Climate Change in Cazenovia and Neighboring Communities

2024

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Rippleton Schoolhouse, Cazenovia

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INTRODUCTION

This 2024 annual report documents long-term climate trends in Cazenovia and neighboring communities. Line graphs display changes in several climate indicators including precipitation, snowfall, air and lake water temperature, ice duration on Cazenovia Lake, drought, and extreme weather events. The descriptive narrative within each chapter explains why continued evaluation of these characteristics is important to monitor and how our local conditions compare to statewide and national trends. This information is compiled each year because it's important to see where we came from in order to set community goals for the future. By taking a look back and documenting historical trends, our community is better positioned to define our path as we move forward.

People often confuse the terms "weather" and "climate." Weather refers to conditions during a short period of time that can change within minutes or hours. It's frequently referenced in terms of temperature, humidity, precipitation, cloudiness, brightness, visibility, wind, and atmospheric pressure. Climate, on the other hand, refers to conditions over extended periods of time and is reported as the long-term average of the weather in a specific location. Weather can change in a short period of time, but climate change develops over longer periods, covering decades or centuries. This climate report displays the extent by which the climate has been changing in our community during the past several years.

We live in a beautiful community and don't need to worry about melting glaciers or rising sea levels. So, should we be concerned about climate change? Absolutely, yes. We all need to do our share to reduce greenhouse gas emissions and control future warming so that anticipated climate changes can be more manageable and less costly. Dealing with a changing climate requires a responsible transition to clean energy and an aggressive plan to reduce carbon emissions. This is the time that families, governments, academic institutions, and businesses need to take action. We can all contribute in one form or another to implement climate solutions that address mitigation and adaptation, reduce vulnerabilities, and enhance resilience.

Climate change should continue to be a priority for all of us, especially with the increasing frequency and intensity of storm events. Cazenovia's success with the implementation of programs to address flooding, erosion and other climate-related issues will depend on our continued focus on proactive management and policy initiatives throughout the town and village. Monitoring of long-term climate trends will help to define priority goals for our community and can help to justify adaptation measures in the coming years.

Climate change is a difficult message to convey but it's important that we remain proactive and optimistic. We don't have time, or the right, to sit back and expect that the environment will get better on its own. We all have a responsibility to do something … *anything* … each day to make our world a bit safer for our children and grandchildren. Optimism can be a powerful call to action. For this reason, I included an important section at the end of this report called, "On the Bright Side: A Local Response to Climate Change," found on page 23. It provides a brief summary of the actions taken by our local government and organizations to address climate change in the town and village.

Please let me know if you have edits or additions for this report and if you would like to help with data collection and analysis for future reports. Thank you.

Anne Saltman, anne.b.saltman@gmail.com
United Climate Action Network, March 2025

ACKNOWLEDGEMENTS

Many thanks to the following people that provided encouragement and contributed information for this report: Kristi Andersen, Mary Bartlett, Van Bartlett, Margot Giblin, Jian Lin, Dave Miller, Nancy Mueller, Geoffrey Navias, Alene Onion, Nancy Paolozzi**,** Kyle Reger, Lars Gosta Rudstam, Roger Saltman, Jonathan Saltman, Sapna Sharma, Dwight Webster, and Kurt Wheeler.

Our thanks also go to Dr. Walid H. Shayya, professor, Natural Resources Engineering, School of Agriculture, Business, and Technology at SUNY Morrisville, for providing information from the SUNY Morrisville weather station.

Additional thanks to the following people that contributed to the chapter titled, "On the Bright Side: A Local Response to Climate Change":

Kristi Andersen, Helen Beale, Christopher Difulvio, Steve Lorraine, Lauren Lines, Dave Miller, Geofrey Navias, Mat Webber, Jen Wong, and Emily Zaengle.

EDITORS NOTE

- This report doesn't include the causes of climate change, projections for the future, or recommendations on adaptation and mitigation strategies. This type of information is presented in Cazenovia's Climate Action Plan, NYSERDA's Climate Impacts Assessment, and through a list of resources on the United Climate Action Network (UCAN) website.

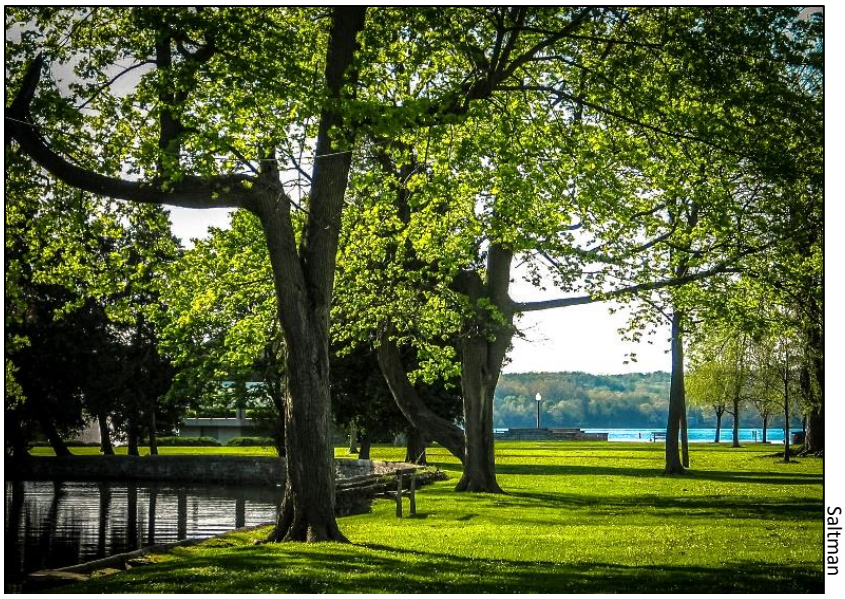
  The Climate Action Plan provides a comprehensive list of actions to address the increasing occurrence of flooding, stormwater runoff, strong storm events, temperature extremes, and other impacts of our changing climate.

  A summary of findings from the NYS Climate Impacts Assessment is found in the chapter titled, "The Big Picture: New York State," found on page 19.

  And finally, be sure to check the United Climate Action Network (UCAN) website for valuable information on ways to conserve energy and reduce your carbon footprint while following important legislation relating to the climate.

- The Town of Cazenovia's weather station, located on the roof at the Town of Cazenovia Highway Department on Constine Bridge Road, is a good source of weather information but it was installed three years ago and doesn't yet provide enough information for long-term trends. However, the National Weather Service in Morrisville has recorded many years of data. Therefore, in addition to graphing the three years of information from Cazenovia, long-term data from Morrisville was used in this report. Morrisville was also selected because of the similar elevation and weather conditions compared to Cazenovia.

- An equipment malfunction occurred at Cazenovia's weather station in 2024, preventing us from using precipitation data. Therefore, precipitation trends from Morrisville were used for this report.



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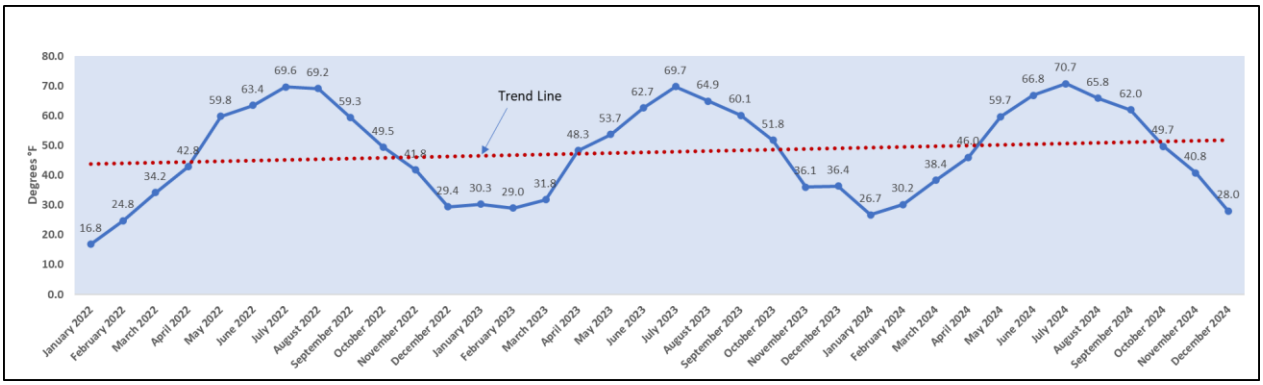
Lakeland Park, Cazenovia

DATA AND TRENDS

AIR TEMPERATURE

The graph below shows average monthly temperature readings from the Cazenovia weather station, located at the town highway garage. Three years of data (2022, 2023 and 2024) is currently available. The red trend line shows a gradual increase in temperature during that time period.

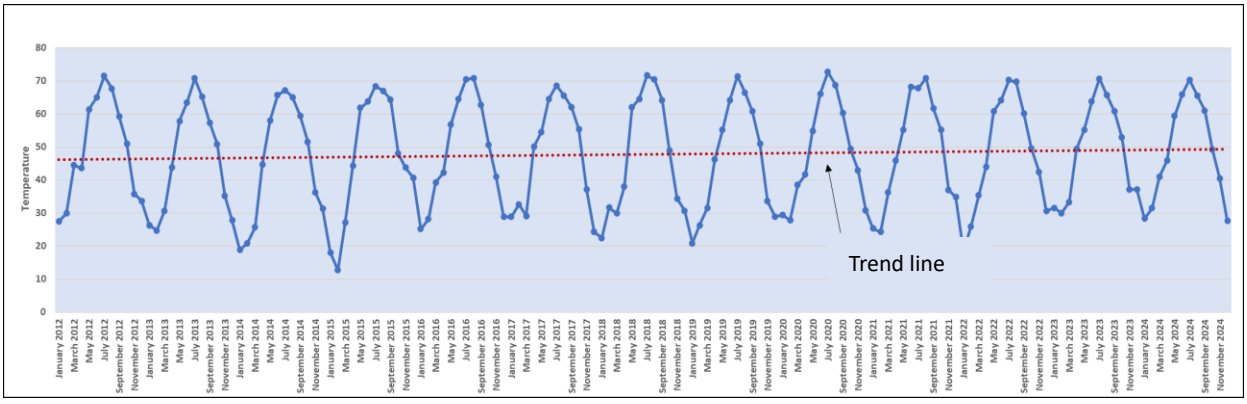
Air temperature (°F), Cazenovia, 2022-2024



Source: Cazenovia Weather Station

The following graph was generated from a weather station located at SUNY Morrisville. The red trend line displays a gradual increase in air temperature from 2012 to 2024.

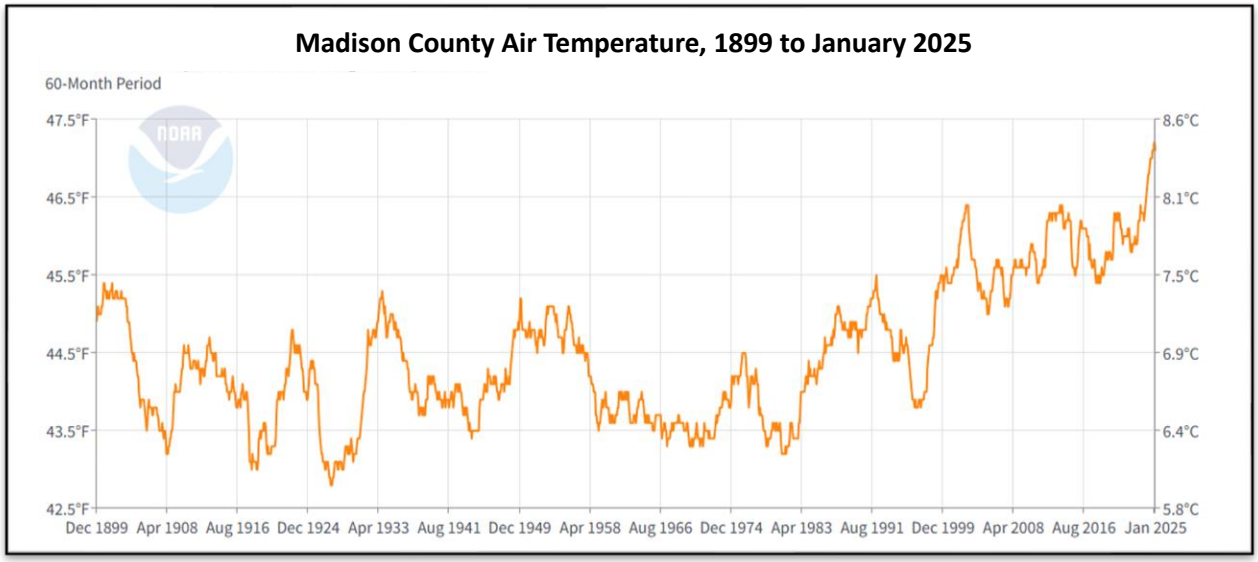
Air temperature (°F), SUNY Morrisville



Source: SUNY Morrisville weather station

How do local temperatures compare to temperatures for Madison County?

Average air temperatures for Madison County ranging from 1899 to 2025 are displayed in the following graph. The information was collected by the NOAA National Centers for Environmental Information. The results show temperature fluctuations (especially since 1983) and an increase in temperature over time.



Source: NOAA National Centers for Environmental Information (link)

What are the New York State and national trends for air temperature?

According to the NYSDEC, increasing average temperatures have been recorded in recent decades. Changes in the frequency and intensity of extreme temperature events, such as heat waves and cold waves have also been recorded. The frequency of cold waves has decreased across most of the United States over the last century, while the number and length of heat waves have been increasing each decade since the 1960s. The annual frequency and length of heat waves in New York State are expected to continue to increase.

A change in the USDA Plant Hardiness Zone Map

The Plant Hardiness Zone Map is the standard by which gardeners and farmers can determine the planting time when perennial plants are most likely to thrive at a given location. The United States Department of Agriculture (USDA) changed the Zone Map in 2023 to account for the warming temperatures throughout the nation. According to the 2023 Hardiness Zone Map, Cazenovia is in Zone 5b (-15°F to -10°F). This is a change from the 2012 Hardiness Zone Map which had Cazenovia in Zone 5a (-20°F to -15°F). The change was based on a temperature change of +4°F in Central New York.

Why is air temperature important to monitor?

Air temperatures can impact human and animal health as well as agricultural productivity. Increasing temperatures also influence the amount of precipitation and frequency of storm events. Warmer average air temperatures will result in warmer water and oxygen depletion in Cazenovia Lake. This can create stress for fish, plants and other aquatic organisms. Increased water temperatures in the lake may also contribute to the frequency and extent of toxic algal blooms which will, in turn, affect the local economy when access to the lake is restricted.

How does temperature affect populations of aquatic and terrestrial invasive species?

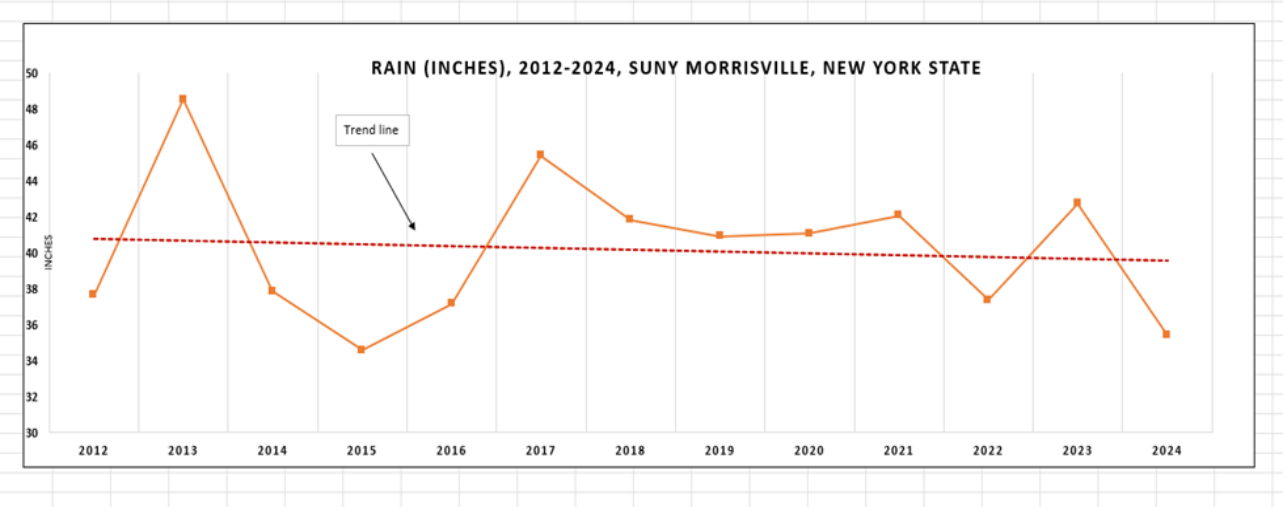
NYSERDA and other New York State agencies report that a warming climate is projected to accelerate the introduction, spread, and negative impacts of invasive species. Recent climate trends and rising atmospheric carbon dioxide concentrations have been identified as the causes of new and expanding infestations. A reduced number of freezing days per year allows new invasives such as the emerald ash borer and the hemlock woolly adelgid to survive during the winter months. Invasive populations tend to grow faster and larger during warmer temperatures. Changes in temperature extremes and precipitation rates can also expand the geographic range, increase the population, and lengthen the activity period for ticks, mosquitoes, and other insects that spread illnesses such as Lyme disease and West Nile Virus.

What are Harmful Algal Blooms?

Many types of algae are harmless and they serve an important role in the aquatic environment. However, Harmful Algal Blooms, also known as HABs, refer to a specific type of algae that produces toxins that can harm humans, wildlife, and pets. HABs have been identified in Cazenovia Lake in recent years. They have been found in rivers, lakes, wetlands and estuaries throughout New York State and are a concern in freshwater systems worldwide. Once confirmed by researchers at SUNY ESF or NYSDEC officials, waterbodies are closed to swimming and other recreational uses until the bloom dissipates. The formation of HABs is thought to be influenced by nutrient availability (primarily phosphorus and nitrogen,) climate conditions such as warming water temperature, weather patterns such as strong storm events, and interactions of aquatic organisms.

PRECIPITATION

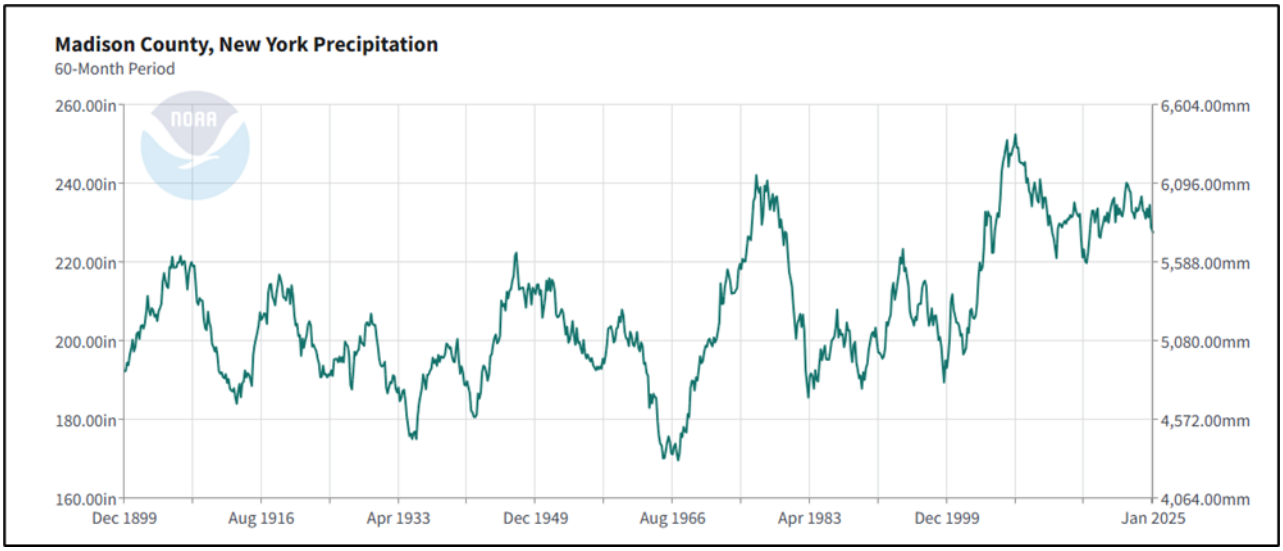
The following graph shows annual precipitation in Morrisville from 2012 to 2024. The red line displays a downward trend in rainfall during this time period.



Source: SUNY Morrisville weather station

Has precipitation changed in Madison County?

The following graph displays long-term precipitation levels in Madison County from 1899 to January 2025. The graph shows an increasing trend in precipitation since the 1980s.

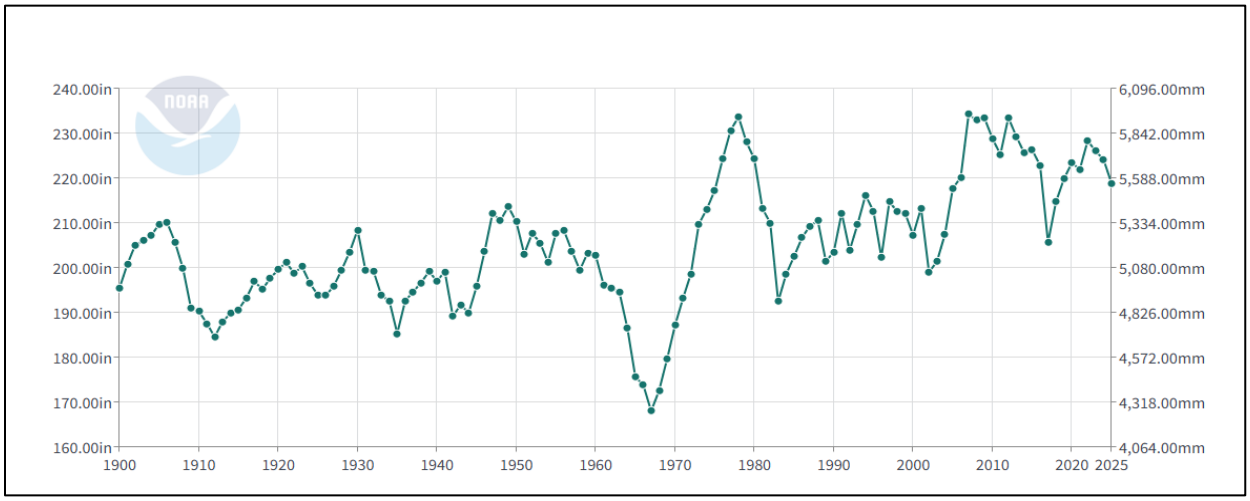


Source: NOAA National Centers for Environmental Information (link)

How have New York State precipitation levels changed?

The following graph displays long-term trends for precipitation from 1900 to January 2025 in New York State. The levels appear to be fairly standard and predictable from 1900 to the late 1960s. The data then show an increasing trend in precipitation and a higher level of variability from year to year.

Precipitation in New York State, 1900 to 2025



NOAA National Centers for Environmental Information (link)

Why is precipitation important to monitor?

It is important to monitor precipitation and its impact on soil moisture in order to predict when to plant and harvest agricultural crops and to assist with infrastructure planning for flood control. Accurate precipitation measurements also generate storm warnings for Cazenovia and can help our community decide if safety precautions should be implemented. Dry periods with minimal or no precipitation can increase the threat of fire, affect wildlife health and stream flow, and the growth of lawns and gardens.

According to the NYSDEC, the northeastern U.S. experienced greater than a 70% increase in heavy precipitation from 1958 to 2010, more than any other region in the country. Precipitation is expected to increase in New York State, with longer and more frequent precipitation events, and heavier downpours.

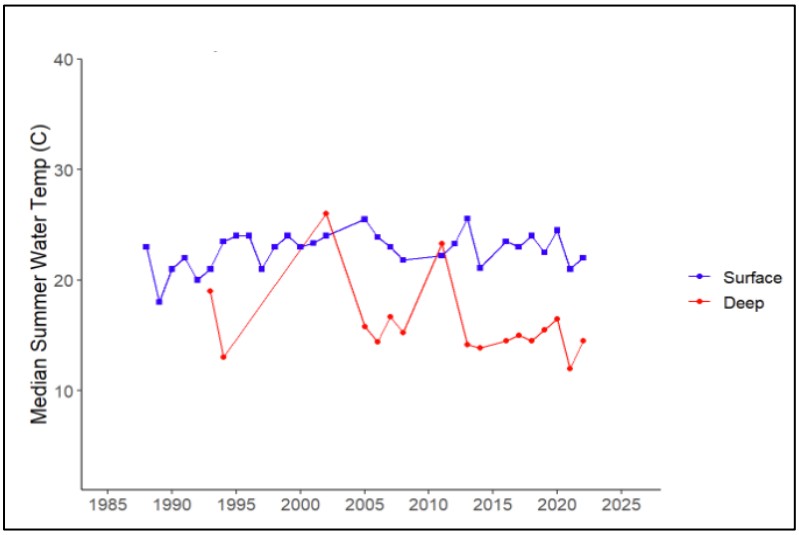
On the positive side, the Town and Village of Cazenovia are certified as Climate Smart Communities. This means that municipal officials are shifting to clean, renewable energy sources while implementing climate-smart land use policies. These projects make our community more resilient to climate change.

The NYSDEC reports that climate change can influence the intensity, frequency, and even type of precipitation that a region experiences. Average temperatures of oceans are rising as more heat is absorbed from the warming atmosphere, increasing the amount of water that evaporates into the air. As the moisture-saturated air moves over land, it can produce more intense precipitation and high humidity. Total annual precipitation has increased over land areas both globally (0.10 inches per decade) and in the U.S. (0.20 inches per decade) during the last century.

SUMMER WATER TEMPERATURE, CAZENOVIA LAKE

Surface and bottom water temperatures in Cazenovia Lake have been recorded since 1988 through the Citizens Statewide Lake Assessment Program (CSLAP.) Temperature readings are collected several times during the summer months by local CSLAP volunteers. The following graph and table were developed by the NYS Department of Environmental Conservation (NYSDEC) and the NYS Federation of Lake Associations. According to the CSLAP annual reports, very little change has occurred with lake water temperature in the past several decades.

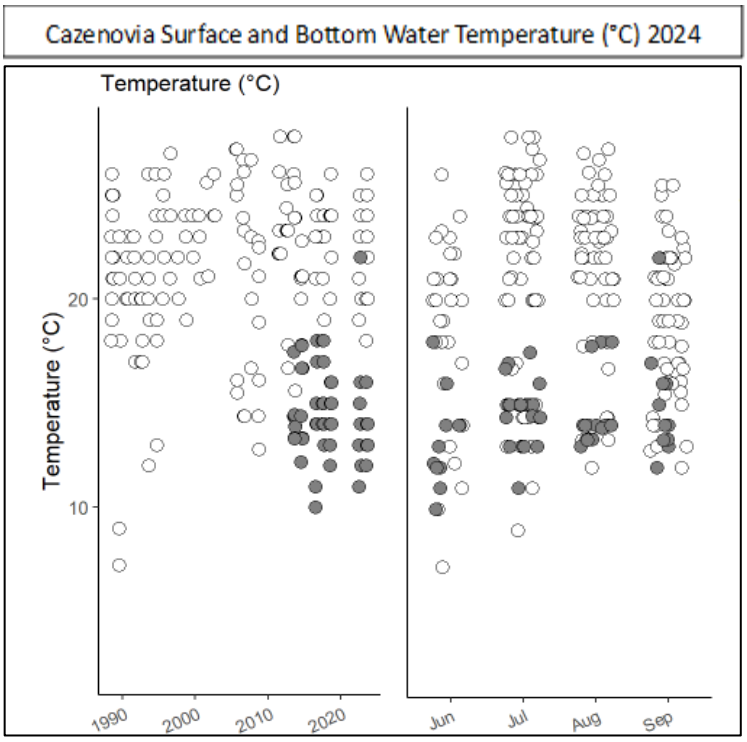
Water Temperature in Cazenovia Lake, 1988 to 2022



Source: NYS Department of Environmental Conservation

CSLAP Sampling Year	Median Summer Surface Water Temperature (°C)	Median Summer Deep Water Temperature (°C)
2020	22.8	14.4
2021	22.8	14.4
2022	22.5	14.4
2023	21.0	14.0
2024	21.0	14.0

This temperature graph was generated by the NYSDEC and NYSFOLA. Each clear circle corresponds to surface water temperature and the gray circles correspond to deep water temperature. The 2024 annual CSLAP report indicated that surface and deep-water temperatures have not changed significantly in the past decade.



Source: NYSDEC and the NYS Federation of Lake Association

How does water temperature in Cazenovia Lake compare to statewide trends?

According to the NYSDEC, lakes throughout New York State are experiencing increased water temperatures and decreased duration of winter ice cover. As the air temperature increases in the coming years, lakes will experience more severe summer heat waves and decreased winter ice cover. The increase in the frequency and intensity of storm events may result in flood damage, heavier tributary flow rates, and increased erosion rates that will impact lakes in New York State.

Why is Cazenovia Lake water temperature important to monitor?

Lake water temperature is important to monitor because it affects the amount of oxygen in the water, the length of the recreation season, and the composition, range, and distribution of fish, plants, and other aquatic life. When the temperature increases, fish and other organisms that are adapted to cold water will tend to migrate to cooler waters, and species adapted to warmer water will move into previously colder habitats.

ICE DURATION ON CAZENOVIA LAKE

Ice duration on Cazenovia Lake was the subject of a research report written in 2006 by Pelle Rudstam titled, “Ice Cover in Central New York and its effects on Phytoplankton, Daphnia and Yellow Perch (Perca flavescens).” Rudstam accessed records of ice formation, melting dates, and other climate information dating back to 1839 that are currently stored at the Lorenzo State Historic Site. Additional sources of ice duration were provided by Dr. Ken Stewart at the University of Buffalo. The diaries were originally developed by members of the Cazenovia-based Ledyard family, including Philip Hart and his father. This data set is highly valuable as it is one of only 78 lakes worldwide with 100+ years of ice cover data (Sharma et al. 2022).

Cazenovia resident, Dwight (Tad) Webster, has monitored ice duration on the lake for the past couple of years. He observes the lake on a daily basis throughout the winter and records the dates of ice formation and melting using the following guidelines:

- Ice-In - This is the first date when ice forms across Cazenovia Lake from Beckwith Bay on the west side to the Notleymere dock on the east side. Notes are recorded if ice is located at both the north and south ends of the lake.
- Intermittent Thaws - When intermittent thaws occur during the winter season, relevant dates and locations are recorded such as areas that are artificially kept open by geese.
- Ice-Out - This refers to the date when the ice is fully melted between Beckwith Bay and the Notleymere dock and doesn't reappear during that winter season. The date when ice is melted from the north and south ends is also recorded.
- Ice In/Ice Out - This is the total number of days from when ice first formed on the lake to when it completely melted. It does not include the number of days that the ice melted within this period.
- Ice Duration - This is the actual number of days that ice remained on Cazenovia Lake. This total accounts for periods when the ice melted in the middle of the winter season.

Winter Season	Number of days from when ice first completely formed on the lake to when it completely melted (including periods of ice and thaw)	Ice duration - number of days of full ice coverage on the lake (not including periods of thaw)
December 22, 2022 to April 2, 2023	101 days	82 days*
January 17, 2024 to February 27, 2024	42 days	38 days

**The Cornell Biological Field Station recorded 68 days, based on their observations of open water along a section of the east shore. The lake was mostly frozen on 1/10/22 and completely frozen again on 2/1/23*.

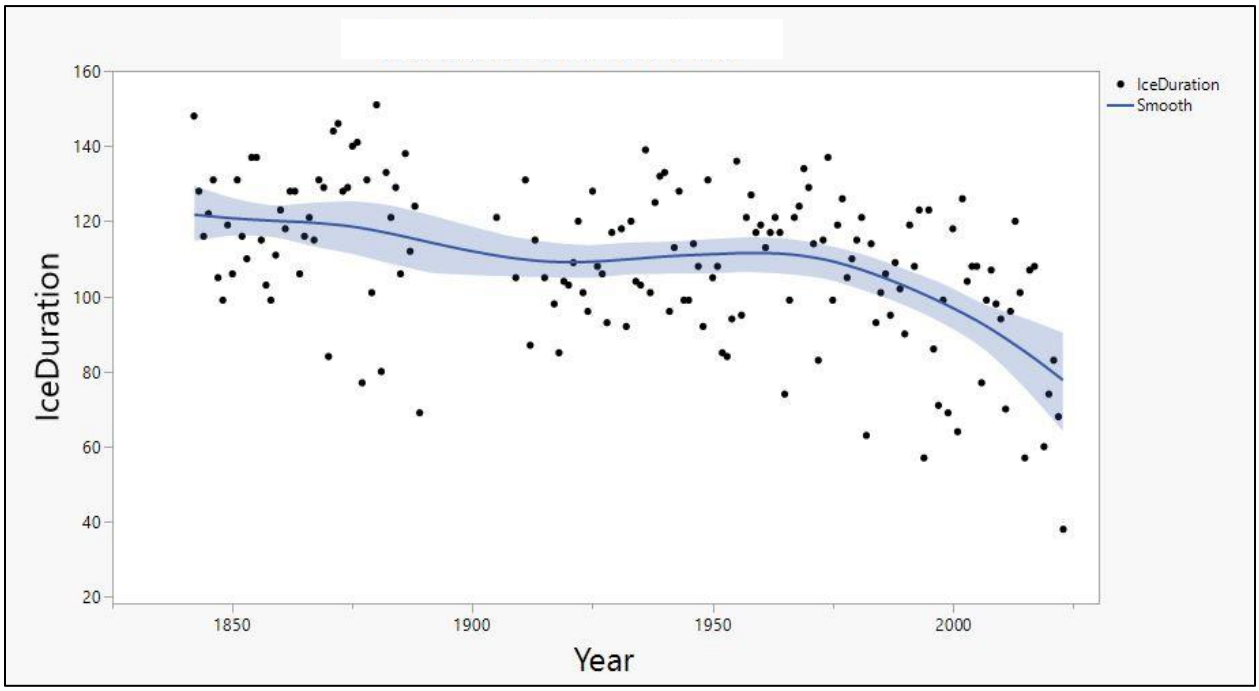
Cazenovia Lake exhibited several freeze-thaw events in the past several years. This refers to the thawing of lake ice after it had been established. Ice formed on Cazenovia Lake on January 17, 2024 and completely melted on February 27, 2024 for an "Ice-In/Ice Out" total of 42 days. However, there were several days during that period when the ice on the lake melted. The total ice duration, therefore was 38 days. This methodology for recording ice on Cazenovia Lake will continue in the coming years in order to provide a long-term trend.

Researchers at the Cornell Biological Field Station keep track of ice duration on Cazenovia Lake and Oneida Lake. Sapna Sharma, a professor at the University of Toronto, uses these data for further analyses. She reports that for Cazenovia Lake, 25% of years had multiple freeze-thaw events from 1838

to 1889 and 13% of years from 1904 to 1957. More recently, 60% of the years from 2000 to 2024 had multiple freeze-thaw events. Dr. Sharma states that the frequency of these events is expected to increase as the air temperature increases.

The following graph and current information are from a data set on Cazenovia and Oneida lakes curated by the Cornell Biological Field Station. The 2023-2024 winter had ice lasting for 38 days and is by far the lowest on record. There is a decreasing trend in ice duration by four weeks from 1843 to 2024 and the change is accelerating. This trend is also found in other long-term data sets from around the globe (Sharma et al. 2021). The decrease in ice coverage causes a change in the length and duration of thermal stratification which will, in turn, impact the release of phosphorus from the bottom sediments.

Cazenovia Lake Ice Duration, 1826 to present



Source: Rudstam, L. G., and L. Z. Almeida. 2023. Ice cover data for Oneida and Cazenovia Lakes, New York, 1826-present. Updated in 2023. Knowledge Network for Biocomplexity. (source)

Why is ice duration on Cazenovia Lake important to monitor?

Ice duration on Cazenovia Lake is important to monitor because of its influence on fisheries, recreation, and other characteristics of the aquatic ecosystem. In the next several years, researchers predict that the number of "ice duration days" on lakes will decrease as the annual mean temperature increases. Warmer water during ice-free days is expected to alter the composition and abundance of fish, plants, and other organisms, which will then impact recreational uses of the lake and the local economy.

How do local conditions compare to national observations?

The Environmental Protection Agency states that "Lakes in the northern United States are freezing later and thawing earlier compared with the 1800s and early 1900s. Freeze dates have shifted later at a rate of roughly half a day to one-and-a-half days per decade. All of the lakes studied were also found to be thawing earlier in the year, with spring thaw dates growing earlier by up to 24 days since 1905." (source)

EXTREME WEATHER

The term “extreme weather” can refer to a variety of different conditions such as winter snow and ice storms, thunder and lightning storms, strong winds, heavy precipitation, hail, nor'easters, tornadoes, and/or hurricanes. National and State environmental agencies report that storm events have become more frequent, significantly stronger, larger, and more destructive.

Extreme weather in Cazenovia and nearby communities

Areas in Madison County experienced an especially strong storm event in 2013 that met or exceeded the 100-year-storm and caused millions of dollars in damage. This resulted in a Federal Disaster Declaration for Madison and seven additional counties in New York State. The following year, a tornado hit Madison County, killing four people in the Town of Smithfield.

The National Climate Data Center reported four thunderstorm wind events in the Town of Cazenovia within a five-year span (2019, 2020 and 2022.) According to the Madison County Mitigation Plan, Cazenovia experienced a local microburst in 2020 that caused tree damage and boat damage on the lake.

What is a Microburst?

A microburst is a localized column of sinking air (downdraft) within a thunderstorm and is usually less than or equal to 2.5 miles in diameter. Microbursts can cause extensive damage at the surface, and in some instances, can be life-threatening. There are two primary types of microbursts: 1) wet microbursts and 2) dry microbursts. Wet microbursts are accompanied by significant precipitation and are common in the Southeast during the summer months.

Severe thunderstorms moved through the area during the mid-afternoon of July 16, 2024. One of the storm cells moved through Canastota, producing a tornado that touched down between the Conrail railroad tracks and Barlow Street.

The Madison County Mitigation Plan warns of the increased probability of climate-related hazard events in Cazenovia. The report states that the town’s overall vulnerability for ice storms, severe thunderstorms, wind, winter storms or hail events is high and that climate change is expected to cause an increase in weather volatility and temperature extremes.

Extreme weather in New York State

The NYS Climate Impacts Assessment reports that from 1901 to 2022, the total annual precipitation in New York State increased between 10% and 20% and that precipitation rates now vary more widely from year to year. Between 1851 and 2022, 15 storms hit New York State at hurricane strength, plus many more at tropical storm strength. The state also experiences frequent nor’easters, lake-effect blizzards, and other storms. The record for the most annual precipitation in New York State was set in 2011 and was attributed to the back-to-back extreme storm events by Hurricane Irene and Tropical Storm Lee.

Severe Thunderstorms

Severe thunderstorms are defined as storms that are capable of producing hail that is an inch or larger or wind gusts over 58 mph. Hail this size can damage property such as plants, roofs and vehicles. Wind this strong is able to break off large branches, knock over trees or cause structural damage to trees.

Why are we experiencing stronger storm events?

In New York State, thunderstorms can occur year-round but are frequently seen between July and August. Nor'easters can happen any time of year but they are most common between September and April. The NYS Climate Assessment states that the observed increases in air temperature, ocean temperature, and Great Lakes water temperature over the past century contribute to the development of stronger storms. Rising air temperatures intensify the global water cycle by causing increased evaporation and precipitation. The changing patterns of precipitation that result include more rain falling in heavy events, often with longer dry periods in between. Increased air temperatures also cause higher levels of oceanic evaporation which intensifies the water cycle. As a result, storm events around the globe are gradually becoming more extreme with stronger wind and higher amounts of rainfall (source).

Why is extreme weather important to monitor?

Storms can reduce opportunities for recreation and tourism and they threaten natural resources such as agriculture, forestry, and fisheries. Climate hazards can also increase insurance rates and threaten the financial health of entire communities.

Heavy rainfall can cause soil erosion and stormwater runoff that contaminates Cazenovia Lake, nearby tributaries, and drinking water sources with bacteria, viruses, pollutants, and sediment. This contamination makes the water unsafe to consume or use for recreation and swimming. Flooding, strong winds and heavy rainfall can close schools and businesses, damage property, increase public exposures to health risks, and disrupt critical government services and operations. Flooding and heavy rainfall can also overwhelm the local wastewater treatment plant and fallen trees from strong winds can damage utility lines, leading to power outages.

What are statewide and national extreme weather trends?

According to NYSERDA and the NYSDEC, extreme climate events such as intense storms, droughts, and heat waves are increasing in frequency and intensity across New York State and the northeastern United States. NYSERDA reports that heavy downpours in New York State have increased over the past 50 years and this trend is projected to continue, causing an increase in localized flash flooding. However, extended droughts can impact wildlife and intensify the risk of wildfire with subsequent damage to homes, property, infrastructure, and air quality.

In 2011, Hurricane Irene and Tropical Storm Lee hit the east coast back-to-back, resulting in damaging winds, extreme precipitation, and significant flooding to eight upstate New York counties. In 2012 Hurricane Sandy hit the east coast of the United States with heavy rains, strong winds, and record storm surge, causing catastrophic damage to the New Jersey shore, New York City, Long Island, and other coastal regions in the northeast. The hurricane caused over $60 billion in damages, created widespread power outages, disrupted transportation and the region's supply chain, and physically altered New York's coastline.

SNOWFALL

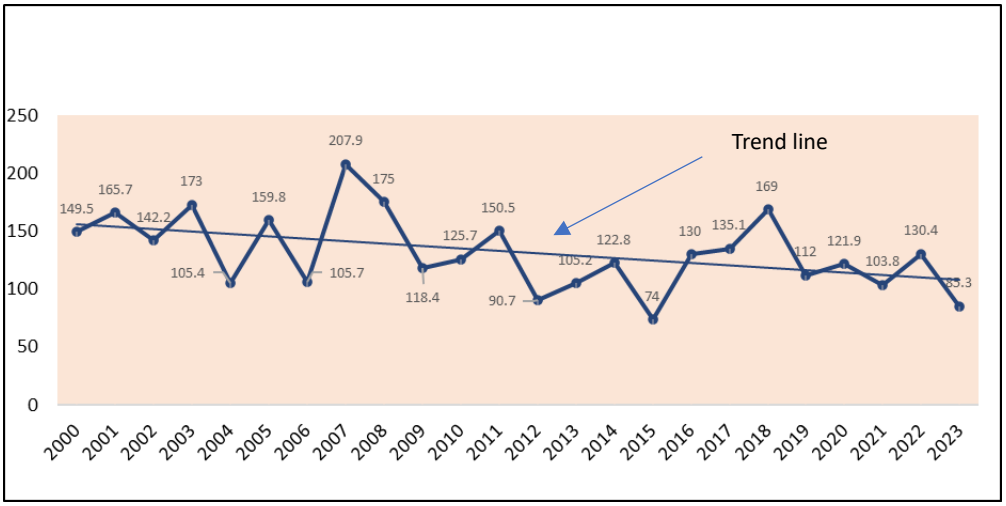
Cazenovia and neighboring communities are occasionally influenced by lake-effect snowfall during the late fall and throughout the winter season. Lake-effect snow occurs when cold air moves across the open waters of the Great Lakes. As the cold air passes over the relatively warm lake waters, warmth and moisture rise to the lowest portion of the atmosphere. When the air rises, clouds form and create a narrow band that can produces two to three inches or more of snow per hour. Wind direction and topography determine which areas in New York State are impacted.

Wind and weather patterns normally move in an easterly direction, so Cazenovia and nearby municipalities to the east of Lake Ontario are impacted the most by lake-effect snow. The greater the temperature contrast between the cold air and the warm water, the heavier the resulting lake-effect snowfall will be.

Because of the increased water temperature and reduced duration of ice cover on Lake Ontario, Cazenovia and other areas to the east and south will continue to experience heavier and more frequent lake-effect snowfall events even while the total annual snowfall declines. (*Source: Cazenovia Climate Action Plan*)

The following line graph shows a decreasing annual snowfall trend during the past 23 years in Morrisville.

Annual Snowfall (inches), Morrisville NY, 2000 - 2023



Source: National Weather Service

Why is snowfall important to monitor?

According to the NYSDEC, annual snowfall in New York State is likely to decrease. Due to increasing annual temperatures, many regions throughout the state are seeing a decrease in winter precipitation falling as snow and an increase in winter rain. The combined effect of fewer snow days, decreased snow depth, and earlier snowmelt will continue to impact natural resources and local industries such as ski resorts. Shallower snow cover influences wildlife populations, disrupts predator/prey relationships, and increases the ground freeze/thaw conditions that determine vegetative growth.

What are the statewide and national trends with snow conditions?

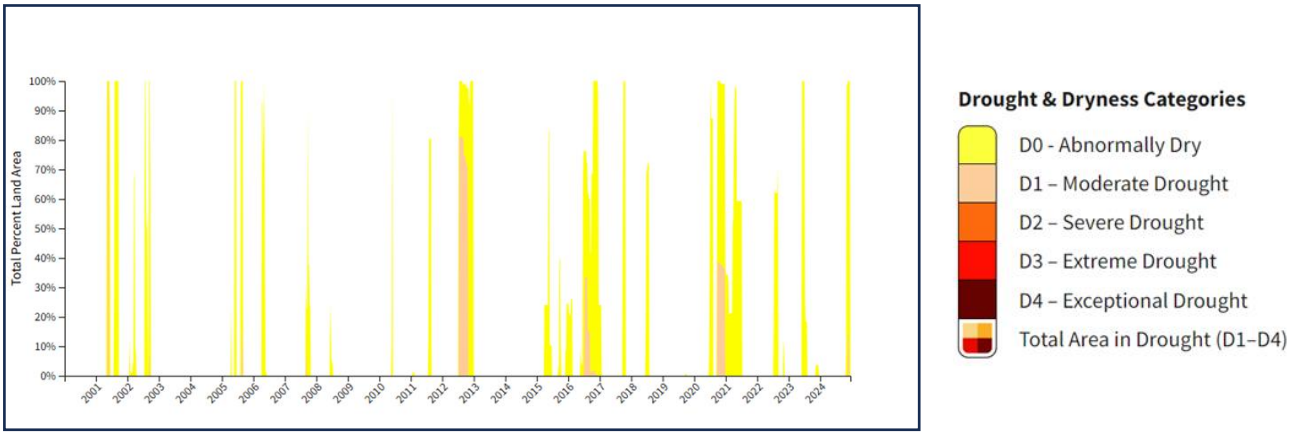
NYSDEC climate scientists predict that increased winter precipitation will continue to fall as rain rather than snow. The EPA reports that total snowfall has decreased in many parts of the country since widespread observations became available in 1930. Of all the sampling sites across the nation, the average change is a decrease of 0.19 percent per year. More than 80 percent of the stations across the contiguous 48 states have experienced a decrease in the proportion of precipitation falling as snow. Snowfall trends, however, vary by region. A few areas such as the Great Lakes region have seen modest increases and currently receive more snow per year than in the past.

DROUGHT

According to the National Drought Mitigation Center, "hydrological drought" results when precipitation rates are low. This impacts the surface and subsurface water supply, affecting streamflow, reservoir and lake levels, and groundwater. The effects of hydrological drought are usually not seen until much later than those from "meteorological and/or agricultural drought," as it takes longer for impacts—such as decreases in groundwater levels—to be seen in the hydrological system.

Drought conditions for Madison County from 2000 to 2024 were compiled by NOAA and are presented below. Most of the recent drought conditions in our region reflect periods that are "abnormally dry."

Drought Conditions in Madison County New York, 2000-2024



Source: NOAA and the National Integrated Drought Information System

Why are drought conditions important to monitor?

Drought conditions are important to monitor because dry periods impact the growth rates and yield of agricultural crops, well water availability, planting dates, fire danger, wildlife health, stream flow, and the growth rates of lawns and gardens. NYSERDA predicts that patterns of precipitation in the future will result in more rain falling in heavy events, often with longer dry periods in between.

How do local conditions compare to statewide and national trends?

New York State has abundant water resources and our streams, lakes, and coastal regions are fed by an average annual precipitation that ranges from 60 inches in the Catskills to 28 inches in the Lake Champlain Valley. However, normal fluctuations in regional weather patterns can lead to periods of dry weather. The last severe droughts in New York State occurred in the mid-1960s and again in the early and mid-1980s.

Average drought conditions across the nation have varied over time. The 1930s and 1950s saw the most widespread droughts, while the last 50 years have generally been wetter than average. The eastern United States—in particular the Midwest and Northeast—have experienced wetter conditions. In terms of scale and duration, the droughts of the 1930s Dust Bowl era remain the most extreme in the historical record (source).

KEY FINDINGS

THE BIG PICTURE: CLIMATE CHANGE IN NEW YORK STATE

Information on the following pages is from the "New York State Climate Impacts Assessment," a report that was published in February 2024 by the New York State Energy Research and Development Authority (NYSERDA.) The Assessment provides a science-based investigation of what to expect from climate change in New York State in the coming years. NYSERDA worked with leading academic institutions, science organizations, and community leaders to research and present the findings. The report provides an opportunity for decision-makers at all levels—from individual residents, businesses, and landowners to municipal and state government—to better understand the impacts of climate change and make informed choices about how to prepare for them. A condensed list of key findings from the Assessment is found below. The full report is located here.

Climate change is affecting New York State now and is projected to continue to change and affect every region of the state. Since 1901, average temperatures have increased by almost 2.6°F, and average annual precipitation has also increased. An increase in the frequency and intensity of extreme weather and climate events will strain the limits of the state's infrastructure and natural environment and the services they provide. However, it is important to recognize that these future impacts are not inevitable. If the world takes serious action to reduce greenhouse gas emissions and control future warming, the resulting climate changes could be more manageable and less costly.

Even under a lower-emissions scenario, climate change impacts across New York State will be substantial. Heat-trapping greenhouse gases that were emitted in the past have already changed the climate in ways that are causing impacts now. It is important to recognize that adapting to current and future climate change impacts is necessary to safeguard New York State.

The frequency and intensity of extreme events such as heavy rainstorms, seasonal droughts, and heat waves are projected to increase and will have serious consequences for human health, communities, infrastructure, and ecosystems. Adaptation and design strategies that consider long-term climate projections with a focus on extreme events will better address future climate risk.

Sea level along New York State's coastline has risen almost 1 foot in the past century and is projected to increase by another 1 to 2 feet by midcentury. Sea level rise will make chronic flooding more common in low-lying coastal neighborhoods, lead to intrusion of salt water into groundwater and freshwater coastal ecosystems, and yield more destructive storm surge during coastal storms.

Climate hazards and impacts can be compounded when multiple events happen near each other in time or space. A heat wave that occurs right after a storm that causes a power outage, for example, could have more serious impacts than either event on its own. Resilience efforts would benefit from planning and design that considers the impacts of multi-hazard and compounding climate events.

New York State residents and communities that are marginalized or suffer from legacies of displacement or discrimination are more vulnerable to climate impacts. Communities of color, Indigenous communities, and low-income communities—urban, suburban, and rural—often have a greater physical exposure to climate hazards. Recognition of and attention to the needs of historically underserved populations are critical elements of equitable and effective resilience planning.

Climate change will introduce new risks and opportunities into nearly every dimension of New York State's economy. Natural resource-based sectors, including forestry and fisheries, will need to contend with loss of some species and in-migration of new species adapted to warmer temperatures. The loss of snow and ice cover will profoundly affect traditional winter recreational activities and the local economies that depend on them, though warmer temperatures could increase outdoor tourism during longer spring and fall seasons. For agriculture, variable and extreme weather conditions could lead to more crop damage and livestock stress; however, warmer temperatures and longer growing seasons could increase some yields and offer new crop opportunities. The state's large finance, insurance, and real estate sectors are exposed to national and global climate change risks, including weather-related property damage claims and economic disruptions, yet there are also opportunities for businesses in New York State that incorporate climate risk into decision-making.

Climate change poses escalating health and safety risks for the people of New York State, including risks to mental health. Heat waves, floods and property loss or displacement, and extreme storms are known to have detrimental effects on both physical and mental health, especially for children, older adults, and those with pre-existing health concerns or limited access to health care.

Infrastructure provides vital services across New York State but is vulnerable to climate-related impacts. Buildings, energy, transportation, and water infrastructure can be affected by climate hazards such as heavy rain and flooding, coastal storm surge, and extreme heat. Additionally, much of the state's infrastructure, including bridges, culverts, and water infrastructure, is aging and in need of repair, which increases its vulnerability to climate change. Designing new infrastructure and upgrading existing infrastructure to incorporate climate projections can offer the dual benefits of building climate resilience for the future while providing immediate improvements in function.

Every community and every sector in New York State has the potential to contribute and to innovative climate solutions that reduce vulnerabilities, foster resilience, and enhance equity. Climate solutions will need to consider those who will be disproportionately burdened by economic disruption, such as small businesses; fiscally constrained, small, and rural municipalities and cultural institutions; frontline workers; and essential public servants including police, firefighters, and teachers. Local and state governments, schools and universities, nonprofits, museums and cultural institutions, and the private sector all play vital roles in raising climate change awareness, supporting educational and workforce

training efforts, and identifying opportunities for innovation that will be necessary to prepare New York State for a changing climate. Centering equity in adaptation and resilience actions and aligning these actions with greenhouse gas reduction strategies is crucial for a successful and sustainable climate change response.

Physical Changes in New York State: Key findings of the NYSERDA Technical Workgroup *(source)*

Many fundamental aspects of New York State's climate have already begun to change. The changes are projected to continue—and in some cases, accelerate—throughout the 21st century. This section explores observed and projected changes in a variety of physical variables that relate directly to weather and climate.

Key Finding 1: Average and maximum temperatures have increased in New York State since the early 20th century and are projected to continue to rise throughout the 21st century. The state has warmed more rapidly than the national average and winter is warming more rapidly than other seasons. Heat waves are expected to occur more often and become more intense, posing greater risks for human health, built infrastructure, ecosystems, and other sectors. New York City is projected to remain the warmest part of the state; northern regions will continue to be relatively cooler while still experiencing large increases in temperature and extreme heat.

Key Finding 2: New York State has experienced increases in total precipitation and heavy precipitation events, and these trends will continue through the end of this century. Heavy rainstorms that lead to flooding are projected to become more frequent across the state. Precipitation is expected to increase the most in winter. Lake-effect snowfall is projected to increase over the next few decades, but as temperatures continue to rise, more winter precipitation near the Great Lakes will fall as rain.

Key Finding 3: Climate change is creating conditions that will increase the frequency and severity of many types of extreme events. Several types of storms are expected to become more intense, with heavier rainfall, stronger winds, and higher storm surge along the coast driven by sea level rise. Short-term summer droughts could increase due to changing precipitation patterns and increased temperatures. Wildfires are unlikely to become much more common within New York State due to climate change, but air quality impacts from large fires elsewhere in North America could increase in the future.

Key Finding 4: Sea surface temperature, sea level, and coastal flooding are increasing along New York State's coast. Sea surface temperatures are rising more rapidly in the state than the global average. Sea level along New York's coastline has risen almost 1 foot in the past century and is projected to increase by another 1–2 feet by mid-century, making chronic flooding more common in low-lying coastal neighborhoods. Ocean water is also becoming more acidic as it absorbs excess carbon dioxide from the atmosphere, although stormwater runoff currently has a larger effect on acidity in New York's coastal waters.

Key Finding 5: New York State's lakes and rivers have experienced increased water temperature, fluctuating water levels, and decreased ice cover, and these changes are expected to intensify in a warmer, wetter future. Lakes are projected to experience more severe summer heat waves and decreased winter ice cover as temperatures rise in the coming decades. The Great Lakes could experience greater year-to-year variability in water levels, driven by periods of drought and extreme precipitation. Flood intensity and damages are expected to increase with extreme rainfall and broader changes in streamflow.

KEY FINDINGS FOR CAZENOVIA AND NEIGHBORING COMMUNITIES

- NYSERDA reports that since 1901, the average temperature in New York State has increased by almost 2.6°F. Long-term data recorded by the weather station at SUNY Morrisville and the NOAA National Centers for Environmental Information in Madison County show similar increases in air temperature trends.
- The USDA Plant Hardiness Zone Map for Cazenovia changed from 5a in 2012 to 5b in 2023, reflecting a temperature change of +4°F. The zone map is based on the average annual extreme minimum winter temperature.
- NYSERDA reports that average annual precipitation has increased in NYS. Long-term trends for Madison County reflect similar results but trends in Morrisville from 2012 to 2024 document a decrease in precipitation.
- Precipitation information in Cazenovia could not be used because of a faulty rain gauge on the Cazenovia weather station.
- Surface and bottom water temperatures in Cazenovia Lake have been recorded since 1988 through the Citizens Statewide Lake Assessment Program (CSLAP.) These annual reports show very little change has occurred in water temperature in the past several decades.
- The duration of ice cover on Cazenovia Lake is decreasing. In addition to local record-keeping, ice duration on the lake has been recorded by the Cornell Biological Field Station. The 2023-2024 winter had ice lasting for 38 days, the lowest on record. Cornell researchers report a decreasing trend in ice duration by four weeks from 1843 to 2024 and the change is accelerating. This data set is highly valuable as it is one of only 78 lakes worldwide with 100+ years of ice cover data.
- NYSERDA predicts that the frequency and intensity of extreme weather events will continue to increase and will have serious consequences for human health, communities, infrastructure, and ecosystems. Adaptation and design strategies that consider long-term climate projections with a focus on extreme events will better address future climate risks for Cazenovia.
- The Madison County Mitigation Plan warns of the increased probability of climate-related hazard events in Cazenovia. The report also states that the Town's overall vulnerability for ice storms, severe thunderstorms, wind, winter storms or hail events is high and that climate change is expected to cause an increase in weather volatility and temperature extremes.
- According to the National Weather Service, annual snowfall rates in Morrisville have trended downward in the past 23 years.
- Cazenovia occasionally experiences lake-effect snow during the late fall and winter months. Because of the increased water temperature and reduced duration of ice cover on Lake Ontario, Cazenovia and other areas to the east and south of the lake will continue to experience heavier and more frequent lake-effect snowfall events even while the total annual snowfall declines.
- There have been no significant trends in drought conditions in Madison County in the past 23 years.

ON THE BRIGHT SIDE: A LOCAL RESPONSE TO CLIMATE CHANGE

The list found below provides a brief summary of the impressive reports, actions, and progress made to address climate change in the Town and Village of Cazenovia.

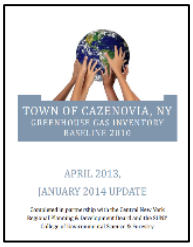
- The **Town and Village of Cazenovia** have adopted the Climate Smart Communities (CSC) pledge. This means that our communities are working on a shift to clean, renewable energy sources while implementing climate-smart land use policies and projects that make our community more resilient to climate change.

- The **Town and Village of Cazenovia** became bronze level Climate Smart Communities in 2020. The municipalities also launched HeatSmart campaigns that continued through October of 2022.

- The **Town of Cazenovia** continues to prioritize the preservation of prime farmland while recognizing the importance of maintaining NYS goals and in support of our Cazenovia's Climate Smart Community designation.

- Energy use data for the **Town of Cazenovia** municipal buildings is recorded each year. Annual records can be viewed on the town website. Village data can be viewed at https://villageofcazenovia.com/public-works/.

- The **Town of Cazenovia** updated the Greenhouse Gas Emissions (GHG) Inventory in 2024. The inventory was developed to audit activities that contribute to the release of emissions. Information from the inventory is used to guide policy decisions and energy improvements, inform sustainability projects, and build public support for broader sustainability initiatives.



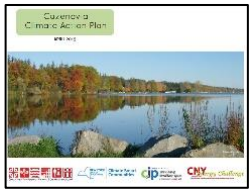
- The **town** supports policies that reduce our carbon footprint while encouraging climate change adaptation. Continued focus is on implementation of green infrastructure, open space preservation, energy efficiency retrofits, and the use of low and zero-carbon transportation options.

- The **Town of Cazenovia** has made significant progress to preserve water quality in Cazenovia Lake by designating the watershed as a Critical Environmental Area and by supporting the Cazenovia Lakefront Development Guidelines.

- The **Town and Village of Cazenovia and the Town of Nelson** have received the Clean Energy Communities designation and each municipality received $60,000. With this funding, the Town of Cazenovia purchased an electric vehicle (EV) pickup truck and the Town of Nelson is installing solar panels. The Village will install heat pumps at the fire department, police department, and Burton Street Park as well as EV charging stations at Burton Street and Lakeland Park. They will also purchase an electric utility cart for landscaping and tree watering.

- The **town and village** are protecting the quality and quantity of groundwater that recharges our local aquifer. An area that is zoned as a Wellhead Protection Overlay requires development restrictions to reduce negative impacts from pollution.

- A Climate Action Plan was developed in 2015 as a partnership between the **Town, the Village, several local organizations, and the CNY Regional Planning and Development Board**. The report provides a comprehensive list of recommendations to improve energy conservation and to reduce the local impacts of climate change such as flooding and stormwater runoff to the lake during strong storm events.



- The **Village of Cazenovia** converted its streetlights to LED light fixtures in 2017 for energy and cost saving benefits. The lights were also upgraded to LEDs in New Woodstock in 2019. The street light conversion coincides with the Climate Action Plan goals and also enhances our ability to compete for state grants and funding.

- The **Village** installed an electric vehicle charging station in Lakeland Park in 2017 and replaced the heating, ventilation and air conditioning (HVAC) at the village office and the fire station with more efficient units.

- The **Town of Cazenovia** insulated the highway garage in 2017 to improve energy efficiency. The Town also purchased a weather station and installed it on the roof at the highway garage in January 2022. It records local conditions such as precipitation, temperature and wind speed.

- The **Town of Cazenovia** received a Climate Smart Communities grant in 2022 to implement flood mitigation. The grant was awarded in response to the increasing frequency and intensity of storm events.

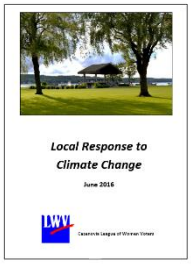
- The **Village of Cazenovia** is a Tree City USA. The Village Tree Commission celebrates local Arbor Day and Earth Day events at which time members plant and maintain trees and bushes at Creekside Park, Lakeland Park, and at several locations throughout the village.

- A solar array has been installed at the **village water plant**.

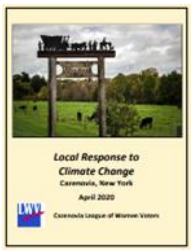
- The **Cazenovia Lake Association** is working with the SUNY College of Environmental Science and Forestry (ESF) to study harmful algal blooms and monitor the introduction of aquatic invasive species.

- Each year**, Cazenovia Lake Association** volunteers work with the Citizens Statewide Lake Assessment Program (CSLAP) to record temperature and additional conditions that are impacted by climate change.

- A **Lake Association** "Users Guide for Shoreline Homeowners" was written to provide recommendations on ways to prevent erosion during storm events.



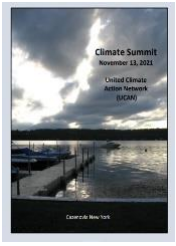
- In 2016 the **Cazenovia League of Women Voters** evaluated how much progress had been made since the Climate Action Plan was completed. The Local Response to Climate Change 2016 contains information on what recommendations had been implemented and what plans were in place for the coming year.



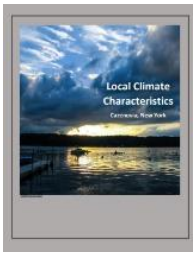
- To honor the 50th anniversary of Earth Day, the **Cazenovia League of Women Voters** worked with the Town and Village and several community groups to evaluate projects to address climate change. The Local Response to Climate Change 2020 report contains a summary of the findings.

- The **United Climate Action Network (UCAN)**, a grassroots organization in New York's 22nd Congressional District, was formed in Cazenovia in 2017. The group advocates for environmentally sustainable policies from local, state, and national officials and engages with businesses, schools, and other local community groups to advance environmental literacy and sustainable practices.

- **UCAN** sponsors Climate Summits, Earth Week celebrations, and energy fairs in Cazenovia to bring awareness about the climate crisis and actions that will help mitigate our environmental impact. Volunteers also set up table displays at weekend Farmers Markets, produce an educational newsletter, and have developed a strategic five-year plan. A UCAN report, generated in 2021, provides a summary of past accomplishments and future climate goals for each of the seven UCAN committees. UCAN committees include Agriculture, Renewable Energy, Recycling, Youth, Trees, Water, and Advocacy.



- Historic trends for climate characteristics are presented by **UCAN**. A team of local and statewide partners document long-term trends of climate conditions such as air temperature, lake water temperature, storm events and ice duration on the lake. The research is designed to help the Cazenovia community prepare for future changes in climate patterns, to help municipal representatives as they determine what projects to prioritize, and to serve as an educational tool for students and adults.



- In honor of Earth Week 2020, the **UCAN Tree Task Force** worked with volunteers from the Cazenovia College Environmental Club and other local groups to plant 220 trees at the Stone Quarry Art Park.

- The **UCAN Water Resources Task Force** organized a team of community volunteers in 2021 and 2022 to collect and test samples for chloride concentration. Supplies and training were provided through Salt Watch, a program of the **Izaak Walton League of America.** The results were used to evaluate the level of salt that is applied to local roads during the winter.

- The **Izaak Walton League's** CNY Chapter developed an interactive environmental education program in collaboration with the Cazenovia Public Library and the SUNY College of Environmental Science and Forestry. College students deliver hands-on nature programs to area youth in the field and at the library.

- The **Cazenovia School District** is taking a holistic approach that encompasses both energy and technology, while paving the way for a more eco-conscious and efficient educational experience. The district is undergoing a transformation with hardware and infrastructure upgrades in order to enhance educational capabilities and increased energy efficiency.

- The **Cazenovia School District** adopted the Energy Performance Contract and transitioned to LED lighting and controls for substantial electricity cost savings. HVAC controls have also been upgraded to include night setbacks, optimizing heating and cooling operations.

- The **School District** is also working on Net Zero projects by focusing on insulating and sealing walls, windows, doors, and roofs to promote energy conservation while providing a more comfortable and environmentally conscious learning environment.

- The **Madison County Soil and Water Conservation District** encourages local farmers to implement best management practices (BMPs) that are designed to reduce nutrient and sediment loading to Chittenango Creek and Cazenovia Lake. BMPs include nutrient management to reduce synthetic fertilizer usage, restricted/designated restricted/designated livestock laneways, controlled stream crossings for livestock, improved fencing parameters, alternative livestock watering systems, improved stewardship of existing pasturelands, and selecting and implementing better vegetative cover.

- The **Cazenovia Public Library** converted their lights to LED in 2017 and 2018. In 2016 new LED strip lighting was also installed in the Museum cases.

- Since 2021, **the Library** has partnered with Neighborhood Forest, an organization that sends free trees to school children across the country. Over 200 young trees have been distributed to young community members.

- **The Library's** art vault and archive room underwent a complete renovation in 2021-2022 which included an updated air conditioning/humidity control unit.

- **The Library** is currently under contract with a local firm to review the HVAC systems throughout the library. The goal is to update the system to meet or exceed current standards and recommendations for public spaces.

- In 2017, **the library** developed a partnership with the Izaak Walton League to implement the Young Naturalist program. After a three-year hiatus, the program was revived in 2024. The library's Youth Services coordinator currently sits on an advisory board for the Young Naturalist's program.

- In 2023, **Stone Quarry Art Park** converted its historic Dorothy Riester House and Studio (Hilltop House) from oil and propane to electric heat pumps.

- In 2024, **Stone Quarry Art Park** launched a three-year project to improve the health of its forest stands and restore native plants to its hedgerows.

- The **Cazenovia Preservation Foundation (CPF)** preserves over 3,800 acres of land in and around Cazenovia, including 3,100 acres of working agricultural land. Most of these lands are protected by perpetual conservation easements which ensure that the conservation provisions remain in place, even when the land changes hands. CPF owns 436 acres of land outright, protecting forestland, wetlands, and other open space, while providing 14 miles of year-round public access hiking trails.

- In 2021, **CPF** began to manage its Burlingame Road Meadow as habitat for field nesting bird species. In 2024, there were at least six nesting pairs of bobolinks identified in that location.

- **CPF** updated its Strategic Land Conservation Plan in 2022. The plan prioritizes projects that protect Cazenovia Lake and Chittenango Creek, areas that are identified as important habitat areas and corridors in The Nature Conservancy's Resilient and Connected Network, and farmland with prime soils and soils of statewide importance.

- In 2024, **CPF** was awarded a Forest Conservation Easements for Land Trust Grant through the Land Trust Alliance in partnership with the NYSDEC to permanently protect approximately 470-acres of forestland in the southeastern portion of Cazenovia.

RESOURCES

- NYSERDA's New York State Climate Impacts Assessment
- Cazenovia Climate Action Plan
- Town of Cazenovia Comprehensive Plan 2030
- NOAA National Weather Service
- NOAA National Centers for Environmental Information
- NYSDEC Climate Change Effects and Impacts
- NYSDEC Impacts of Climate Change in New York
- 2023 National Climate Assessment
- NYSDEC Observed and Projected Climate Change in NYS
- Madison County Multi-Jurisdictional Hazard Mitigation Plan

Saltman

Kite Festival, Stone Quarry Hill Art Park