Selected Findings from

Confronting Climate Change in the Great Lakes Region

Impacts on Our Communities and Ecosystems

Impacts on Water: Our Region's Vital Resource

Photo: Courtesy of Michigan Travel Bureau

Photo: David Saville/FEMA News Photo

ABOVE: Port Calcite, Rogers City, MI. RIGHT: East Grand Forks, MN, 1997.

The Great Lakes basin contains 20 percent of Earth's surface fresh water. A rapidly changing climate will alter water availability and quality, not only in the Great Lakes but also in the region's groundwater and in the hundreds of thousands of smaller lakes, wetlands and streams that dot or flow acrros the area.

Climate Projections

In general, throughout this century, the region's climate is expected to become considerably warmer in both summer and winter. Although average annual precipitation may not change much, projected changes in seasonal precipitation patterns are more distinct: winter and spring precipitation is expected to increase while summer rain could decrease by as much as 50 percent. Yet at the same time, heavy summer downpours are likely to become more frequent with dry periods in between. Soil moisture and stream flow will reflect these changes in rainfall, and lake levels are expected to drop overall. Some of these changes have already been detected in regional climate trends.

People Depend on Water

Countless small communities and major cities such as Chicago, Detroit, and Toronto are situated on the shores of the Great Lakes. Sewage and run-off, especially during heavy downpours, can overwhelm outdated water infrastructure and contaminate streams and lakes. Moreover, the region's economy is large and diversified, and freighters ply the lakes and seaway corridors to the Atlantic Ocean carrying goods and commodities worth billions of dollars. All of these activities rely on water for drinking, irrigation, industrial processes, and shipping. In the process, communities and industries can and do pollute and overdraw both surface and groundwater.

The Changing Character of Our Region

Some of the expected impacts on the water-rich Great Lakes region include:*

- More heavy rainfall and flooding;
- Worsening water quality due to higher water temperatures and heavy run-off that transports pollutants, nutrients, and sediment;
- Lower groundwater recharge rates;
- Less soil moisture in summer, harming crops, forests, and ecosystems;
- Wetland and wildlife habitat losses and reduction of flood-retention and water-purifying functions;
- Drying up of smaller streams during the summer season as a result of earlier ice-out and snow melt and lower summer water levels;
- Changes in fish distribution due to warmer lake and stream water temperatures; increased risk of dead-zones in lakes; and
- Lower lake levels due to higher evaporation and reduced ice cover.

[* To review the level of scientific confidence accorded each of the impacts listed above, see *Confronting Climate Change in the Great Lakes Region* pages 68–69.]

Preparing for Water Supply and Quality Changes

The continued and increasing impact of humans on water will coincide with changes in rainfall, runoff, lake levels, and soil moisture. Water and fisheries managers must increase their flexibility and adaptive capacity to respond to rising temperatures, shifting precipitation patterns, increasing climate variability, and changing water quality and availability. Managers must ensure that:

- Ground and surface water quality and supplies, as well as aquatic habitats and the species living in them, are protected;
- Effective water-conservation strategies are implemented for all users during summer months, and are considered year-round for water-intensive users;
- Sewer and septic systems are upgraded, and non-point source pollution from urban areas, farmland, etc. are reduced;
- Water extractions and diversions are planned with climate change in mind to reduce conflicts within and beyond the region; and
- Heat-trapping gases are reduced as quickly and aggressively as possible to avoid the worst impacts of a changing climate.

Union of Concerned Scientists

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The full report is available from UCS at www.ucsusa.org/greatlakes or call (617) 547-5552.

This fact sheet is based on the findings of *Confronting Climate Change in the Great Lakes Region*, a report published in April 2003 by the Union of Concerned Scientists and the Ecological Society of America. The report was written by 10 regional experts under the leadership of George Kling (University of Michigan).

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THE CASCADING EFFECTS OF CLIMATE CHANGE ON GREAT LAKES WATER RESOURCES

CLIMATE CHANGES IN THE GREAT LAKES REGION DURING THE TWENTY-FIRST CENTURY

Warmer: Average temperatures rise 5-20°F (3-11°C) in summer, 5-12°F (3-7°C) in winter.

Seasonal shifts, overall drier: Little change in annual average, but higher temperatures = more evaporation = drier, especially in summer and fall.

More extremes: More extreme downpours, dramatic increases in extreme-heat days, more droughts.

Growing season: Lengthening by several weeks, but varying across region.

Lake levels drop: More evaporation and declining ice cover likely to lower lake levels.

MORE WATER AT THE WRONG TIME

IMPLICATIONS

More run-off in winter and spring from rain-on-snow events and in summer from intense downpours causes more flooding and erosion.

Extreme run-off could increase heavy metal pollution, sedimentation, high nutrient levels, and toxic organisms.

Increased spring flooding delays planting; intense summer downpours and more run-off leads to soil erosion and fertility losses.

Heavy storms could increase shore and bank erosion; lower lake levels and less ice cover could decrease bluff failures and ice damage.

More moisture and warmer winter temperatures boost agricultural, forest, and other pests' survival and reproduction.

POSSIBLE SOCIETAL IMPACTS

Flooding and shoreline erosion damage private property and public infrastructure, affecting the construction, real estate, and insurance industries.

Beach closures due to public health hazards from toxic algal blooms and other organisms would affect the important recreation and tourism industries.

Soil fertility losses, combined with an increase in pests, create higher costs and losses for the agriculture and forestry industries.

Additional resources would be required to maintain, repair, and upgrade flood response infrastructure, manage run-off, and recover from flood damages.

Increased risk of vector-borne (e.g., ticks, mosquitoes) and water-borne (e.g., *Cryptosporidium*) diseases would require greater education, surveillance, prevention, and response from the public health system.

LESS WATER WHEN IT'S NEEDED

IMPLICATIONS

Higher summer temperatures increase evaporation, making drought conditions more frequent and likely more severe.

Decreased summer stream flow and warmer stream and lake waters affect fish and other aquatic organisms.

Lake levels likely to drop as evaporation increases and ice cover shortens.

Intense summer downpours may not alleviate dry conditions but can increase pollution in lakes; algal growth leading to oxygen depletion may increase.

Decreased soil moisture in summer due to more evaporation and less rainfall penetration affects plant growth and soil processes.

Less rain infiltration, decreased summer stream flow, and lower lake levels reduce groundwater recharge.

POSSIBLE SOCIETAL IMPACTS

Crops currently not irrigated may need it; those already irrigated may need more. Long-lived perennials such as fruit trees are especially vulnerable to greater variability in moisture and temperature.

Greater demand for water and summer shortages increase water extraction, lower the water table, and drive up costs; more conflicts over water allocation likely.

Warmer water, pollution, "dead zones," and changes in aquatic food webs, species, and productivity would affect recreational and commercial fisheries.

Threat of wildfires may increase and forest composition may change, affecting bird and animal species, recreation, and the timber industry.

Lower lake levels would affect recreational boating, hydropower generation, and shipping; require more dredging; and force changes to shore facilities and water infrastructure.