



# Climate Summary

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## *Working toward Climate Resilience*

### **A Summary Prepared for the Town of Copake**

*March 2014*

This summary was completed to provide information for land-use planning and decision-making as requested by the Town of Copake. It identifies historic climate trends and introduces future projections and strategies to address the climate hazards most likely to affect Hudson Valley communities. The summary is based on information currently available to the New York State Department of Environmental Conservation (NYSDEC) and its partners.

New York's changing climate presents new challenges and opportunities for communities in the state. It is vital for local decision-makers to understand their community's vulnerability to a changing climate and take steps to increase their climate resilience. We commend Copake for taking the Climate Smart Communities pledge.

Central to the information in this document is the concept of **Climate Resilience**—the ability to manage climate risks, respond productively as climate changes, and recover quickly from extreme events. Our climate resiliency can be greatly enhanced by protecting and augmenting natural systems, like green and natural infrastructure.

To further support land-use and conservation planning efforts in the Town of Copake, this summary can be supplemented by complementary summaries of water resources and natural areas and habitats. These summaries are also being provided to Copake.

This document was created by the New York State Department of Environmental Conservation's Hudson River Estuary Program and Cornell University's Water Resources Institute in collaboration with DEC's Office of Climate Change. The [Estuary Program](#) protects and improves the natural and scenic Hudson River watershed for all its residents. It was created in 1987 and covers the river from the Troy dam to upper New York harbor.



Cornell University

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The Estuary Program is funded by the New York State Environmental Protection Fund. The New York State [Water Resources Institute](#) at Cornell University seeks to foster an understanding of the critical connections between people and the state's waters. It also seeks to empower communities to make informed decisions about land use that minimize impacts to water resources, including drinking water supplies, floodplains, and aquatic habitats.

The New York State Office of Climate Change was created to lead development, in concert with other DEC programs and New York State agencies, of programs and policies that mitigate greenhouse gas (GHG) emissions and help New York communities and individuals adapt when changes in climate cannot be avoided.

The information provided in this document was taken from the following:

- *The NYS 2100 Commission Report*  
(<http://www.governor.ny.gov/assets/documents/NYS2100.pdf>)
- *Responding to Climate Change in New York*  
(<http://goo.gl/Ug5LCb>)
- *The DEC Climate Smart Communities Program*  
(<http://www.dec.ny.gov/energy/50845.html>)

Additional information about climate change in the Hudson Valley can be found on NYSDEC's webpages, starting with <http://www.dec.ny.gov/lands/39786.html>. For the latest funding, events and opportunities, sign up for our *Climate Resiliency in the Hudson Estuary* newsletter: [https://public.govdelivery.com/accounts/NYSDEC/subscriber/new?topic\\_id=NYSDEC\\_147](https://public.govdelivery.com/accounts/NYSDEC/subscriber/new?topic_id=NYSDEC_147)

***The core mission of the Hudson River Estuary Program is to:***

- *Ensure clean water*
- *Protect and restore fish, wildlife and their habitats*
- *Provide water recreation and river access*
- *Adapt to climate change*
- *Conserve world-famous scenery*

For more information about this summary or the Estuary Program, please contact:

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*Website: <http://www.dec.ny.gov/lands/4920.html>*

## Introduction

Hudson Valley communities could benefit from improved planning, response and recovery relevant to climate events, as highlighted by the impacts suffered by Hurricanes Sandy (2012) and Irene (2011) and Tropical Storm Lee (2011). Using the latest studies from New York State, this document presents Copake’s primary climate hazards and the risks and opportunities they present.



## Climate Hazards in New York State

Three significant climate hazards are expected to affect New York State residents during the 21st century: *increasing temperatures, rising sea level, and changing precipitation patterns*. Rising sea level is not a hazard for Copake but it will affect the Hudson Valley on a regional scale and could lead to indirect impacts on the Town.

## Increasing Temperatures

Annual average temperatures have been steadily increasing in New York State, posing new challenges to many of our industries, including agriculture, snow sports and more. Since 1970, temperatures have been increasing at a rate of 0.6 degree Fahrenheit (F) per decade. In winter months, this warming effect is even greater, at 1.1 degrees F per decade.



Since 1970, temperature increases in New York have surpassed national and global averages:

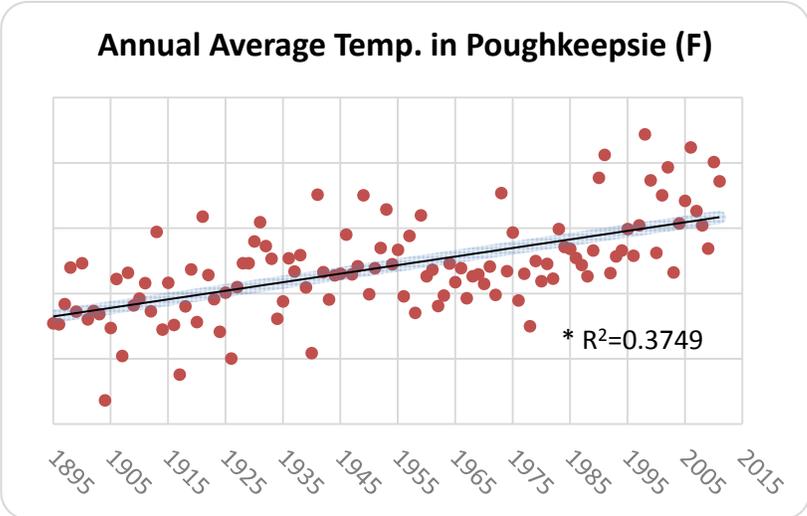
- Global annual average temperature up nearly **1°F**
- U.S. annual average temperature up **1.8°F**
- New York annual average temperature up nearly **2°F**
- New York winter temperatures up almost **5°F**

### AIR TEMPERATURE PROJECTIONS FOR EAST OF THE HUDSON

	Baseline 1971-2000	2020s	2050s	2080s	2100
Annual average air temperature	50°F	51.5 - 53°F	53 - 55.5°F	54 - 58°F	54.5 - 59.5°F
Increase in annual average	-	1.5 - 3.0°F	3.0 - 5.5°F	4.0 - 8.0°F	4.0 - 9.5°F

Local evidence from Poughkeepsie’s water treatment plant illustrates the two-degree increase in the area’s annual average temperature (see chart at right).

Models project an additional 3 to 5.5 degrees F will be added to the annual average temperature by 2050 in counties east of the Hudson estuary, including the Town of Copake; 4 to 9.5 degrees by 2100.



*Intense precipitation can lead to flooded roads and unsafe driving conditions.*

### Changing Precipitation Patterns

Precipitation has become more variable and extreme, whereas total rainfall has changed only marginally.

**Heavy downpours increased 74%** between the periods of 1950-1979 and 1980-2009 in the Northeast.

Projections indicate total annual precipitation should increase only slightly. Overall in New York State, we can expect more dry periods intermixed with heavy rain and decreased snow cover in winter. In the future, Copake can expect the same.

## PRECIPITATION PROJECTIONS FOR EAST OF THE HUDSON

	Baseline 1971-2000	2020s	2050s	2080s	2100
<b>Total annual precipitation</b>	51"	51" - 53.5"	51" - 53.5"	53.5" - 56"	51" to 56"
<b>% Increase in annual precipitation</b>	-	0 - 5%	0 - 5%	5% - 10%	0 - 10%
<b># Days with precipitation &gt; 1"</b>	10	10 - 11	10 - 11	10 - 12	*
<b># Days with precipitation &gt; 2"</b>	1	1 - 2	1 - 2	1 - 2	*

\*No data available

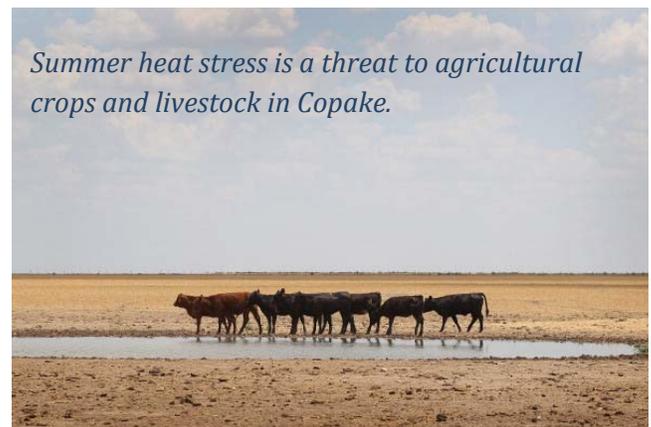
## Climate Risks and Opportunities for Copake

Increasing temperatures and changing precipitation will lead to climate risks that Copake can start preparing for now. Building climate resiliency presents opportunities for adapting infrastructure, institutions, and communities as climate changes to respond productively and recover quickly from extreme events. Resiliency also depends on maintaining or enhancing natural systems and the vital benefits they provide communities, such as clean air and water, wildlife habitat, and natural flood protection. Effective conservation of natural areas for climate resiliency occurs across property and political boundaries and requires a broader view of natural landscapes. Conducting a natural resource inventory is a step toward identifying important natural areas in a town and considering them in local planning processes. See the accompanying Habitat Summary and Water Resource Summary for more discussion on managing and conserving important habitats and water resources.

The section below introduces major climate risks and opportunities for action in Copake. These suggestions are from DEC’s Climate Smart Communities guidelines. For more information and guidance on taking action, refer to the list of resources at the end of this document.

### RISK: Heat Waves

Increasing annual temperatures will lead to more frequent, intense, and long-lasting heat waves during the summer, posing a serious threat to human health. This will also impact agriculture as heat stress reduces crop yield and livestock productivity. Around one third of Copake’s land is designated agricultural, making heat a significant climate risk for the Town. The number of days above 95 degrees is expected to more than triple by 2050 in communities east of the Hudson and rise dramatically by 2080, while days below freezing will steadily decrease.



### HEAT WAVE PROJECTIONS FOR EAST OF THE HUDSON

	Baseline 1971-2000	2020s	2050s	2080s	2100
# Days per year above 90°F	10	14 - 20	20 - 35	26 - 60	*
# Days per year above 95°F	1	2 - 4	3 - 10	6 - 25	*
# Heat waves per year	2	2 - 3	3 - 5	4 - 8	*
Average # days of each heat wave	4	4 - 5	4 - 5	5 - 6	*
# Days per year ≤ 32°F	134	128 - 139	111 - 127	90 - 120	*

\*No data available

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## OPPORTUNITIES

**Protect agricultural resources** by ensuring enough water resources are available to satisfy crops and livestock under a warmer climate. Consider incorporating crops that perform well under more extreme conditions.

**Develop and implement a community heat emergency plan** for the municipality or in collaboration with neighboring municipalities. This plan should identify vulnerable populations and existing resources and networks, and outline a course of action during a high-heat event.

**Increase shading in public spaces with trees and other structures.** During times of extreme heat, public spaces should provide relief for residents and animals, especially those that do not have access to air conditioning.

**Expand cooling centers.** To reduce hospitalization rates and deaths associated with heat waves, make sure the community has sufficient cooling centers with multiple modes of transit to and from these locations.

## RISK: Short-term Drought

Soil moisture will likely decrease with warmer, less snowy winters, fewer steady rainfalls, and higher evaporation from increased temperatures. This could lead to more frequent and intense periods of short-term drought, threatening local drinking water supplies, agricultural production and aquatic ecosystems. Drought may be of particular concern for Copake given its abundance of low well yields and high percentage of agricultural land.

## OPPORTUNITIES

**Implement a water conservation and reuse program.** Outline and implement best practices and technologies to decrease water use and increase rainwater harvesting. Encourage xeriscaping—landscaping that requires little or no irrigation.

**Maintain existing natural infrastructure.** Protecting existing forested areas and wetlands will contribute to groundwater infiltration, which can decrease the extent of drought. Use the accompanying Habitat and Water Resource summaries, along with town plans and local knowledge, to help identify important and healthy natural infrastructure.

**Implement a source-water protection program.** Identify, map and protect local water supply sources and their watersheds or recharge areas.

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## RISK: Flooding

Increased intense precipitation could lead to more frequent flooding along the Roeliff Jansen Kill in Copake, potentially threatening waterfront assets such as homes, businesses, sewage infrastructure, roads and more. Copake residents in the hamlet area suffered flooding during Hurricane Irene in 2011. Survey respondents from the Comprehensive Plan design agreed that the town should take an active role in preventing flooding.

Stormwater runoff is of particular importance in Copake, where there are areas developed beyond recommended density thresholds (NY Rural Water Association). Copake currently contains over \$1 million in vulnerable property represented by 53 policies in the National Flood Insurance Program. To date in Copake, there have been over \$230,000 in total flooding claims under this program. Flooding and stormwater management are listed as top priorities in the Healthy Natural Environment Goal of Copake's Comprehensive Plan. To manage flood risk over time, the town could consider projected flooding in future development proposals.



There is a very strong relationship between land use and flooding that is essential to addressing increased flood risk from climate change along streams. Healthy watersheds, including both land and water resources, can reduce erosion and flooding impacts, minimize public infrastructure costs, and be more resilient to climate change—all ecosystem services that directly benefit our communities and cost less than the alternatives. For more information on natural systems contributing to stormwater management and flood protection in Copake, see the accompanying Water Resource and Habitat summaries.

## OPPORTUNITIES

**Incorporate future flooding into municipal planning.** Adopt a floodplain protection or management ordinance, and require waterfront and streamside developers to consider stronger storms over the lifespan of projects.

**Use natural vegetated buffers to protect assets from flood risk.** Enhance or create natural vegetated shoreline and stream buffers to protect natural areas for flood mitigation and wildlife habitat. Consider facilitating a managed retreat from flood-prone areas over the long term and allowing for the migration of habitats as the floodplain evolves. Please see the sections on riparian areas in the Water Resource and Habitat Summaries.

**Right size culverts.** Many communities rely on culverts that are undersized and prone to cause flooding, especially given the trend of more intense precipitation. Culverts should be inspected and re-sized to adequately handle water flows and reduce flooding.

**Integrate changes to flooding risk into emergency planning.** Incorporate strategies for managing flooding into the county's multi-hazard mitigation plan.

**Promote best practices and technologies to address flooding.** Promote flood prevention strategies, such as minimizing impervious surface areas and promoting the use of green infrastructure practices or natural features

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that help manage stormwater. See the accompanying Water Resource Summary for a discussion of post-construction stormwater management and green infrastructure.

**Identify and conserve natural areas contributing to stormwater management.** In addition to natural vegetated stream buffers, forests, wetlands, and other natural areas are critical to managing stormwater on the landscape by intercepting rain and snowfall, reducing and slowing runoff, and contributing to groundwater recharge. See the accompanying Water Resource and Habitat summaries for more information on how natural areas contribute to stormwater management and flood protection, and for maps of streams, floodplains, riparian forests, large forests, and wetlands in Copake.

## What Can I do Next?

**Tap into the Climate Smart Community network.** Copake has taken the proactive step of becoming a Climate Smart Community, opening more opportunity to receive state assistance and resources to reduce greenhouse gas emissions, save energy and improve climate resiliency. Later this year you will be eligible for technical assistance as the program transitions to an actual certification. To learn more, please contact:

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Stay in touch with the Hudson River Estuary Program by visiting our Climate Resilience webpage (<http://www.dec.ny.gov/lands/39786.html>) and subscribing to our *Climate Resiliency in the Hudson Estuary* newsletter ([https://public.govdelivery.com/accounts/NYSDEC/subscriber/new?topic\\_id=NYSDEC\\_147](https://public.govdelivery.com/accounts/NYSDEC/subscriber/new?topic_id=NYSDEC_147)).

For more information on the topics discussed in this summary, please see the following sources:

- NYSDEC Climate Smart Communities: <http://www.dec.ny.gov/energy/50845.html>
- Climate Program under the Hudson River Estuary Program: <http://www.dec.ny.gov/lands/39786.html>
- NYSDEC Office of Climate Change: <http://www.dec.ny.gov/energy/44992.html>
- NYC's Climate Resilience Planning: [http://www.nyc.gov/html/dcp/html/sustainable\\_communities/sustain\\_com4.shtml](http://www.nyc.gov/html/dcp/html/sustainable_communities/sustain_com4.shtml)
- Conserving Natural Areas and Wildlife in Your Community: <http://www.dec.ny.gov/lands/50083.html>
- The NYS 2100 Commission Report (<http://www.governor.ny.gov/assets/documents/NYS2100.pdf>)
- Responding to Climate Change in New York (<http://goo.gl/Ug5LCb>)