Wisconsin climate change report showcases impacts and solutions for coastal communities

The Wisconsin Initiative on Climate Change Impacts (WICCI) released its latest assessment of climate change in Wisconsin earlier this year with information and tools to make Great Lakes coastal communities more climate resilient. The report shows that warming temperatures and changing precipitation patterns are impacting the state's coastal ecology and communities. The last two decades have been the warmest on record in Wisconsin, and the past decade has been the wettest.

In the report, a focus on climate impacts to Great Lakes ecology shows Great Lakes water level fluctuations and changes to water temperature, lake mixing, and ice cover are impacting Great Lakes water quality and habitats. For example, the increasing frequency of extreme precipitation events and warming waters are impacting the amount and cycling of nutrients and contaminants in the nearshore lake environment, leading to more microbial contamination on beaches and increasing the risk of potentially toxic blue-green algal blooms. A focus on climate impacts to Wisconsin's Great Lakes coastal communities shows that large fluctuations in Great Lakes water levels along with flooding and bluff erosion from extreme storms are impacting the areas along the state's coastlines and causing uncertainty for coastal communities and industries. Wave energy reaching Great Lakes coasts is expected to increase in the future, in part due to anticipated decreases in ice cover extent and duration.



Danger Thin Ice, 2015 Great Lakes Photo Contest natural category, by Edward Deiro.

By Dea Larsen Converse, Communications Director, Wisconsin Initiative on Climate Change Impacts.

Filamentous algal blooms in clear lakes

Unexpected and often unexplained proliferations of filamentous algae are increasingly common on the bottom of clear lakes, as reported in our article in BioScience. Usually, these filamentous algal blooms (FABs) are composed of green algae (chlorophytes), which have a distinctive chartreuse color and form extensive mats growing from the bottom (benthic) habitat of the lake into the water column (see inset, Lake Michigan). Filamentous algae are a normal part of benthic communities in lakes, but these expansive proliferations appear to be an emerging threat to some of the world's most iconic lakes.

We immediately suspect nutrient pollution when faced with algal blooms. But FABs are not common in eutrophic lakes because benthic filamentous algae require a lot of light and do not proliferate when shaded by abundant phytoplankton. FABs occur in water with extremely low nutrient concentrations, but nevertheless, nutrients are sometimes the culprit. In the Laurentian Great Lakes, invasive mussels promote FABs by filtering the water clean of phytoplankton and simultaneously excreting nutrients on the lake bottom. In Lake Baikal, untreated sewage or polluted groundwater percolating through the lake bottom causes massive FABs. The algae often foul beaches (background photo). In order to understand and control FABs, scientists need to start monitoring nutrients in more than just the water column.



Background photo shows algal washup on shore of Lake Baikal, courtesy of Oleg Timoshkin. Inset photo shows fiilemantous algae on the bottom of Lake Michigan, courtesy of Harvey Bootsma.

FABs are not just associated with groundwater pollution. Complex interactions among climate change, lake hydrodynamics, and food webs are likely causing FABs. Reductions in winter ice cover and changes in the intensity of summer storms are changing physical conditions in the nearshore, while warmer temperatures and reductions in insect grazers may be facilitating the rapid growth of filamentous algae. The nearshore habitat supports most of the biodiversity in lakes, and most human interactions with lakes occur along the shoreline. Despite this, littoral habitats are rarely studied. A coordinated effort between scientists and the public is needed to respond to this emerging threat to clear lakes.

By Yvonne Vadeboncoeur, Wright State University.