The Great Lakes Policy Report

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The Great Lakes Policy Report is a quarterly news report published by the Little Traverse Bay Bands of Odawa Indians Natural Resource Department's Environmental Services Program. The report features Great Lakes policy updates and relevant initiatives, projects, and issues.

The report is meant to be an educational document, and does not express an opinion on the subjects discussed. Stories and information cited in this report are taken from a variety of sources including news articles, non-governmental reports, interviews, and government documents.

A Summary of Climate Impacts on Our Water Resources

Lake Michigan's Little Traverse Bay. Photo Credit: Wikipedia C .C.

Earth's climate has begun to change due to human activities. It is not merely a future problem, trends in weather patterns clearly show many changes have been occurring over the last several decades. Change in the climate can be seen at both the global and local level, including our own region. The recorded increase in temperature over the last 60 years is one example (see Table 1). Climate change will continue to cause changes to many natural and human-made processes, including precipitation patterns, seasonal changes, and species migration, to agriculture and forestry production. Given the wide ranging consequences of climate change, here we will focus in on arguably our most precious natural resource: water. Looking at how climate change has and will alter our water cycle in Northern Michigan, can give us some insight on how to prepare in the future.

Table 1. Changes in Mean Temperature (°F) from 1951-1980 to 1981-2010

Annual	1.3
Winter, December-February	2.4
Spring, March-May	1.6
Summer, June-August	0.9
Fall, September-November	0.4

*Table modified from GLISA factsheet

The northwestern tip of the lower peninsula of Michigan is principally influenced and regulated by Lake Michigan and Grand Traverse Bay when it comes to our local climate. The area's lake effect precipitation is a natural process that will continue and likely increase in intensity in the coming decades. But much of the other hydrologic processes for the area have or will experience change.

Since 1900, annual precipitation (rain and snow) has increased by 10.8% in the U.S. Great Lakes Region, and is expected to continue to increase. Precipitation will increase during the autumn, winter, and spring seasons likely in the form of rain, but may remain close to historical average or decrease during the summer. Not only are we seeing an annual increase in precipitation, our precipitation is coming from more intense severe storms. Precipitation from the heaviest 1% of storms has increased by 37% in the Midwest from 1958 through 2012. Projections show this trend continuing over the next several decades.

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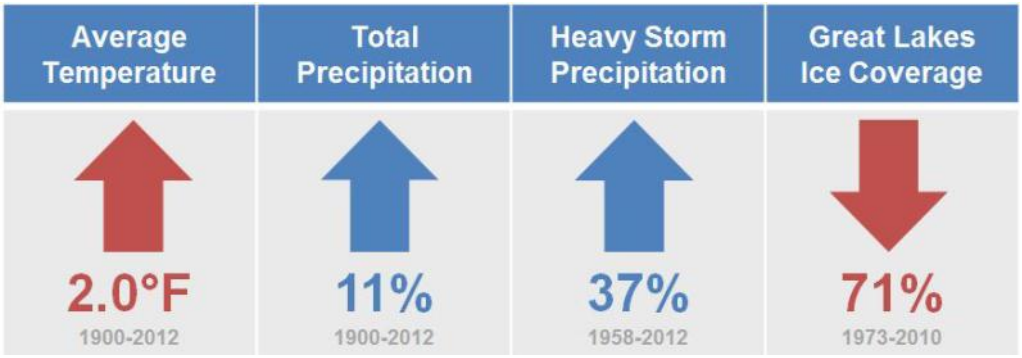

Graphic illustrating selected trends in the region's environmental conditions. Modified from GLISA

As precipitation increases in the winter months, the length and amount of snow cover is decreasing. From 1975 to 2004, annual snow depth has decreased by 2 inches (5.1 cm) and the annual days with snow cover on land has decreased by 15 days. Reduced snow fall and increased temperatures will continue to cause decreases in ice cover on the Great Lakes. "From 1973 to 2010, annual average ice coverage on the Great Lakes declined by 71%. Reduced lake ice coverage will result in more exposed water and more opportunity for lake-effect precipitation" (GLISA). Projections show Lake Superior with little ice cover by mid-century in a typical year.

Great Lakes water levels have been below the long-term average for over 20 years. Lake levels are certainly one of the most difficult parts of the region's water resources to project into the future. "Most models project continued, long-term declines in lake levels, shorter-term variations will remain large, and periods of high lake levels are probable" (GLISA). But there are other factors that influence Great Lakes water levels besides climate, including lake regulations from dams, water diversions, and geologic land movement. One thing is certain lake levels have never been or will be constant over time; water levels will continue to fluctuate.

Although the annual increase in precipitation is expected to continue, we will likely experience drier conditions overall, especially in the summer months. Increasing air temperatures and evaporation rates will lead to more summer droughts.

Bear River at Petoskey. Photo credit: Wikipedia

Increased drought conditions could potentially have huge impacts on groundwater. Groundwater recharge rates and consequently available groundwater withdrawal rates may be reduced for residential wells in the area. Groundwater is an area of study with little research to date. Research is currently ongoing and should produce some needed information soon.

With air temperature increasing, surface water will also become warmer. Slow moving and shallow rivers and lakes will experience change first and at a more rapid rate. The precise temperature increase will also depend on land cover, tree shading, and groundwater temperatures.

With all the changes occurring as a result of climate change, there are several impacts that will likely effect residents of Northern Michigan.

- Frequent droughts may lead to reductions in soil moisture, surface waters, and groundwater supply.
- More severe storms may cause damage to local infrastructure leading to negative economic impacts.
- Severe storms and flooding could also lead to water quality impairments from increased soil erosion, runoff, sewage overflows, and potentially higher home insurance costs
- Winter tourism and recreation will likely decrease because of reduced snow cover and a shorter season.
- Coldwater fish species will decline, while warmwater species populations increase.

Adapting to these changes will require commitment and resources. Water infrastructure may need to be updated, local economies will need to be able to adapt to new opportunities and loss of historical revenue sources. Natural resource managers will need to use adaptive management techniques for local plants and animals. These changes will also require us to adjust our expectations of what our native environment is. Changes in the water cycle will result in visible changes to our environment and may not be the environment we are used to.

For more information on this topic, visit the Great Lakes Integrated Sciences and Assessments' website: http://glisa.umich.edu/.

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