

## **“Global Warming in the Great Lakes: Emerging Issues in Submerged Lands Management”**

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Mr. Boyer focused his presentation on the area of Buffalo, New York, and the issues they are facing with regard to global warming. He hopes to see a network evolve [from this audience] with emphasis on global climate change and submerged lands. His specific interests and focus today:

- How will climate change affect Great Lakes water levels and the lands below them?
- What will altered water levels do to habitats?
- How can management agencies and legal regimes adapt?

As background, the Great Lakes represent a system moving in the other direction – to reduced flows and changing lake levels. Lake Superior, for example, is down a couple of feet and sand bars are forming. Freighters in Lake Ontario must be “light loaded” due to depth constraints.

Why is this happening... because of climate change. New York’s climate is today more like that of the Carolinas. This has significant impacts on the hydrology of the entire GL system, where 99% of the water is “legacy” water, not provided by annual influx.

The projected effects of climate warming on the system are: later freeze up, earlier iceout, warmer water temperatures, reduced ice cover, more evaporation, and more lake-effect precipitation. Most of the lakes have small watersheds, and evaporation has a greater effect. Other impacts mentioned included: longer growing seasons, more transpiration, more droughts, flashier runoff, and increase demands on groundwater.

Pressures to divert water out of the basin will increase, and groundwater will be drawn down even more. Quantitatively, levels may drop by 2 to 3 meters (or 6.5 to 10 feet) this century. As a result, many submerged lands will emerge.

Mr. Boyer then talked about specific areas and anticipated impacts. He cautioned that the accuracy of predictions is greatly debated, and that humans continue to modify these natural systems, which makes such predictions even more problematic. He referenced the St. Clair drain-hole example, where greater flows are now occurring from the upper to the lower lakes.

Northern Lake Michigan and Lake St. Clair will experience lots of shallow areas. Lake Erie (which is the most shallow of the GL) will be particularly affected, especially in the western basin. Here, there are lots of important fisheries habitat, including spawning

reefs and shoals important to fish such as walleye, many forage fish, and sport fish. Serious changes in fish populations and communities will occur.

Important bird areas will be impacted as waters become shallower. Wading, waterfowl, and neo-tropical migrants will face serious declines. Lots of important wetlands are found here, especially along the Ottawa shores. Wooded and emergent vegetation will become exposed. In Lake Superior, for example, a 2-foot decline is already impacting wild rice fields. These fields are used by native peoples for their local economy and used by waterfowl.

Vegetation regimes will shift from submerged to emergent, to shrubby to woody, to upland forests. Will habitats be able to move along with the changing/dropping water line? Many variables will probably affect this, such as: the rate of change, the substrate over which waters are retreating, the contour of the underwater areas (deep grade means losing more habitat quickly, for example). Detailed mapping will help to determine the likely outcomes.

Climate change will add a suite of stressors that will drive GL ecosystems toward an irreversible tipping point. Current changes, such as lost species, toxic/boil pollutants, rampant sprawl, and modified hydrology are greatly stressing these systems already. Their new structure and function “won’t be pretty.”

Social and legal systems will also be stressed by changes in the GL. Will such systems have the capacity and resilience to adapt? For example, infrastructure stresses like the need to dredge deeper in shipping channels and more frequently, to build docks farther offshore, to adapt water intake pipes... they all take money and raise important management questions.

More property disputes will occur (see [www.OhioLakefrontGroup.com](http://www.OhioLakefrontGroup.com)). Is the PTD written to the high or the low water mark? That will change who owns the newly emergent land, and litigation costs will likely skyrocket. In the lower Niagara River, water use disputes between water plants in different jurisdictions illuminate a legal conundrum of many layers of common law rights, statutory rights, federal government interests, and more.