy Outreach Task Force at Northwestern University

Water Quality in the Great Lakes Region

SPOTlight: The Great Lakes region is the world's largest freshwater resource and supports the livelihood of those living in the surrounding area. Agricultural practices and climate change threaten water quality in the region. While water consumption is recorded and regulated, the outcomes of water quality and conservation practices are not well-studied.

Why is conserving water quality important in the Great Lakes region?

- The Great Lakes are the world's largest freshwater resource, holding 25% of the total freshwater on Earth [1].
- People living in the region depend on the Lakes for potable water, recreation, agriculture, and industrial processes [2]. The economic prosperity of the region is largely considered an effect of freshwater resources [1].
- The Great Lakes region is also an essential part of 20 tribal lands, shoreline wetlands, and other crucial ecosystems and communities [2].
- While there is currently little threat to the quantity of available freshwater in the Great Lakes region, there is growing support for sustainable development of the region that does not negatively impact water quality [1].

How does climate change impact water quality in the Great Lakes region?

- The energy sector in the Great Lakes region is dependent on fresh water for mining processes and heating/cooling power plants. This water is not recirculated back into the region's natural water cycles [1].
- Warmer water temperature from climate change is expected to make power plant processes less efficient and the growth of nuclear power could place a greater demand on water resources [1, 3].
- Extreme precipitation events that are worsened by climate change can overwhelm sewage systems, leading to the introduction of pollutants and disease into the Great Lakes [4].

How do agricultural practices and agricultural runoff impact water quality in the Great Lakes region?

- Agriculture in the Great Lakes region is dependent on freshwater in the region, and the water that is used in agricultural processes is not returned to the natural hydrological system [1].
- Most water used by farmers in the region is groundwater. As groundwater sources subside, agricultural sectors will move to surface water to meet their needs, depleting resources like Great Lakes water [5].
- Farmland runoff is the greatest threat to water quality in the region. Runoff consists of water that carries excess fertilizer and pesticides, and brings an excessive amount of nutrients into the lakes, causing algal blooms [5].
- Algal blooms introduce nervous system toxins, like cyanotoxins, into the water which kill fish, limit available freshwater, and reduce water quality overall [6]. Current strategies for removing cyanotoxins from drinking water do not always reduce concentrations below the safe level [6, 7].

How do toxins and pollutants in the Great Lakes region impact water quality?

- Some substances, like persistent organic pollutants (POPs), contaminate the Great Lakes despite having been banned [8]. Reproductive, developmental, behavioral, neurologic, endocrine, and immunologic adverse health effects have been linked to POPs [9].
- Microplastics are a rising problem in the Great Lakes region and primarily enter water through runoff from urban sources [10, 11].
- Plastic pollution accumulates in fish, posing a health hazard to consumption [12]. There is also growing evidence of reproductive harm in humans attributable to plastic pollution [13].

What are ongoing management and quality conservation strategies for water in the Great Lakes region?

- Those looking to divert water (over 100,000 gallons per day) from Lake Michigan must register with the State, obtain a permit and report the volumes of withdrawal monthly or annually. The total, annual domestic water use in IL from Lake Michigan has been decreasing [14].
- Control of invasive species that foul beaches, harm fisheries, and clog water infrastructure could improve water quality [15].
- The Great Lakes Basin Compact Act and the Great Lakes-St. Lawrence River Basin Water Resources Compact Act work to preserve and manage water and water use in the Great Lakes region and promote interstate collaboration to balance uses of water in the region [16, 17].
- A lack of understanding of the environmental outcomes of conservation practices has limited the efficacy of conservation investment by rewarding conservation actions rather than conservation outcomes [8].

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