



Climate Resiliency Plan

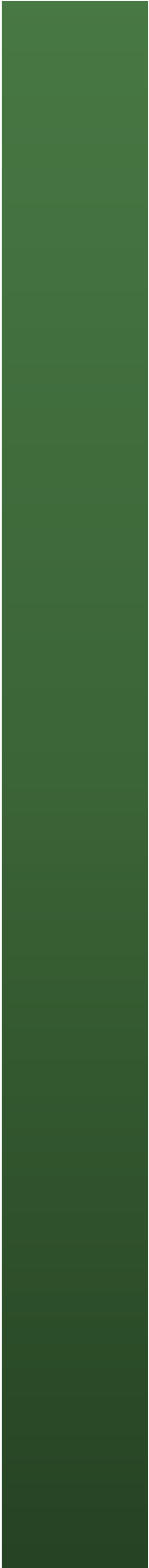
for Grant Park
Milwaukee County Parks

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Prepared By

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1. Executive Summary

This plan provides a high-level overview of environmental risks, impacts, and potential resiliency solutions for Grant Park. It is important to note that a sizable portion of the Plan's content is based on climate projections and data from historic events in the area. Although it is important to consider strategies to abate emissions that drive climate change, this Plan focuses on anticipating and adapting to the changing climate. Milwaukee County Parks Department strives to align with county, state, and regional goals and plans. As Milwaukee County undergoes various changes, it is important to continue to build partnerships, work with the community, and collaborate with other entities as the County has done with the Milwaukee Metropolitan Sewerage District (MMSD), Wisconsin Department of Natural Resources (WDNR), and City of Milwaukee, to date.

Climate change is not an isolated concern but will be impacting communities, parks, and cities across the United States (US) and around the globe. As resilience plans become more common, there will be an increase in opportunities for innovation and collaboration when it comes to implementing risk reduction strategies.

Recently, Milwaukee has been impacted by more intense and more frequent weather events raising concerns about resiliency. In an effort to align with other Milwaukee County Departments as well as Milwaukee County municipalities, this high-level plan discusses risks and potential solutions that vary in efficacy, cost, and type. This Plan covers various climate-related risks including:

- Severe heat
- Severe precipitation and flooding
- Ice coverage
- Drought
- Coastal and bluff erosion
- Forests.

Each hazard is unique and will require its own risk management plan.

There are many associated costs with the changing climate including resilience strategies and damage clean up. Fortunately, there are multiple funding opportunities available ranging from local, state, federal,



FIGURE 1: Manmade trails and features are one of the pleasures of Grant Park.

and even private sources. Winning resilience grants will support the Park in various ways, some of which may be planning and design related.

Many of the climate hazards discussed below are based on historic events and future projections from various climate change data sources. Readers will gain an understanding of the most impactful risks and resilience solutions for Grant Park considering the local environment, community, and facilities.

2. Introduction

The purpose of this Resiliency Plan is to provide an overview of potential climate impacts and recommended solutions for Grant Park in South Milwaukee, WI. A substantial amount of the information in this plan can be applied to other parks in Milwaukee County and Wisconsin. There is some analysis specific to Grant Park (e.g., bluff erosion), but much of the available data reflects regional history, trends, and projections. The Resiliency Plan supports Milwaukee County Parks' mission to "steward a thriving park system that positively impacts every Milwaukee County Park visitor," by increasing overall resilience to ensure that Grant Park will continue to have a positive impact on the community and visitors now and into the future.



FIGURE 2: Residents past and future will see every changing conditions at Big Bay County Park, Whitefish Bay.

Anthropogenic (human) forced climate change is impacting ecosystems, communities, infrastructure, and weather patterns globally.¹ As climate change continues to manifest, it is critical to adapt and prepare for potential hazards. Recently, many cities, counties, and parks across the U.S. have been developing Climate Action and Resiliency Plans with the intent to mitigate potential damages to communities and minimize the time it takes to bounce back after an extreme weather event.

¹ What will climate feel like in 60 years? University of Maryland Center for Environmental Science.
<https://fitzlab.shinyapps.io/cityapp/>

The County is aligning with the Paris Agreement² in an effort to limit global temperature increasing 1.5 degrees Celsius (2.5 degrees Fahrenheit). Historically, the City of Milwaukee has been a leader in environmental preservation and consistently publishes environmental reports including, the City of Milwaukee Green Infrastructure Plan, the City of Milwaukee 2018 Inventory of Community Greenhouse Gas Emissions, and the Climate Action 2050 Plan is currently in development to highlight a few examples. Milwaukee has published three goals from the Climate Action 2050 Plan:

1. “Achieve ‘carbon neutrality’, or zero net carbon emissions, in county operations no later than 2050.
2. Improve the resiliency of county operations and the community to climate change.
3. Align Milwaukee County’s climate initiatives with its vision to become the healthiest county in Wisconsin by achieving racial equity”³.

Over the last few decades Wisconsin has been increasingly impacted by the changing climate. The weather-related changes range from warmer temperatures, increasing precipitation, a decrease in ice cover on the Great Lakes, and changing migration patterns. Between 2007 and 2017 Wisconsin’s temperature rose approximately two degrees Fahrenheit⁴, and climate models project for this trend to continue. Warmer temperatures have significant impacts on the local ecology, human health, and larger weather patterns. For example, in 1995, an historic heatwave led to 70 deaths and is indirectly linked to an additional 70 fatalities⁵. There has also been a 63% decrease in ice cover on the Great Lakes since 1970, which is attributed to an overall warmer climate⁶. Increasing and changing precipitation patterns is impacting rates of bluff erosion, flood risks, and infrastructure resilience.

The various climate hazards and potential mitigation strategies are discussed in further detail below. Adapting to environmental changes is critical to improve resilience and maintain Grant Park as a cornerstone of Milwaukee County. The climate-related risks discussed in this Plan vary in scope, likelihood, intensity, and potential impacts.



FIGURE 3: February 2024 had temperatures above 50 degrees in Grant Park.

² United Nations Climate Change, The Paris Agreement: <https://unfccc.int/process-and-meetings/the-paris-agreement>

³ Milwaukee County Climate Action 2050 Plan: <https://county.milwaukee.gov/EN/Administrative-Services/Facilities-Management/Sustainability/Climate-Plan#:~:text=The%20Climate%20Action%202050%20Plan,the%20community%20to%20climate%20change>

⁴ EPA: What Climate Change Means for Wisconsin, August 2016, EPA 430-F-16-051: <https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-wi.pdf>

⁵ Milwaukee Journal Sentinel: <https://www.jsonline.com/story/life/home-garden/2022/07/21/severe-weather-affects-milwaukee-wisconsin-like-tornadoes-floods-heat/7460527001/>

⁶ EPA: What Climate Change Means for Wisconsin, August 2016, EPA 430-F-16-051: <https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-wi.pdf>

3. Trends in Plans in the U.S.

Many parks and agencies are developing resilience plans that integrate the community needs with climate-related environmental hazards and mitigation strategies. A common theme in many of the plans is to increase equity and accessibility for all community members by becoming more resilient. The changing climate can have negative effects on human health including (but not limited to) heat-related fatalities and respiratory illnesses from poor air quality to mental health issues from climate degradation. Many parks departments and organizations are trying to minimize the negative impacts that a changing climate can have on local community members by changing forest management practices and taking care of critical assets. While focusing on environmental benefits, parks departments and organizations are also striving to protect and preserve historic and culturally valuable buildings.

Today, there is an increase in determining specific parks to invest in based on demographics and equity. For example, supporting parks that are in historically low-income or disadvantaged areas is becoming a priority for many cities. The growing focus on equity strives to ensure that all parks, regardless of the neighborhood, have similar amenities and infrastructure.



FIGURE 4: Grant Park Golf Course still uses the historic 1892 farmhouse for its clubhouse.

In Denver, Colorado the Denver Park Trust has set up a Community Grant Program that focuses on improving parks in “historically under-resourced areas of the city”.⁷ The program pairs key equity indicators including race, prevalence of obesity, income level, and age with traditional planning framework elements like access, density, and capital investment history to map priority areas for investment.

In the same way, Milwaukee County Parks has created a Parks Equity Index (2020) based on the Center for Disease Control (CDC) Social Vulnerability Index (SVI). This index, updated and reviewed annually, looks at socioeconomic status, household characteristics, racial and minority status, and housing type and transportation to determine on overall vulnerability score. Paired with other social and health indicators (tree canopy, crime, etc.), an Equity Index Score is assigned, and priority improvements can be determined.⁸

Although many diversity, equity, and inclusion efforts are happening on local levels, there is also a push at the federal level. In early 2024 the Department of Interior published its 2023 Equity Action Plan.⁹ This plan identifies five key areas:

1. Equitable Access to Public Programs
2. Trust in Law Enforcement
3. Equity in Contracting
4. Access to Public Lands
5. Environmental Justice

Generally, park resilience plans begin by providing context of existing and noteworthy weather conditions. The plans then discuss potential impacts and mitigation strategies. Most of the plans reviewed include a long-term vision and monitoring plan. Resilience Plans often identify funding sources to support implementing the recommendations. It is important to note that each plan is unique due to location, vulnerabilities, scope, budget, and user activity.

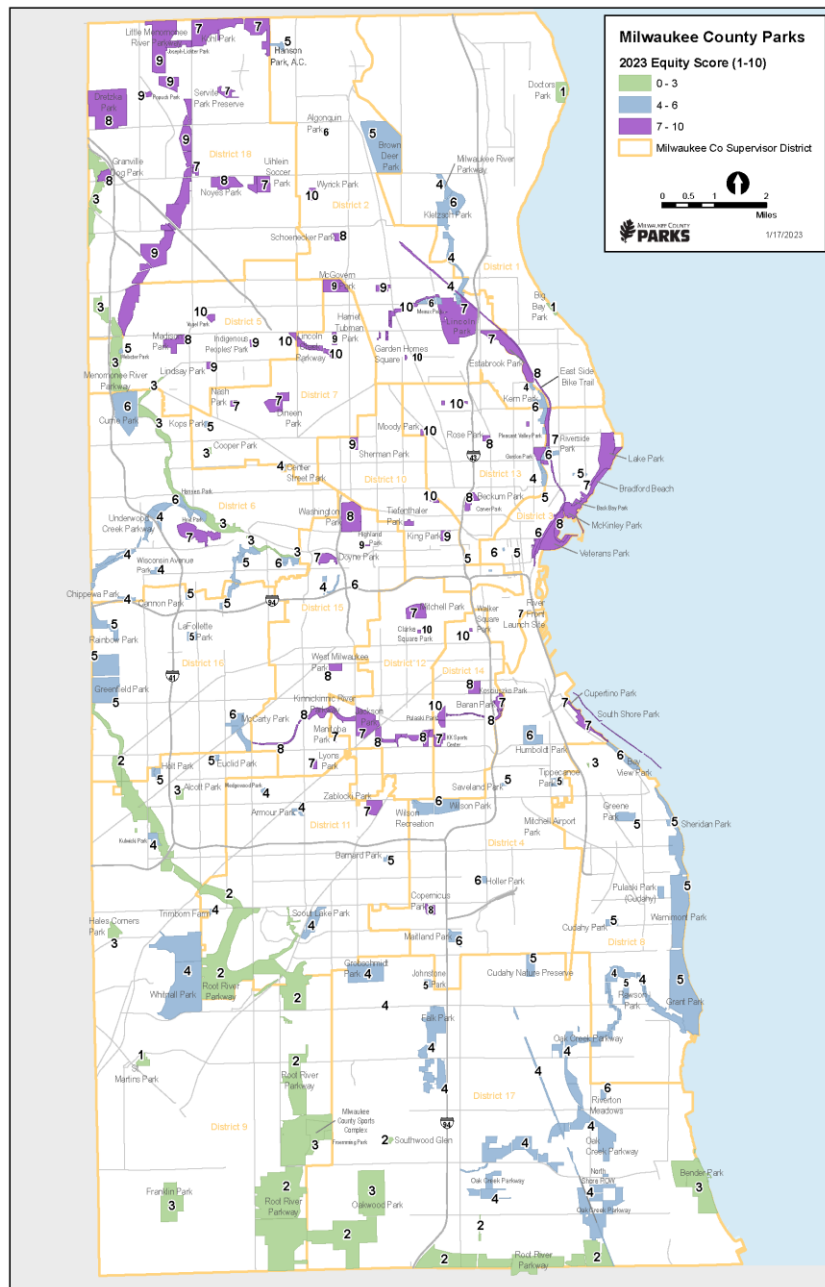


FIGURE 5: Equity Index Score Map, 2023. Milwaukee County parks.

⁷ Denver Park Trust. <https://denverparktrust.org/about/our-approach/>

⁸ Milwaukee County Legistar. <https://milwaukeecounty.legistar.com/LegislationDetail.aspx?ID=6048721&GUID=CB36E213-50E4-435B-8E7F-6951A1EFA783&Options=ID%7CText%7C&Search=equity>

⁹ Interior Department Unveils Equity Action Plan, Outlines Continues Work to Advance Justice and Equity. U.S. Department of the Interior. February 14, 2024. <https://www.doi.gov/pressreleases/interior-department-unveils-equity-action-plan-outlines-continued-work-advance>

4. Local Partnership Opportunities

Reviewing regional plans was a critical phase in developing the Grant Park Resilience Plan. In 2015 the Wisconsin Coastal Resilience Organization was founded and has led many projects and resilience assessments along the Wisconsin coast. The Wisconsin Initiative on Climate Change Impacts and the Milwaukee Environmental Collaboration Office are also working towards increasing overall resiliency and developing accessible strategies to mitigate impacts and recovery time following damaging weather events. There are many opportunities to align and collaborate with existing local and regional resilience and environmental offices. Climate change is not isolated to one specific location but is more regional in scope. Communicating and collaborating with local and regional organizations will support the Parks Department in developing robust resilience strategies. It is important to engage with local entities to learn about resilience strategies that have been successful in the area, those that have not, and ways to work together to reduce environmental, climate-related risks.



One organization that stands out is the *Great Lakes Commission*. In 2022 they published their *Action Plan for a Resilient Great Lakes Basin*. The plan discusses similar concerns regarding changes in climate and natural resources in the region and the potential impacts that they will have on the economy, tourism, transportation, and other industries. The Action Plan stresses the need for collaboration to encourage collective action and alignment and as a channel to share experiences. The Parks Department should engage with organizations of this time to gain and share knowledge and collaborate to build a more resilient future.



FIGURE 6: Trail entrance within Grant Park.

5. Grant Park Climate Analysis

This section presents an analysis of climate-risks identified by the Milwaukee County Parks Department. Multiple factors are discussed including the likelihood, scope, intensity, impacts, and recommendations of each climate related risk.

A. Severe Heat

Rising Temperatures

Climate models and historic events project more frequent and hotter temperatures in the region. Various models indicate that in approximately 70 years there will be 5-10 more days with temperatures exceeding the current average of 95 degrees Fahrenheit¹⁰. It is no longer a question of if there will be hotter days, but a matter of when, how hot, and how often will Milwaukee see these changes. The region was impacted by a significant heat wave in 1995 which led to 70 fatalities as a direct result, and 70 associated fatalities. Additionally, Milwaukee experienced another significant heat wave in 2012. July 1st to 7th were among the hottest days that the city had experienced. At the time, two maximum temperature records were broken. At 103 degrees on July 5th, 2012, and 102 degrees on July 4th, 2012, they were the 3rd and 6th hottest days on record in Milwaukee.¹¹ Thankfully, unlike the 1995 heat wave, there were no fatalities directly related to the heat.

Historically, the region has approximately seven days per year that exceed 90.7 degrees Fahrenheit¹². It is anticipated that by 2050 this will increase to an average of 30 days annually¹³. Records show that the



FIGURE 7: Events such as the Grant Park Race can become unsafe in extreme temperatures.

¹⁰ EPA: What Climate Change Means for Wisconsin, August 2016, EPA 430-F-16-051:

<https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-wi.pdf>

¹¹ National Weather Service. July 1-7, 2012 Wisconsin Heat Wave. July 2012. <https://www.weather.gov/mkx/070112-WisconsinHeatWave#:~:text=Wisconsin%20experienced%20a%20major%20heat,hundred%20people%20needed%20medical%20reatment.>

¹² Climate Check: <https://climatecheck.com/wisconsin/milwaukee>

¹³ Climate Check: <https://climatecheck.com/wisconsin/milwaukee>

average temperature from 1900 to 2010 increased at least 1.5 degrees Fahrenheit¹⁴. Specifically, temperatures in the Spring have increased approximately 1.7 degrees Fahrenheit since 1960, and Spring has been arriving three to 10 days earlier¹⁵. Although there was not a consistent increase between 1900 and 2010 there was a period of rapid warming between 1980 and 2010. These temperature changes will have significant impact on recreation, human health, the natural environment, and seasonal changes (e.g., pollen blooms, animal migration, etc.). The data and climate projections indicate a very high likelihood of temperatures to continue to increase.

Figure 7 shows the annual temperature in the Midwest and how it differs from average annual temperature.¹⁶ The black trend line helps to show how since 1900, the annual temperature has been increasing to nearly 5 degrees warmer than the average.

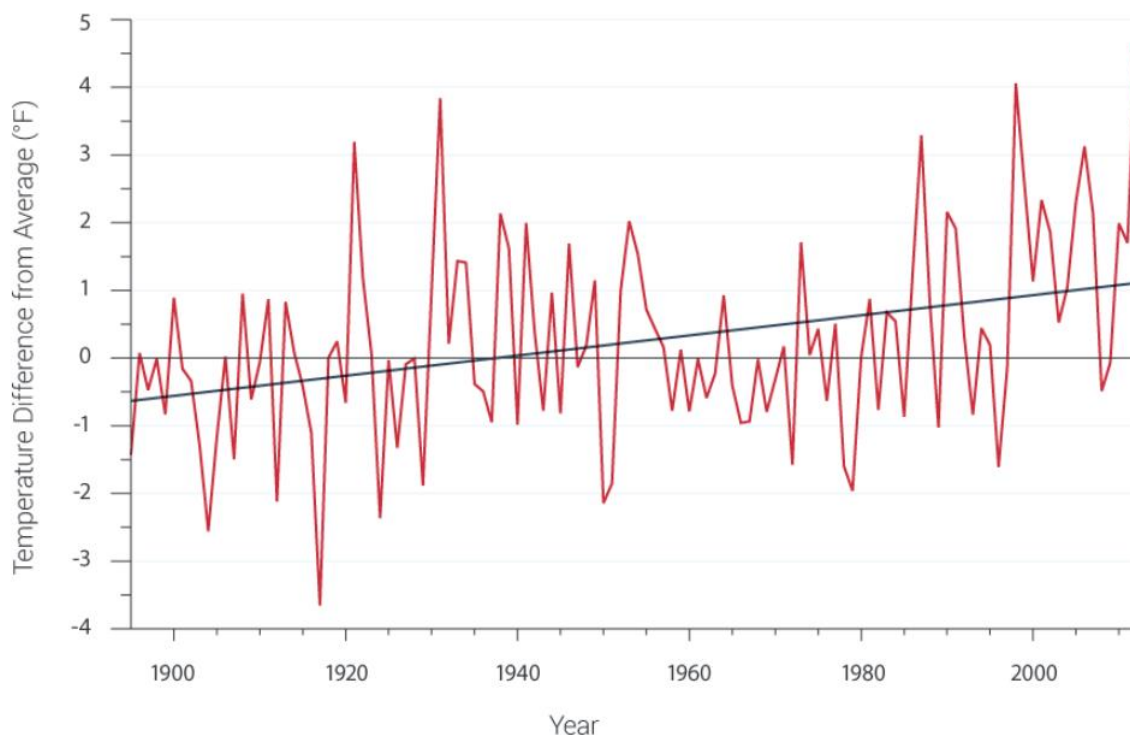


FIGURE 9: Historic Annual Average Temperatures in the Midwest

Impacts to Ecology

Hotter temperatures also negatively impact water quality. Warm waters lead to harmful algal blooms in water bodies. Algal blooms¹⁷ can result in an increase in fish and aquatic species mortality rates. They are unsightly and have an unpleasant smell. Reducing the amount of fertilizer that ends up in bodies of water (in the form of runoff) is one strategy to minimize the likelihood and intensity of algal blooms. Another solution is via human intervention in the form of aeration, mixing the water, and using ultrasound technology. The ultrasonic technology¹⁸ is relatively new and it reduces algae’s buoyancy causing them to sink to the bottom of the water and die off.

¹⁴ EPA, Climate Impacts in the Midwest: <https://climatechange.chicago.gov/climate-impacts/climate-impacts-midwest>

¹⁵ Wisconsin Department of Natural Resources, “The Science of Climate Change”: <https://dnr.wisconsin.gov/climatechange/science>

¹⁶ States included in the “Midwest” include Minnesota, Iowa, Missouri, Wisconsin, Illinois, Indiana, Michigan, and Ohio.

¹⁷ WDNR, Nuisance Algae in Lake Michigan: <https://dnr.wisconsin.gov/topic/GreatLakes/Cladophora.html>

¹⁸ LG Sonic: <https://www.lgsonic.com/how-to-prevent-algal-blooms/>

In addition, warmer temperatures over longer periods of time will lead to earlier snow melt in Wisconsin. In recent years, there have been multiple flood events leading to road closures that have been attributed to rapid snow melt from increasing temperatures^{19,20,21}. Increasing temperatures are impacting migratory patterns and agricultural seasons. Regionally, migratory birds are arriving earlier than they used to, which is attributed to the changing climate²².

Increased Stress on Park Resources

The Park staff has already reported challenges with increasing temperatures. Park goers want to use the aquatics facilities on hot days after Labor Day or before Memorial Day, outside of the aquatics operating season. But the Parks Department currently runs on the traditional aquatics season between Labor Day and Memorial Day and cannot open them due to a lack of seasonal labor. Grant Park operations will have to evaluate strategies to manage the increasing temperatures. Some examples include, employees working outdoors will likely have to work different hours to avoid high midday temperatures, adding more canopy

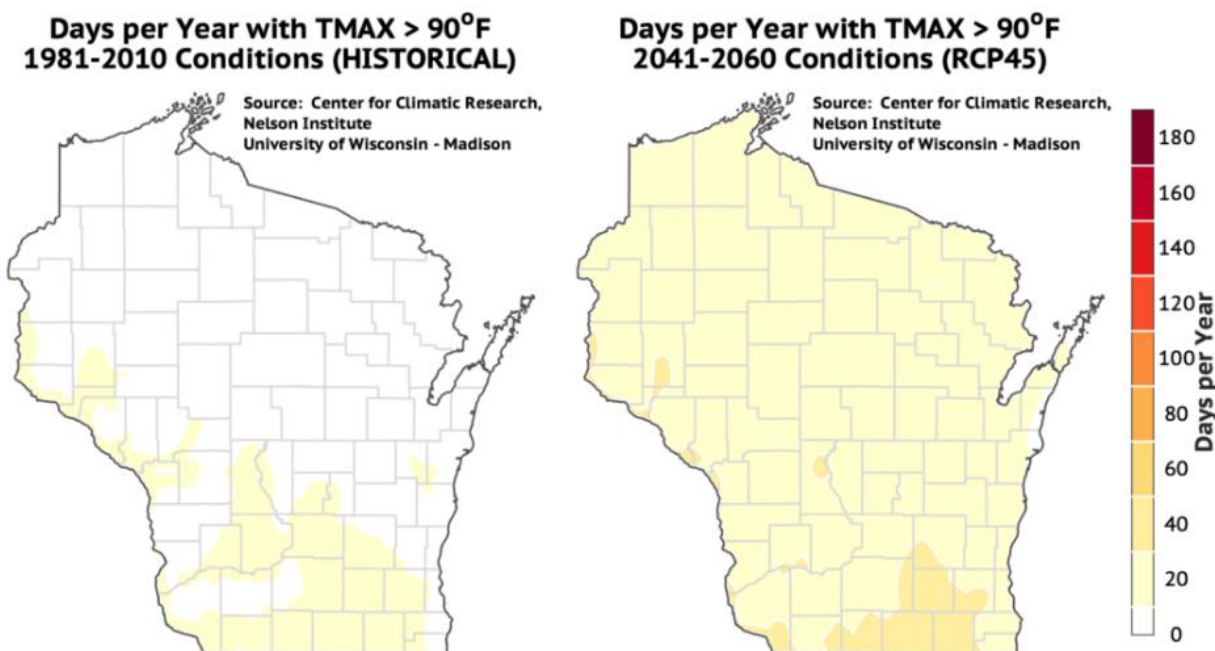


FIGURE 10: Image source: <https://wicci.wisc.edu/wisconsin-climate-trends-and-projections/>

trees to offer more areas of shade, or operate public misters so park users and employees can cool off. In addition to employee schedules being impacted it is highly likely that park users will also change their times of use. Rather than using park facilities in the middle of the day, when the temperatures are typically the highest, patrons may visit the park earlier or later in the day. Due to these changes, the park should consider installing more exterior lighting to increase safety.

Mitigation Strategies

There are various strategies to mitigate the impacts of prolonged heat exposure ranging in efficacy, cost, type of recommendation, and many other categories. One recommendation is to plant more indigenous

¹⁹ Milwaukee Journal Sentinel: [Wisconsin weather: Snow melt causes flooding; MMSD releases sewage \(jsonline.com\)](https://www.jsonline.com/story/news/local/2019/05/15/wisconsin-weather-snow-melt-causes-flooding-mmmsd-releases-sewage/4611110002/)

²⁰ Spectrum News One: [Heavy rain and melting snow combo causes flooding \(spectrumnews1.com\)](https://www.spectrumnews1.com/news/local/2019/05/15/heavy-rain-and-melting-snow-combo-causes-flooding/)

²¹ Milwaukee Journal Sentinel: [Upper Mississippi River floods homes, businesses, roads, farm fields \(jsonline.com\)](https://www.jsonline.com/story/news/local/2019/05/15/upper-mississippi-river-floods-homes-businesses-roads-farm-fields/4611110002/)

²² EPA, Climate Impacts in the Midwest: <https://climatechange.chicago.gov/climate-impacts/climate-impacts-midwest>

trees and flora to increase the cooling effect that trees and plants naturally have. Trees reduce the urban heat island effect, which is when buildings, pavement, and other developments retain heat. Co-benefits to planting more trees for temperature control include enhancing biodiversity and air quality.

Another strategy is to lighten the color of park facility roofing, benches, and other traditionally dark surfaces. Changing the material's color will increase albedo, thus reflecting solar energy and having a cooling effect. Adding canopies over picnic areas, benches, and other high use spaces will create shade and cover from the heat. However, this may require additional park maintenance to manage and the potential to have to circumvent vandalism.

The Parks Department should also make sure there are ample drinking water stations throughout the park. Additional building related upgrades include increasing mechanical and electrical efficiencies; often older systems emit a significant amount of heat. The Parks Department may also consider installing air conditioning systems into its occupied facilities to provide a space for patrons to cool down during hotter temperatures.

Overall, the Parks Department should be diligent in keeping records of days with high temperatures and the associated impacts on staff and operations. This will allow the Parks Department to analyze and identify trends. The Department should also develop a heat action plan to notify employees and park patrons of dangerous heat events and management strategies.

B. Severe Precipitation and Flooding

The Climate Issue

Climate models indicate a high likelihood of precipitation to increase in Milwaukee and Wisconsin. Recent weather events support the various climate projections, for example historic records from 1990 show that 2010 – 2019 has been the wettest decade in Wisconsin²³. Since 1950 annual precipitation in Wisconsin has increased 17% (approximately 5 inches)²⁴. Milwaukee is particularly vulnerable due to the three rivers and multiple streams the flow through the city and feed Lake Michigan²⁵. Increasing precipitation will vary seasonally but there is agreement that winters will be wetter with a mean



FIGURE 11: Menomonee River Parkway after heavy rains. Image: Andre Ost.

²³ University of Wisconsin-Madison, Nelson Institute for Environmental Studies: [Air | Wisconsin Initiative on Climate Change Impacts 2021 Assessment Report: https://wicci.wisc.edu/2021-assessment-report/air/#:~:text=The%20decade%20from%202010%2D2019,the%20previous%20long%2Dterm%20average](https://wicci.wisc.edu/2021-assessment-report/air/#:~:text=The%20decade%20from%202010%2D2019,the%20previous%20long%2Dterm%20average)

²⁴ Wisconsin's Changing Climate: Impacts and Solutions for a Warmer Climate: <https://uwmadison.app.box.com/s/lob4igia3b55u1q6kead7l91p14odoqu>

²⁵ Flooding In Milwaukee, ArcGIS StoryMap: <https://storymaps.arcgis.com/stories/06fccc65314a422b8a8eb87e20219f56>

increase of the current average of 32" per year to 35" per year in 2050²⁶. Many infrastructure plans consider the impacts of 50-, 100-, or 500- year flood events. Climate models are now projecting an increasing likelihood of 100- and 500- year floods. Table 1 displays the increasing chance of significant flood events to occur over the next 30 years. Climate models and precipitation records project a high likelihood of more frequent and more significant flooding events. For example, Table 1 shows a growing percent chance of both 100- and 500- year flood events.

Table 1 Significant Flood Projections

Flood Event	%chance of flooding in a given year	%chance of flooding over 30 years
100 year	1%	26%
500 year	0.2%	6%

Source: Risk Factor, Recreated by Mead & Hunt

It is important to note that despite more severe and frequent precipitation there may also be periods of abnormal dryness and even drought. Climate projections relating to drought are discussed later in this plan. A concern regarding the relationship between the two is the potential for more whiplash events. Whiplash events occur when there is an extremely long and dry period followed by severe precipitation and flooding, or vice versa. Whiplash events can be very disruptive by causing power outages, land and mudslides, agriculture and infrastructure damage and operational issues, and other impacts.

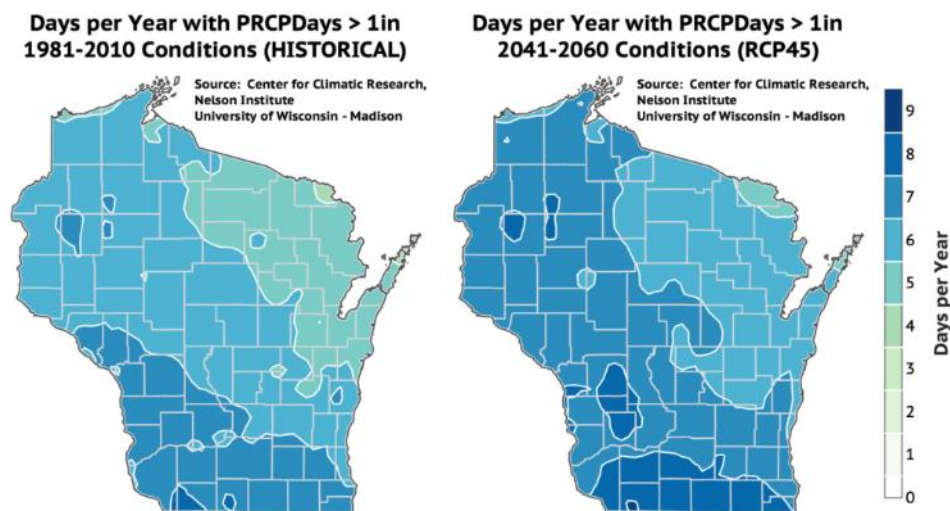


FIGURE 12: Days per year with precipitation greater than one inch. Image Source: <https://wicci.wisc.edu/wisconsin-climate-trends-and-projections/>

²⁶ Climate Check: <https://climatecheck.com/wisconsin/milwaukee>

Impacts on Grant Park

An increase in severe precipitation will impact multiple aspects of Grant Park. Low-lying parts of the park will flood more frequently which will limit usability and lead to a more hazardous environment. Water features, such as ponds and streams, will become more polluted with debris and fertilizer from precipitation run-off, and will also flood the riparian areas. More run-off from rain and snowfall will carry fertilizers that frequently lead to harmful algal blooms. There are various types of algal blooms that vary in levels of potential harm, color, texture, and toxins, some are particularly toxic to humans and animals. Flooding from severe precipitation may damage stormwater infrastructure that is not designed to withstand higher volumes of water. Damaged stormwater drainage systems will lead to many other challenges for the Parks Department as well. Additional infrastructure from roads and trails to buildings will be at risk of water damage as precipitation increases. It is important to note that more frequent and more severe precipitation will likely occur over the next 30 years and will have significant impacts on park operations due to safety closures and damaged infrastructure. Flood water will also lead to potholes in parking lots and other infrastructure due to subsurface washouts. In the same vein, there is significant debris clean up, including sediment deposits and movement of land.



FIGURE 13: A stagnant stormwater drainageway within Grant Park.

Recommendations

There are various design strategies to reduce precipitation damage. Updating stormwater infrastructure to withstand future rainfall and snow volumes is critical. When designing or retrofitting infrastructure, the Parks Department should design systems for future climate projections to increase long-term resilience. The canopies and shelters recommended for severe heat will also provide shelter from precipitation. It is recommended that tree limbs near buildings should be trimmed annually. An additional resilience measure is to install green infrastructure such as bioswales, permeable pavements, and rain gardens throughout the park. Green infrastructure provides natural solutions to flooding by slowing, absorbing, and filtering stormwater. Another form of green infrastructure to consider is green roofs. Green roofs absorb water, retain pollutants, enhance biodiversity, reduce the urban heat island effect, and increase insulation²⁷. While green roofs are typically found on flat roofs, low-sloped roofs can be used for certain types of green roofs. This makes the Wil-O-Way Grant facility within Grant Park a good candidate for green roof.

The Parks Department should prioritize green and other low Impact, sustainable infrastructure, but in some cases grey infrastructure may be more resilient²⁸. Grey infrastructure is typically defined as traditional infrastructure such as drainage systems, pipes, dams, roads, seawalls, etc. Critical infrastructure and buildings that are in high-risk areas may need to be raised, waterproofed, or relocated. Creating maps with

²⁷ Elena Cristiano, Stefano Farris, Roberto Deidda & Francesco Viola (2023) How much green roofs and rainwater harvesting systems can contribute to urban flood mitigation?, Urban Water Journal, 20:2, 140-157, DOI: [10.1080/1573062X.2022.2155849](https://doi.org/10.1080/1573062X.2022.2155849)

²⁸ Flooding In Milwaukee, ArcGIS StoryMap: <https://storymaps.arcgis.com/stories/06fccc65314a422b8a8eb87e20219f56>

the future inundation locations will allow the Parks Department to understand the high, medium, and low risk areas. Raising structures is a costly design strategy but should be considered if building new facilities. Rather than elevating the entire structure critical systems, such as mechanical and electrical rooms, could be placed on the second floor to reduce the likelihood of being flooded. Another lower cost strategy is to waterproof existing infrastructure and ensure there are no exterior gaps and holes that water could enter through.



FIGURE 14: Grant Park has already seen the need for stormwater improvements.

C. Ice Coverage

The Climate Issue

Ice coverage data records dating back to 1973 show a declining trend over the last fifty years. Although some years have had higher than average ice coverage and for longer periods of time, the overall trend is a decline. Over the last fifty years, nine of the years with the lowest percentage of ice cover have been since 2002²⁹. Recently in mid-February 2023 the Great Lakes ice coverage reached a record low and had a much lower percent of lake coverage than the February average. The lower levels persisted throughout the 2023 ice season with only 6.2% coverage relative to 24.5%, the 50-year average³⁰. In January 2024 Lake Michigan had more ice coverage than the 2023 season but was also below average. In mid-January the mean ice coverage on Lake Michigan was approximately 8%.

²⁹ [Flooding and bluff erosion from extreme storms are impacting Wisconsin's Great Lakes coastlines | Wisconsin Initiative on Climate Change Impacts \(WICCI\): https://wicci.wisc.edu/2021-assessment-report/built-environment/flooding-and-bluff-erosion-from-extreme-storms-are-impacting-wisconsins-great-lakes-coastlines/](https://wicci.wisc.edu/2021-assessment-report/built-environment/flooding-and-bluff-erosion-from-extreme-storms-are-impacting-wisconsins-great-lakes-coastlines/)

³⁰ Milwaukee Journal Sentinel: [Great Lakes average ice cover fourth lowest in more than 50 years \(jsonline.com\)](https://www.jsonline.com/story/news/local/2023/02/23/great-lakes-ice-coverage-record-low/7000000001/)

The records of the Great Lakes ice coverage indicate that Wisconsin and the regional environment is already experiencing climate change. The area and duration of ice cover on the Great Lakes are used as indicators for a changing environment and climate. Ice on the Great Lakes plays a significant role in the local ecology, economy, and ultimately the surrounding communities. Reduced ice coverage (in both area and duration) will have negative impacts on ice fishing, evaporation rates, and the organisms that rely on freeze-thaw cycles. The lack of winter ice is raising a concern for the food web and nutrient mixing patterns³¹. In addition to the aquatic organisms impacted by changing ice coverage, local weather will also be altered. The size of the Lakes is so large that they influence local weather, for example when the Great Lakes have reduced ice cover, more water is exposed and evaporates which then turns into precipitation on land³².

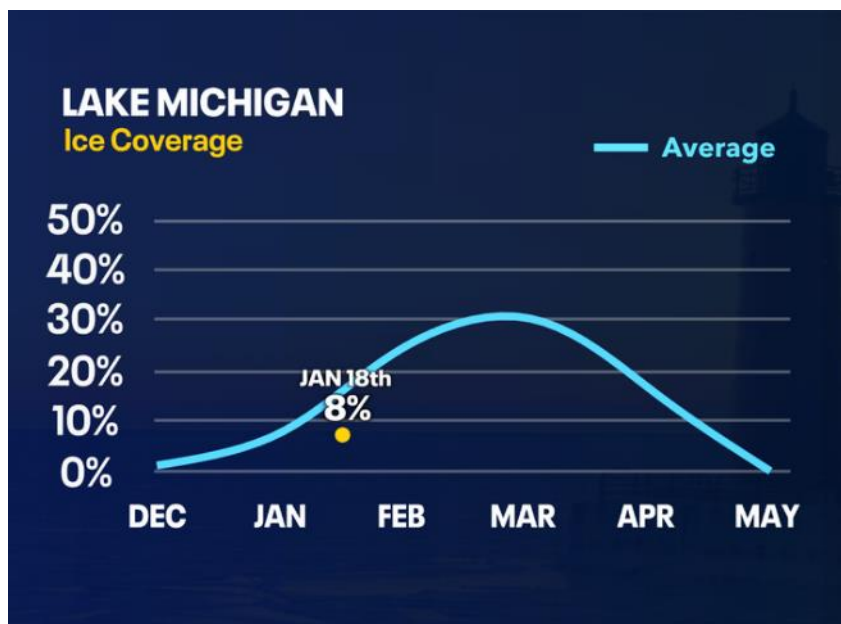


FIGURE 15: Lake Michigan Ice Coverage. Image source: <https://www.fox6now.com/weather/lake-michigan-ice-coverage-january-2024>

Impacts on Grant Park

Grant Park's coastal ecology will likely be impacted by the changes affecting Lake Michigan and other larger lakes. Large bodies of water undergo a natural freeze-thaw cycle that drives nutrient mixing and oxygen distribution throughout the depth of the water. Organisms depend on nutrient mixing, to ensure that food and key minerals are distributed throughout. With earlier warming, there is less movement in the water column, which ultimately reduces the availability of nutrients to all organisms. These changes will lead to an overall decrease in lake productivity leading to negative impacts on the aquatic habitat and an increase in the chances of harmful algal blooms occurring³³. Unfortunately, these impacts will not be isolated but will affect the larger food web in the region. For instance, if a specific fish species can no longer survive, its



FIGURE 16: Maximum Ice-Covered Area in Lake Michigan, 1973 – 2020. Image Source: https://www.epa.gov/sites/default/files/2021-04/great-lakes-ice_download1_2021.png

³¹ Woolway RI, Sharma S, Smol JP. Lakes in Hot Water: The Impacts of a Changing Climate on Aquatic Ecosystems. *Bioscience*. 2022 Jul 18;72(11):1050-1061. doi: 10.1093/biosci/biac052. PMID: 36325103; PMCID: PMC9618276. [Lakes in Hot Water: The Impacts of a Changing Climate on Aquatic Ecosystems - PMC \(nih.gov\)](https://doi.org/10.1093/biosci/biac052)

³² EPA: [Climate Change Indicators: Great Lakes Ice Cover | US EPA](https://www.epa.gov/climate-indicators/climate-change-indicators-great-lakes-ice-cover): <https://www.epa.gov/climate-indicators/climate-change-indicators-great-lakes-ice-cover>

³³ Woolway RI, Sharma S, Smol JP. Lakes in Hot Water: The Impacts of a Changing Climate on Aquatic Ecosystems. *Bioscience*. 2022 Jul 18;72(11):1050-1061. doi: 10.1093/biosci/biac052. PMID: 36325103; PMCID: PMC9618276. [Lakes in Hot Water: The Impacts of a Changing Climate on Aquatic Ecosystems - PMC \(nih.gov\)](https://doi.org/10.1093/biosci/biac052)

predators will lose their food source and there will be a cascading impact³⁴. The fishing industry and overall coastal ecology will be affected by a decrease in ice coverage.

Grant Park's beaches and bluffs will also be impacted by bigger and stronger winter waves. Studies suggest that a decline in ice cover has led to more intense wave action in the winters³⁵. The increase in surface area favors wave growth overall, especially when there are strong winter winds moving across the Lakes³⁶. The concern with increasing wave activity is that it leads to coastal damages including wetland and habitat loss³⁷.



FIGURE 17: Big Bay County Park "beach", December 2023.

Decreasing ice cover will impact recreational activities including ice fishing. Ice fishing is a culturally significant activity to the region and provides significant financial benefits to the area. Prior to European settlement in the region, indigenous communities relied on ice fishing³⁸. Grant Park is situated on the historic lands of the Potawatomi Nation and a shorter, or possibly non-existent, ice season on Lake Michigan will have lasting impacts on the ice fishing industry and the regional indigenous culture.

In addition to impacts within the Lake ecosystems themselves, their characteristics and ice cover will influence regional weather. Lake

Effect Snow (LES) is a particular phenomenon that occurs in the Great Lakes Region. As cold air moves across the warm, unfrozen lakes, the moisture and warmth move into the atmosphere, and clouds and snow form when hitting land³⁹. Although LES does not typically impact Milwaukee to the degree that other Great Lakes cities are affected, it is still important to consider these weather events. Climate models predict two potential outcomes; the first is that atmospheric and water temperatures were warm, reducing the frequency of LES, the second being that water temperatures will increase more rapidly than the atmospheric temperatures, making LES more frequent and extreme.⁴⁰

³⁴ [Lakes in Hot Water: The Impacts of a Changing Climate on Aquatic Ecosystems - PMC \(nih.gov\)](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6888888/)

³⁵ Frontiers in Marine Science, "Wave Climate Associated with Changing Water Level and Ice Cover in Lake Michigan" <https://doi.org/10.3389/fmars.2021.746916>

³⁶ Frontiers in Marine Science, "Wave Climate Associated with Changing Water Level and Ice Cover in Lake Michigan" <https://doi.org/10.3389/fmars.2021.746916>

³⁷ Frontiers in Marine Science, "Wave Climate Associated with Changing Water Level and Ice Cover in Lake Michigan" <https://doi.org/10.3389/fmars.2021.746916>

³⁸ Climate Wisconsin: <https://climatewisconsin.org/story/ice-fishing.html>

³⁹ National Weather Service: <https://www.weather.gov/apx/les>

⁴⁰ The paradox of lake effect snow: global warming could bring the Great Lakes more of it, at least for a while. Climate.gov. January 2017. <https://www.climate.gov/news-features/event-tracker/paradox-lake-effect-snow-global-warming-could-bring-great-lakes-more-it>

Recommendations

The Parks Department should collaborate with other lake front organizations including research institutions such as the U.S. National Ice Center. Although there is a lack of robust ice coverage management strategies, a first key step is to enhance documentation. By

recording ice cover and the impacts it is having on Park activity and the local community allow the

Department to find trends in recreational activity, wave events, and support regional climate research. Bluff erosion attributed to strong storms and waves is explored later in the Plan, but if coastal damage occurs in the winter, it should be recorded with correlating ice coverage data. Although there are limited resiliency actions to manage the impacts, reducing contributions to the warming climate is critical. It will be important to diversify winter recreational activities away from ice fishing and other behavior that relies on Lake Michigan to be frozen over.

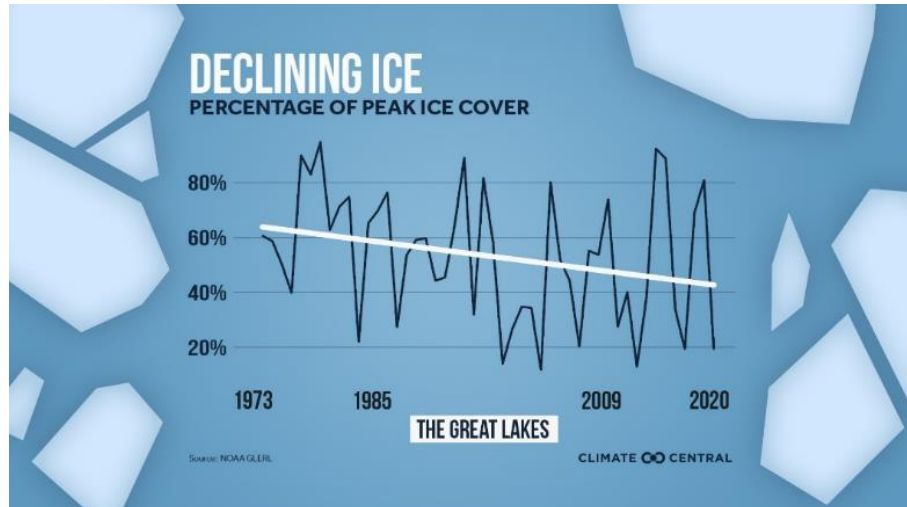


FIGURE 18: Declining Ice on the Great Lakes.

<https://www.climatecentral.org/climate-matters/great-lakes-ice-coverage-is-shrinking>

D. Drought

The Climate Issue

Despite there being more intense precipitation events in the region, there have also been more frequent, and longer dry spells. May 2023 is considered the sixth driest since 1871, the first-year records were kept. The average precipitation for May in Milwaukee is 3.54 inches and only 0.88 inches fell during May 2023.⁴¹ Over 58% of the Midwest was in drought (ranging from moderate to extreme) in July as the lack of precipitation persisted throughout the summer.^{42,43} Although 2023 was an abnormally dry year, FEMA's National Risk Index ranks drought with a "very low" relative risk. It is important to note that for this risk category FEMA focuses on agricultural impacts.

Impacts on Grant Park

General impacts from drought and decreasing precipitation include algal blooms, increasing costs of water prices, damages to fish and wildlife habitat, and agriculture and food security concerns. Over Summer 2023, Grant Park felt the effects of the decrease in precipitation in water prices for its golf courses. In addition to the higher costs, the irrigation infrastructure (sprinkler heads and piping) experienced more wear and tear

⁴¹ Southern Wisconsin is 'abnormally dry' and could get drier through June. Milwaukee Journal Sentinel. June 2023. <https://www.jsonline.com/story/weather/2023/06/06/southern-wisconsin-faces-june-drought-historically-low-may-rainfall/70294649007/>.

⁴² Wisconsin's summer drought was unexpected. That's what makes it so dangerous. UpNorthNews. July 2023. <https://upnorthnews.com/2023/07/26/wisconsin-summer-drought-was-unexpected-thats-what-makes-it-so-dangerous/>

⁴³ "Midwest" states include: Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio, Wisconsin <https://www.drought.gov/drought-status-updates/drought-status-update-midwest-us-2023-06-23#:~:text=Many%20people%2C%20agencies%20and%20sectors.Lower%20Mississippi%20River%20from%20St.>

from having to be used more frequently.⁴⁴ Drought will also cause soil moisture to decrease, which ultimately makes it more difficult for the ground to absorb water once it does rain. Rather than the soil absorbing precipitation and recharging the groundwater sources, the precipitation will become runoff and potentially lead to flooding. Extensive periods of dryness and drought also increase the chances of wildfires.

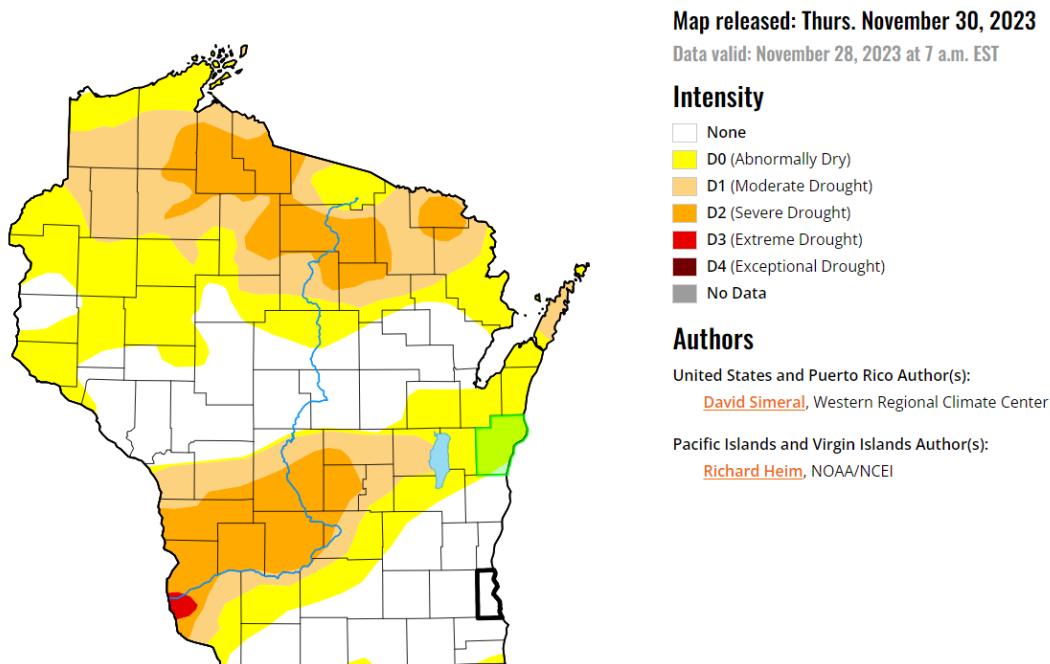


FIGURE 19: Milwaukee County, WI. U.S. Drought Monitor.
https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?fips_55079

Recommendations

Milwaukee County Parks should utilize native and potentially drought resistant plants in its landscaping to decrease water demand. Irrigation systems that must be used even during dry spells should only be used at night or in the early morning. Evaporation rates are lower when there is no solar radiation making the water used more effective. Weather stations, or small scale all-in-one wind, rain, and freeze sensor systems can also be programed into irrigation systems to avoid overuse. The Parks Department could also explore installing rainwater harvesting systems throughout the park. In preparation for a drought or dry period the Parks Department should create a list of areas that do not need to be irrigated in an effort to reduce water use and money. One such area, which could be replicated in other County Parks, are the synthetic greens and tee boxes at Zablocki golf course.



FIGURE 20: Synthetic greens and tee boxes at Zablocki golf course.

⁴⁴ Milwaukee County Parks spent an additional \$82,000 on maintaining golf courses in 2023.

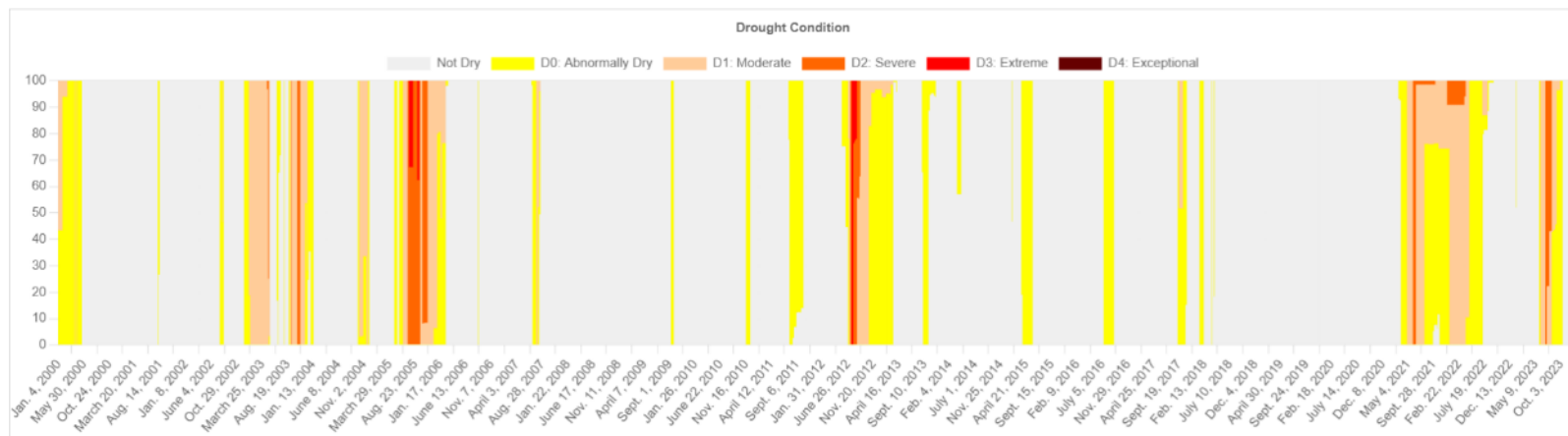


FIGURE 21: Milwaukee County, WI. U.S. Drought History.
https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?fips_55079

E. Coastal/ Bluff Erosion

The Climate Issue

Increasing precipitation rates and higher temperatures in Milwaukee are leading to fluctuating water levels in Lake Michigan. More precipitation causes flooding that can trigger bluff erosion while also raising water levels. In contrast to the increasing precipitation, there are also hotter summers which increase evaporation rates and ultimately lower Lake Michigan’s water level. Studies indicate that over the past decade there have been both record high and record low water levels which has contributed to an increase in coast and buff erosion.^{45,46,47} The variability between the low- and high-water levels is one factor that leads to erosion. The changing freeze-thaw cycles previously discussed also lead to coastal and bluff degradation. An additional non-climate or weather-related contribution is land development along bluffs. It is worth noting that there is historic bluff erosion in the region which indicates that the area is vulnerable without a changing climate.



FIGURE 22: Coastal erosion has been occurring in Grant Park for decades.

⁴⁵ Wave Climate Associated With Changing Water Level and Ice Cover in Lake Michigan. November 2021. <https://www.frontiersin.org/articles/10.3389/fmars.2021.746916/full>

⁴⁶ Slope Restoration Grant Project. Friends of Grant Park. September 2013. <https://fogp.org/2013/09/>

⁴⁷ A Lake Michigan Shoreline Erosion, Bluff Recession, and Storm Damage Control Plan for Milwaukee County, Wisconsin. Wisconsin Coastal Management Program. 1988. <https://www.govinfo.gov/content/pkg/CZIC-ht393-w6-l34-1988/html/CZIC-ht393-w6-l34-1988.htm>

Impacts to Grant Park

Sand and land movement not only degrades the geology but is also harmful to vegetation and ecosystems along the coastline. Beach access and trails along the coastline may be inaccessible during and following large storm events, ultimately limiting park visitors. Bluff and coastal erosion can be dangerous for humans and animals located nearby, and extra precautions and preparation is necessary. In addition, above and below ground infrastructure can be damaged from land movements associated with coastal erosion. An additional impact is the potential for extensive periods of downtime and loss of revenue for the park during bluff restoration projects.

Recommendations

Milwaukee County Parks has partnered with the Southeastern Wisconsin Regional Planning Commission (SEWPRC) to utilize a grant from the Wisconsin Coastal Management Program to create an inventory and guidelines for future development along the bluff.⁴⁸ This guideline should be utilized on all future projects implemented along not only lake bluff and coastlines but river and parkway bluffs as best practice.

There are multiple strategies to reduce the intensity of erosion along the coast of Lake Michigan. One of the most effective design solutions is to build out wide beaches that are highly maintained. The gentle slope of beaches reduces the impact of waves by slowing them down. Beaches and coasts are more resilient when they have native vegetation growing which helps hold the land together. The Parks Department should increase dune grasses and other native plants along the coast to help reduce erosion. In addition,



FIGURE 23: Everchanging shoreline conditions at Grant Park Beach.

key infrastructure and heavily used recreational areas along the bluff should be relocated to avoid added pressure to these already vulnerable areas strategy.⁴⁹

The Parks Department could also consider installing grey infrastructure to redirect the waves away from the land. If pursuing this path, there are various strategies including utilizing local boulders, fiber rolls, live staking, brush mattress, and/or brush layering.⁵⁰ A more in-depth analysis by a coastal engineer will provide more specific insights into site-specific

⁴⁸ Milwaukee County Coastal Management Guidelines. Report Number 248. February 2021.

COASTLINE MANAGEMENT GUIDELINES [mr-248-milw-co-coastline-mgmt-guide.pdf](https://dnr.wisconsin.gov/topic/Waterways/shoreline/info-erosion.html) (sewrpc.org)

⁴⁹ Shoreline erosion: Causes, prevention, and control options. Wisconsin Department of Natural Resources.

<https://dnr.wisconsin.gov/topic/Waterways/shoreline/info-erosion.html>

⁵⁰ Shoreline erosion: Causes, prevention, and control options. Wisconsin Department of Natural Resources.

<https://dnr.wisconsin.gov/topic/Waterways/shoreline/info-erosion.html>

solutions. Sea walls are controversial as they redirect water to another location along the coast, potentially creating more damage elsewhere. It is important to note that different parts of the coast will be impacted more than others due to sediment type, wave height, water levels, and the geology of the lakebed in that particular area. Miami Park in Michigan recently did a study to analyze the efficacy of new remote sensing technologies to understand bluff erosion.⁵¹ Collaborating with other entities on similar studies will provide insights into the unique challenges Grant Park is facing, and solutions that may be helpful to other coastal parks and communities.

F. Forests

The Climate Issue

As the climate continues to change, forests will be impacted in various aspects. For one, as the climate changes, specific tree species will not thrive as they once did. Many of the climate risks discussed above such as, increasing temperatures and precipitation will degrade forest health. Both of those risks make it more likely that there will be invasive species and pests in the region.⁵² When trees undergo stress of any kind, they become vulnerable and may be outcompeted by invasive species and/or pests.⁵³ In 2011 the Emerald Ash Borer was first reported in Milwaukee County and since 2012 approximately 25,000 trees



FIGURE 24: Milwaukee County parks have numerous amenities which take patrons through old and new growth forests. These forests are one reason the system is so special to area residents.

⁵¹ Remote sensing application for landslide detection, monitoring along eastern Lake Michigan (Miami Park, MI). July 2022. <https://www.usgs.gov/publications/remote-sensing-application-landslide-detection-monitoring-along-eastern-lake-michigan>

⁵² Milwaukee County Parks awarded \$635,000 grant. Friends of Grant Park. March 2015. <https://fogp.org/2015/03/>

⁵³ County Parks Fights Ash Borer With Reforestation. Urban Milwaukee. October 2022. <https://urbanmilwaukee.com/2022/10/01/mke-county-county-parks-fights-ash-borer-with-reforestation/>

have been removed due to this pest.⁵⁴ The Emerald Ash Borer is not the first invasive pest to harm Wisconsin forests, in the 1950s the Dutch Elm Disease led to extensive tree mortality in the region as well.

Impacts on Grant Park

Warming temperatures and changes in precipitation will provide the opportunity for non-native species, especially those from southern regions, to grow in Grant Park and Milwaukee. Native species to Wisconsin such as paper birch, quaking aspen, balsam fir, and others may begin to decline as temperatures continue to rise. Under a high emissions scenario, with warmer temperatures, the dominant species in Milwaukee forests will change to white oak, hickory, and pine trees.⁵⁵ Warmer and less severe winters also encourage larger deer populations to thrive, which in turn negatively impacts forests by damaging seedlings, saplings, and other forest floor vegetation.⁵⁶



FIGURE 25: New growth continues in Grant Park.

Changing forests will lead to many significant impacts ranging from altered ecosystem dynamics for local wildlife to fallen trees that may limit recreational activities for park patrons. A loss of trees may also increase temperatures due to the urban heat island effect. Trees reflect solar radiation and provide shade and moisture which ultimately drives local temperatures down.⁵⁷ In addition, if trees become more vulnerable and are not as healthy, they will be more prone to falling during severe storms, which are expected to become more frequent and more

intense. Many trees and the wildlife they provide habitat for are culturally significant and may be negatively affected by the changing climate.

⁵⁴ County Parks Fights Ash Borer With Reforestation. Urban Milwaukee. October 2022.

<https://urbanmilwaukee.com/2022/10/01/mke-county-county-parks-fights-ash-borer-with-reforestation/>

⁵⁵ What Climate Change Means for Wisconsin. USEPA. August 2016. [19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-wi.pdf](https://www.epa.gov/sites/production/files/2016-09/documents/climate-change-wi.pdf)

⁵⁶ Wisconsin Initiative on Climate Change Impacts, Forestry Working Group. <https://wicci.wisc.edu/forestry-working-group/#:~:text=Examples%20of%20Primary%20Climate%20Impacts%20to%20Wisconsin%20Forests&text=Heavy%20precipitation%20events%20are%20becoming,from%20insect%20pests%20and%20diseases>

⁵⁷ Reduce Urban Heat Island Effect. USEPA. <https://www.epa.gov/green-infrastructure/reduce-urban-heat-island-effect#:~:text=Trees%2C%20green%20roofs%2C%20and%20vegetation,releasing%20moisture%20into%20the%20atmosphere>

Recommendations

Milwaukee County Parks already strives to maintain a healthy forest. In 2015, it received a grant from the Environmental Protection Agency (EPA) to combat invasive species. Continual forest management to ensure that native species continue to thrive is critical. It also was a sub-recipient of a 2023 US Forest Service Grant as part of the City of Milwaukee's *Growing Milwaukee's Tree Canopy and Community Resilience* project aimed at tree planting, maintenance, restoration, workforce development, planning, and community engagement.⁵⁸ Continuing to pursue and partner with local agencies to pursue grant opportunities to ensure a healthy urban forest will be critical for Milwaukee County Parks moving forward.

Although changing temperatures and precipitation are out of the Parks' own control, other management strategies can help protect its forests. It will be critical to update forest management plans to reflect the changing climate and to aid tree species in rebounding after disturbances.

It is important that the Parks Department continues to update its tree inventory frequently. A current inventory will allow the Department to properly maintain species diversity and understand if there is a change in dominant species. Species that are particularly susceptible to disease and precipitation and temperature changes should be closely monitored. Forest and tree management plans should be updated to include climate-focused management strategies.

G. Impacts on facilities, staff, and patrons

Park facilities, staff, patrons, and natural resources will feel a range of impacts as the climate continues to change. Facilities located near large trees may be at risk of damage from falling limbs. Buildings may also need to be raised to avoid flooding as precipitation increases. A final impact to note is that facilities for patrons may need to be open during different hours to accommodate the changing climate and weather events.

Many of the staffing changes relate to new schedules. As the warm season grows longer,

there will likely be a need for more seasonal employees to ensure that pools and other summer facilities like bathrooms can be open. Another potential option is for full time employees to support in other activities such as unlocking public facilities earlier in the spring and later in the fall. There will need to be flexibility amongst park staff as climate change manifests. In addition, dated electrical systems that have significant



FIGURE 26: Fisherman at the mouth of the Oak Creek.

⁵⁸ Urban and Community Forestry Grants - 2023 Grant Awards. <https://www.fs.usda.gov/managing-land/urban-forests/ucf/2023-grant-funding>

amounts of heat loss and inefficiencies should be updated to reduce warming and emissions.



FIGURE 27: If temperatures are warmer, more demand for restroom facilities is anticipated.

Park users will also feel the effects of the changing climate as well, particularly as it relates to their recreational activities. Winter activities such as ice fishing, snowshoeing, and cross-country skiing will be negatively impacted due to decreasing ice coverage, less snow fall, and warmer and shorter winters. It is important to note that some of these activities have strong cultural ties to the region. Activities such as golfing and using pools will increase since there will be longer warmer seasons, but it is likely that there will be more precipitation and storms during the summer which may result in closing these activities. Similarly, there will be both negative and positive impacts for beach goers, in general there will be more beach days, but the increasing storms and lack of ice coverage will lead to more beach erosion.

6. Recommended Actions

Climate Hazard	Recommendations
<i>Severe Heat</i>	<ul style="list-style-type: none"> • Plant more trees and flora • Paint park facility roofing, benches, and other traditionally dark surfaces white • Increase mechanical and electrical efficiencies in buildings • Add canopies over picnic benches and other areas for people to shelter • Make sure there are ample drinking water stations throughout the park • Install more cooling systems in occupied public park facilities • Improve record keeping • Develop a Heat Action Plan
<i>Severe Precipitation and Flooding</i>	<ul style="list-style-type: none"> • Retrofit stormwater infrastructure • Install green infrastructure (e.g., bioswales, permeable pavements, rain gardens, green roofs, etc.) • Raise facilities to avoid flooding • Add canopies over picnic benches and other areas for people to shelter from rain • Trim tree limbs near buildings annually • Move electric/ mechanical and other critical systems to the second floor of buildings where feasible • Fill any gaps and holes in existing facilities at lowest levels to avoid flooding
<i>Ice Coverage</i>	<ul style="list-style-type: none"> • Collaborate with research institutes such as the U.S. National Ice Center • Enhance documentation and record keeping • Diversify winter recreational activities
<i>Drought</i>	<ul style="list-style-type: none"> • Plant native and drought resistant vegetation • Program irrigation systems to only turn on at night or early in the morning, and fewer days per week • Incorporate weather station into irrigation system • Create a list of irrigated spaces that do not need to be watered in case of a drought • Explore rainwater harvesting systems
<i>Coastal/ Bluff Erosion</i>	<ul style="list-style-type: none"> • Increase width and amount of sloping beaches • Plant local vegetation such as dune grasses to help support the substrate • Relocate infrastructure, including trails, that are close to the edge of bluffs • Consider green infrastructure installations in the water such as local boulders, fiber rolls, live staking, etc. • Collaborate with other municipalities facing the same challenges to find innovative solutions
<i>Forest</i>	<ul style="list-style-type: none"> • Keep an up to date tree inventory • Update forest management plans • Track the creep of new species into the region • Be diligent in pest and invasive species monitoring and removal

7. Funding Opportunities

There are various funding mechanisms available to support resiliency upgrades. Funding is provided at regional and national levels, and through various entities ranging from the National Fish and Wildlife Foundation to the US Department of Transportation (USDOT). Each funding opportunity has specific eligible project types including construction, mitigation, design, engineering, planning, monitoring, and restoration. Below are potential funding sources to enhance Grant Parks resiliency efforts.

Funding Type	Funding Organization	Program	Link
Regional	Wisconsin Department of Natural Resources	<ul style="list-style-type: none"> Wisconsin Wetland Conservation Trust 	<ul style="list-style-type: none"> https://dnr.wisconsin.gov/topic/Wetlands/wwct
Regional	Fund for Lake Michigan	<ul style="list-style-type: none"> Fund for Lake Michigan 	<ul style="list-style-type: none"> https://fundforlakemichigan.org/apply-for-funding/
National	Federal Emergency Management Agency	<ul style="list-style-type: none"> Building resilient Infrastructure and Communities (BRIC) Pre-Disaster Mitigation Grant Program Hazard Mitigation Grant Program (HMGP) 	<ul style="list-style-type: none"> https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities https://www.fema.gov/grants/mitigation/pre-disaster https://www.fema.gov/grants/mitigation/hazard-mitigation
National	National Oceanic and Atmospheric Administration (NOAA) for Coastal Management	<ul style="list-style-type: none"> Coastal Habitat Restoration and Resiliency Grants for Underserved Communities Coastal Management Zone Management Habitat Protection and Restoration Grants National Coastal Resilience Fund 	<ul style="list-style-type: none"> https://www.rivernetnetwork.org/wp-content/uploads/2023/09/coastal-habitat-restoration-and-resilience-grants-factsheet.pdf https://www.fisheries.noaa.gov/grant/coastal-habitat-restoration-and-resilience-grants-tribes-and-underserved-communities https://coast.noaa.gov/resilience-grant/
National	National Fish and Wildlife Foundation	<ul style="list-style-type: none"> Five Star and Urban Waters Restoration Grant National Coastal Resilience Fund Sustain our Great Lakes 	<ul style="list-style-type: none"> https://www.nfwf.org/programs/five-star-and-urban-waters-restoration-grant-program https://www.nfwf.org/programs/national-coastal-resilience-fund https://www.nfwf.org/programs/sustain-our-great-lakes-program
National	Environmental Protection Agency (EPA)	<ul style="list-style-type: none"> Great Lakes Restoration Initiative (GLRI) 	<ul style="list-style-type: none"> https://www.glri.us/funding
National	US Department of Transportation	<ul style="list-style-type: none"> Rebuilding American Infrastructure with Sustainability and Equity (RAISE) 	<ul style="list-style-type: none"> https://www.transportation.gov/RAISEgrants
National	US Fish and Wildlife Service	<ul style="list-style-type: none"> North American Wetlands Conservation Act Grants: US Small National Coastal Wetlands Conservation Grants 	<ul style="list-style-type: none"> https://www.fws.gov/service/north-american-wetlands-conservation-act-nawca-grants-us-small https://www.fws.gov/service/national-coastal-wetlands-conservation-grants

8. Conclusion

Grant Park is one example of how the Milwaukee County Park System is becoming increasingly vulnerable to the changing climate. While climate models project many weather-related events out to 2050, the region and the County system is already being impacted to a degree. It is critical that Milwaukee County Parks continue long-range planning while simultaneously undertaking immediate implementation actions to ensure a sustainable future for the system. Fortunately, there are many resources available including partnership and funding opportunities.

Looking forward, Milwaukee County Parks should see seek out local partners and other parks departments undergoing the same stressors to share solutions and strategies. By sharing knowledge and remaining proactive, Milwaukee County Parks will be able to adapt to future climate conditions and ensure a positive impact for employees, the local environment, park users, and the local community. Structure and stability provide a framework for moving the system into the future. But often adaptation and flexibility prove a suitable path forward.



FIGURE 28: *A sustainable, planned approach, Grant Park.*

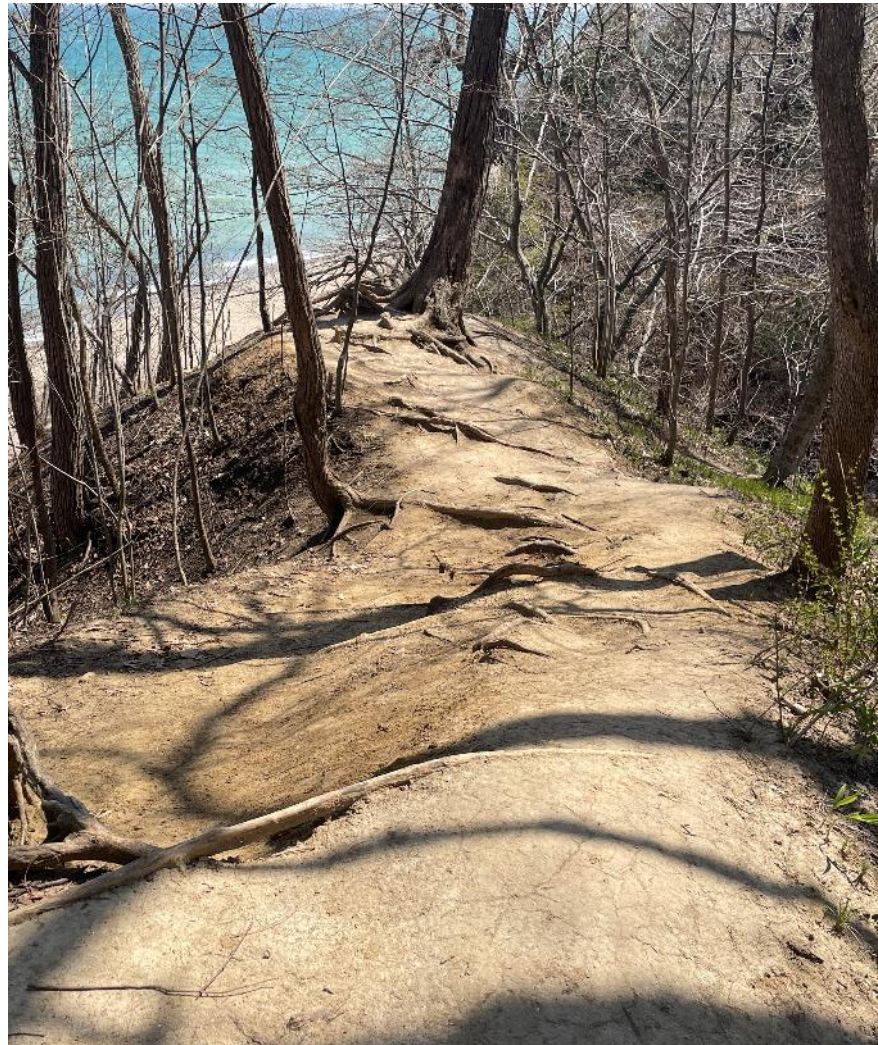


FIGURE 29: *“The road less traveled” is one which is often unplanned and comes with unintended consequences. Grant Park.*