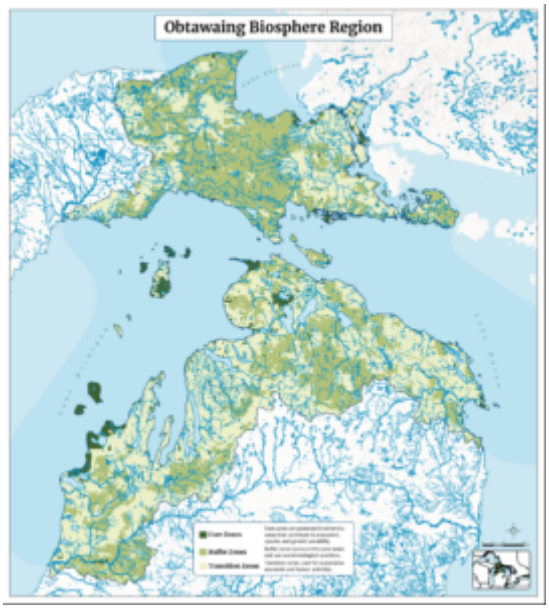
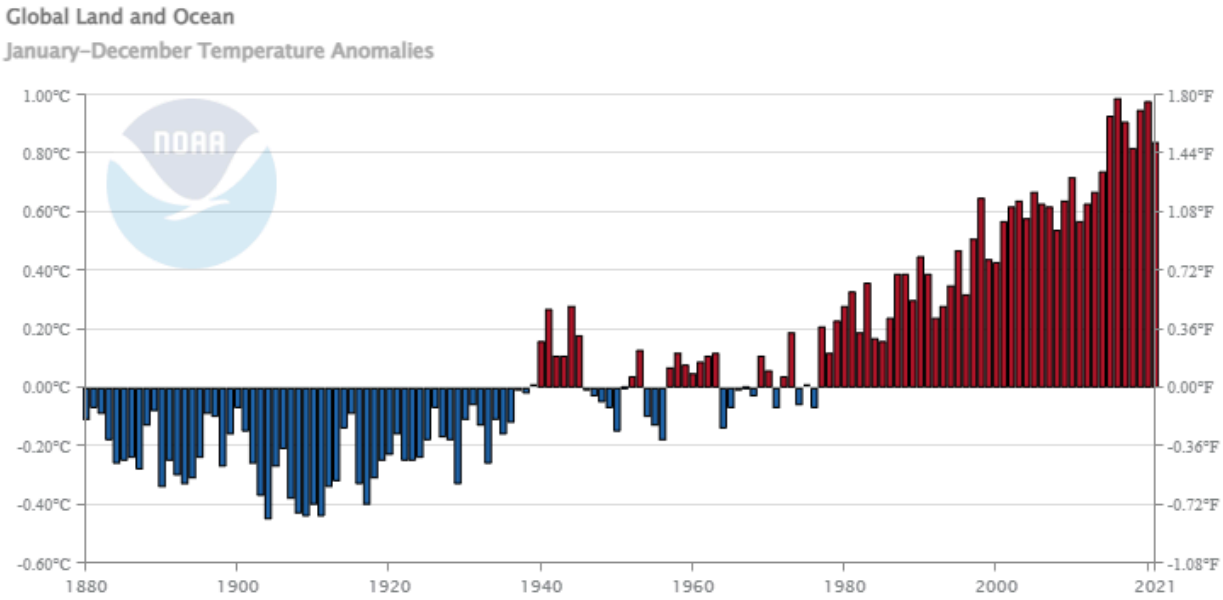
Obtawaing and Climate Change



Climate Change

Over the last decade, the consequences of human-driven climate change are becoming apparent with increasing frequency. Devastating earthquakes, storms, and other natural disasters have claimed countless human lives and created a domino effect of catastrophe. Over the last century, climate experts have recorded a global, long-term shift in weather conditions exponentially greater than a normal period of climate change driven by natural processes2. The current change we are experiencing is unprecedented in scale and intensity in all of Earth's history. Experts have proven this point using multiple techniques, such as ice core analysis in Antarctica, mountain-top Carbon Dioxide measurements on Mauna Loa, and measurements of the atmosphere from around the world, providing a well-rounded look of Earth's atmosphere over time and a projection for the future 2.

Climate research has also found an explanation for the unprecedented change. The world report conducted by the impartial and expert International Panel on Climate Change (IPCC) has reported that humans are fully responsible for global warming2. More than that, some of the shifting climate systems will be irreversible for centuries, and we will observe greater storms and natural disasters in the coming years3. To this point, the ten warmest years since the record of atmospheric temperature , which began in 1880, have all occurred since 2010, and July 4, 2023 was the warmest day on record4. This points to a snowballing set of consequences of a debt we have been incurring since the industrial revolution.



Annual 2021 Global Climate Report | National Centers for Environmental Information (NCEI) (noaa.gov)

Local Changes

Climate change does not simply cause major catastrophes halfway across the world from us; it has local impacts and consequences. Many who live in Michigan will recall the nights of storms and non-stop lightning seen in southern Michigan in August 20235. NOAA found the storms noteworthy as well, reporting, “On August 24, 2023, severe thunderstorms formed over western Lower Michigan during the evening hours in the midst of an extremely unstable environment that also featured dew point readings (a measure of atmospheric moisture) around 80F, some of the highest we have seen over the last 60 years. These thunderstorms spawned two tornadoes in western Lower Michigan.” Both of these tornadoes were classified as moderate to significant on NOAA’s tornado scale6. These intense storms swept through lower Michigan, leaving behind intense damage, leaving thousands without power, and five dead5. Though these tornadoes were particularly catastrophic, it is not a one off event. Storms in the 99th percentile have increased by 42% from 1958-20167. Events like these will only become more frequent and powerful in the coming decades.

Ecosystems

Not all effects of climate change are as sensational as hurricanes and tornadoes; much of it involves subtle but powerful shifts in environmental conditions. One of the most apparent and direct consequences of the accumulation of greenhouse gasses in the atmosphere is increased air temperature. Northern Michigan has already warmed more than 1.5 degrees Fahrenheit since 1950, making it one of the fastest warming regions in the country7. While this may not seem significant to us, as we can tolerate a vast range of temperatures, the ecosystems we depend on are much more sensitive to these changes. Additionally, this is not the extent of the rise, with projections indicating air

temperatures could increase by 4 to 10 degrees Fahrenheit by 2100, with heightened warming during winter7.

Many long-time residents of Michigan have observed milder winters over the last ten years, a trend expected to continue with more rain and less frozen ground. In towns like Petoskey, long-standing winter traditions are evolving as milder winters become the norm8. The duration of frozen ground has already shortened by 2-3 weeks in the past 70 years and is expected to reduce even further in the coming years7. In the future, an expected 30 to 50 fewer days of frozen ground sufficient for winter management are projected by 21007.

“A tree sits damaged after severe weather in Kent County, Michigan on Thursday, Aug. 24, 2023. A strong storm powered by winds up to 75 mph has downed trees and power

lines across Michigan, torn roofs off buildings and left hundreds of thousands of customers without power. Credit: Joel Bissell/Kalamazoo Gazette via AP”5

Snow Impacts

Warmer air delivers more precipitation as rain instead of snow, particularly impacting northern Michigan winters. Alongside increased winter rain, there is also more snowmelt between snowfall events, and the snowpack is not as deep or consistent7. Due to these changes, winter snowpack is projected to be reduced by 30-80% by 21007. Even coastal snowfall will be impacted; while lake-effect snowfall may increase in the short term, greater temperatures will likely convert it to rain in the near future7. These changing conditions in ice cover are at least partially responsible for our increasingly cloudy skies across Michigan9. Apart from future generations missing the joy of snow angels, snowmen, and general winter activities, the shifting patterns of precipitation and reduced winters will significantly impact winter ecosystems across Michigan.

Soil Moisture

The increase in temperature, precipitation, and milder winters will have direct impacts on soil moisture, setting off a chain reaction of environmental consequences7. More precipitation, particularly in spring and winter with reduced amounts in summer, will alter soil moisture patterns, affecting the types of plants that can thrive. Cold-season soil is projected to increase by 1.8 to 5.4 degrees Fahrenheit by 21007. The diminishing snow cover and frozen soil will disrupt management and ecosystem processes like decomposition and nutrient cycling, with far-reaching effects on forests and agriculture7. Seasonal variations in soil moisture, coupled with altered precipitation,

may influence the magnitude and duration of floods7. Cherry farmers in particular are experiencing the negative effects of erratic weather and changing soil moisture patterns 15. The escalating flood risks pose threats to ecosystems, wildlife, property, infrastructure, and human health and safety. The likelihood of flooding rises, especially during heavy precipitation events when soils are already saturated.

Agriculture

The reduction in frozen ground, increased precipitation, and warmer temperatures will extend the growing season, not only impacting agriculture, but also prompting changes in the forest and its species composition7. By 2100, the growing season is anticipated to lengthen by 30 to 70 days7. Warming temperatures are expected to accelerate nutrient cycling and boost photosynthetic rates for most trees7. Despite the obvious increase and growth and productivity, the prolonged growing season brings unique challenges. With the recent trend of earlier springs and later falls, the life cycles of organisms such as birds and plants, which rely on temperature cues for development, are shifting, with potentially catastrophic consequences. Additionally, the longer growing season associated with warmer temperatures will lead to increased water loss in the soil, resulting in less soil water availability later in the growing season and drier soil conditions7. Warmer air, capable of holding more water, increases the moisture demand on plants, creating greater stress on plants7.

Identifying 13 Common Native Michigan Trees Showing Autumn Colors – Owlcation

Forest Ecosystems

Climate change will favor certain forest types, while others will face disadvantages. Boreal species, under greater stress from increased temperatures, will experience reduced suitable habitat and biomass7. They will struggle to capitalize on warm temperatures and longer growing seasons compared to temperate species. Southern or temperate species will be favored as they encounter more suitable habitat and increased biomass7. The longer growing season and warmer temperatures will enhance productivity for these species, including natives like American Basswood, Black Cherry, and White Oak. Beyond native temperate and boreal species, these

changes will create suitable habitat for species not currently found in Michigan, such as Black Hickory, Hackberry, and Sycamore trees7. Moreover, there will be lower forest productivity in localized areas due to disturbances such as fires, wind events, pests, and droughts7.

Invasive Species, Pests, and Pathogens

The looming threat of climate change brings with it the proliferation and increased damage of invasive species, pests, and pathogens by the year 21007. Elevated temperatures and heightened moisture stress will intensify the impact of these environmental threats. Warmer temperatures and longer growing seasons create ideal conditions for pests to produce multiple generations annually, extending their reach further north7. This expansion poses a grave danger to forests that were previously shielded by harsh winters and reduced snowpack. The altered climate, combined with increased stress from invasive species, pests, and pathogens, creates a lethal combination for many ecosystems7.

Aquatic Ecosystems and Great Lakes Water Levels

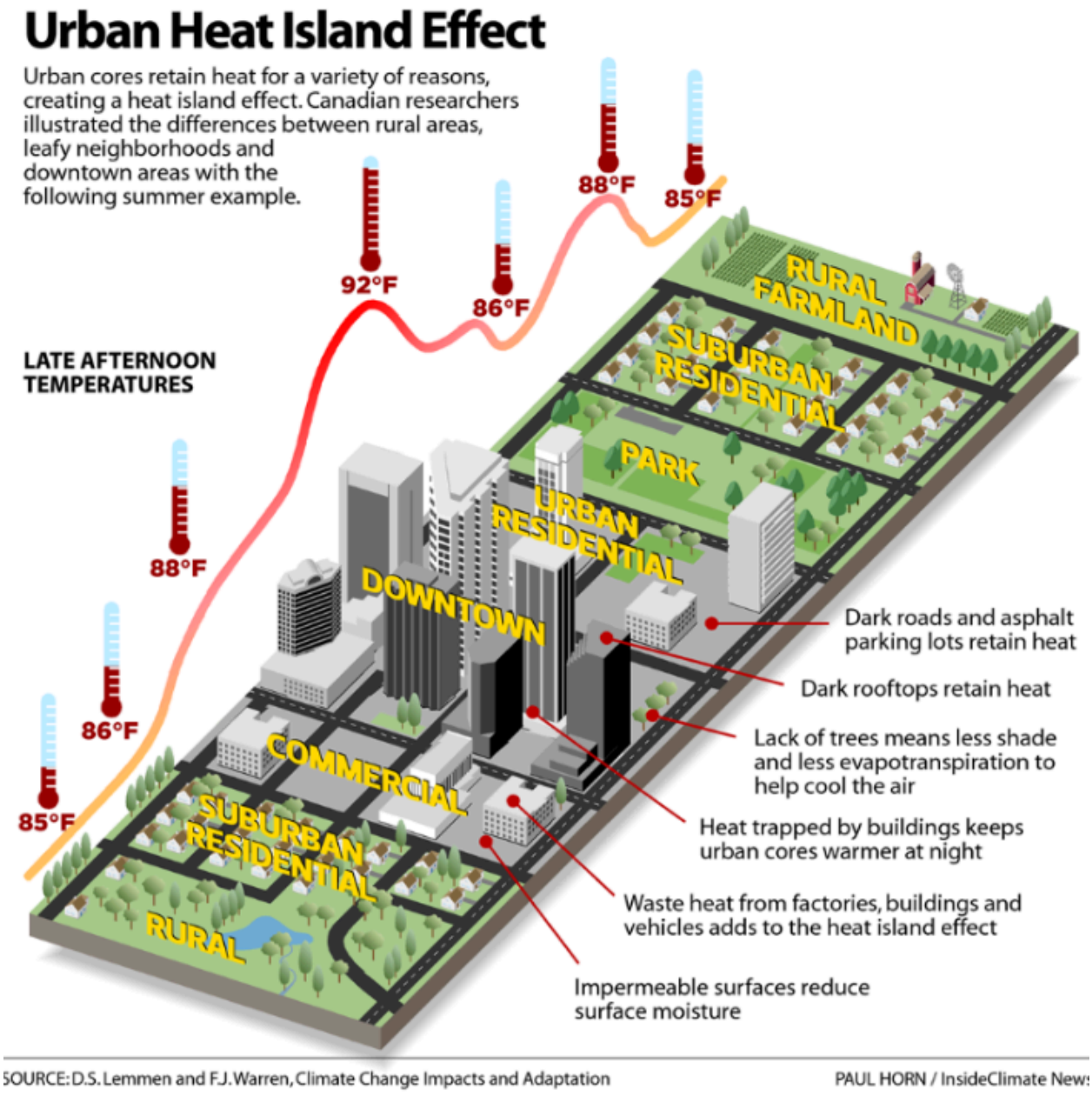
The repercussions of climate change extend beyond land ecosystems to aquatic environments, which can be even more sensitive to slight changes in temperature and species composition than forests. Projections indicate a rise in surface water temperatures in the coming years, with summer temperatures expected to increase from 1.4 to 7.2 degrees Fahrenheit by 21007. Prolonged warming of surface waters will lead to compromised water chemistry, elevated levels of nutrient enrichment, and oxygen-depleted conditions7. These changes will severely degrade aquatic ecosystems.

In recent decades, Great Lakes water levels have experienced abnormal oscillations, ranging from record highs to record lows7. This unpredictability is attributed to erratic precipitation patterns induced by climate change7. The consequential “Rain on Snow” effect, resulting from warmer temperatures, contributes to an increase in nutrients in lakes3. These fluctuations in lake levels not only pose environmental challenges but also impact shipping canals, thereby exerting a significant influence on Michigan’s import and export economy10.

Impact on Inland Lakes

The ongoing warming of inland lakes is anticipated to disrupt the seasonal mixing of stratified lakes and diminish available dissolved oxygen. The average warming rate is estimated at 0.34 degrees Fahrenheit per decade in inland lakes, with a projected increase of 2.9 to 3.02 degrees Fahrenheit by the end of the century7. This warming trend will accentuate stratification, leading to a reduction in available dissolved oxygen for both plants and aquatic organisms. Such warming waters pose a significant threat to cold-water habitats and aquatic communities, resulting in reduced growth and heightened aquatic mortality, especially at younger life stages7. As aquatic species increase respiration to cope with warmer temperatures, there will be even less dissolved oxygen available. Coldwater fisheries, vital components of the Michigan coastal economy, are particularly susceptible to these changes7.

Human Impacts



Beyond the environmental consequences of climate change, there will be substantial effects on human life. The surge in summer temperatures is anticipated to escalate heat-related illnesses and fatalities7. The urban heat island effect, prevalent in high density areas like Detroit and Alpena, exacerbates the impact of rising temperatures11.

Urban areas with over one million inhabitants can be 2 to 1 degrees Fahrenheit warmer than their rural surroundings due to heat-absorbing infrastructure and waste heat from manufacturing and automobiles11.

Michigan may face an elevated summer drought threat, jeopardizing water availability and recreational water use for many7. In areas not affected by droughts, the heightened rates of precipitation induced by climate change directly contribute to increased flooding7. Drought conditions are particularly pronounced in the winter, with an article from 2022 reporting that 60% of Michigan was “abnormally dry”, a designation that proceeds drought status12. Nearly 340,000 people reside in Michigan’s flood-prone areas, exposing them to potential property damage and physical peril13. The proliferation of impervious cover in urban areas, such as pavement or compacted land preventing rainwater absorption, significantly amplifies the size and frequency of localized flooding7. Prolonged flooding can stress trees to the point of mortality and may lead to secondary attacks by pests and diseases7.

Atmospheric Impacts

Air pollution from increased aerosols and particulates will also be exacerbated by climate change, harming vulnerable populations such as children, the elderly, and those with respiratory illnesses. Increased temperatures will also escalate the spread of water and food-borne diseases, like ticks and Lyme disease in Michigan14.

Climate conditions are poised to heighten the risk of fires by the end of the century. The risk will surge by 20 to 30% due to increased summer temperatures, particularly in boreal, temperate coniferous, and temperate broadleaf forests7. The augmented fuel

loads from pest-induced mortality and blowdown events will further elevate the fire risk7. Additionally, heightened drought stress will contribute to increased fire risks, with a projected 20 to 50% increase in droughts by the century's end7. The intensified fires, spurred by warmer and drier summers, will lead to increased tree mortality due to stress. Climate change will usher in more frequent weather conditions that foster large forest fires, posing threats to ecosystems, human health, and property7.

Conclusion

Climate change is a real and present concern for the communities and nature of Obtawaing Biosphere Region. People and wildlife will be directly and indirectly impacted by the changes in seasonal temperature, precipitation, and extreme weather events. We cannot ignore this danger. We as the public must vote for representatives that are as concerned about this cause as we are and will take tangible measures to lower the regions contribution to greenhouse emissions as well as create Climate Change Adaptation plans for our cities to help prepare for the consequences of climate change. Also, landowners must manage their land responsibly and learn what they can do to join the effort. This may include planting vegetation on shorelines to reduce erosion, or planting more native trees to sequester carbon and restore native communities. To learn what you can do for Obtawaing, email us at Obtawaing@admin.org

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