Putnam County:

Climate Change Adaptation & Resilience Plan

Final Draft Report

November 2026



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Special thanks to the residents of Putnam County, for their willingness to contribute to this process.

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Local Government Commitment

PUTNAM COUNTY LEGISLATURE

Resolution #213
Introduced by Legislator: Greg Ellner on behalf of the Physical Services Committee at a Regular Meeting held on September 2, 2025.

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APPROVAL - PUTNAM COUNTY'S PROPOSED VULNERABILITY ASSESSMENT AND CLIMATE ADAPTATION PLAN

WHEREAS, Putnam County pledged to take part in and has become bronze certified in the NYS DEC Climate Smart Communities Certification Program that includes as an action item the preparation of a Vulnerability Assessment and Climate Adaptation Plan; and

WHEREAS, free technical assistance is available to support the development of these documents (PE7 Action: Climate Vulnerability Assessment and PE7 Action: Climate Adaptation Plan) from the Hudson Valley Regional Council (HVRC) through a NYS DEC Climate Smart Communities Coordinator Services contract; and

WHEREAS, the Climate Smart Task Force, comprised of municipal officials and environmental volunteer community leaders, will collaborate with HVRC in the development of a combined Vulnerability Assessment and Climate Adaptation Plan, review drafts, and provide valuable feedback on iterations that result in final draft; and

WHEREAS, the Climate Smart task force will provide an opportunity for public input and comment on the draft report; and

WHEREAS, the Climate Smart task force will present a summary of the vulnerability results and adaptation plan to the County legislature for consideration of adoption; now therefore be it

RESOLVED, that the County Executive, together with the Putnam County Legislature, support the County's undertaking of the combined Vulnerability Assessment and Climate Adaptation Plan; and be it further

RESOLVED, that the County Executive, together with the Putnam County Legislature, supports, approves and authorizes the Department of Planning, Development and Public Transportation to submit these documents to the NYS DEC Office for Climate Change for consideration of points toward Climate Smart Communities certification for Putnam County; and be it further

RESOLVED, that this resolution shall take effect immediately.

BY POLL VOTE: ALL AYES. CARRIED UNANIMOUSLY.

APPROVED

9/5/25

COUNTY EXECUTIVE **DATE**

State of New York
ss:
County of Putnam

I hereby certify that the above is a true and exact copy of a resolution passed by the Putnam County Legislature while in session on September 2, 2025.

Dated: September 4, 2025

Signed: Diane Schonfeld

Diane Schonfeld
Clerk of the Legislature of Putnam County

Key Terms

The following key terms list uses the definitions compiled by the NYS DEC CCARP Template. Definitions are direct quotes.

Adaptation (climate change): In human systems, the process of adjustment to actual or expected climate and its effects to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects (IPCC 2022).

Incremental adaptation: Adaptation that maintains the essence and integrity of a system or process at a given scale (IPCC 2022).

Transformational adaptation: Adaptation that changes the fundamental attributes of a social-ecological system in anticipation of climate change and its impacts (IPCC 2022).

Adaptive capacity: The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences (IPCC 2022).

Adaptive management: A process of iteratively planning, implementing, and modifying strategies for managing resources in the face of uncertainty and change. Adaptive management involves adjusting approaches in response to observations of their effect and changes in the system brought on by resulting feedback effects and other variables (IPCC 2022).

Climate change: Changes in average weather conditions that persist over several decades or longer. Climate change encompasses both increases and decreases in temperature, as well as shifts in precipitation, changes in frequency and location of severe weather events, and changes to other features of the climate system (Grade et al. 2023).

Climate change effects: The physical effects of anthropogenic (human-caused) climate change, including changes in average temperatures, precipitation rates, sea level rise, and ocean temperatures.

Climate change impacts: The impacts experienced by a human, natural system, or human-made system because of climate variation including physical changes in average conditions or

extreme weather. Examples of climate change impacts include flooding of homes or ecosystem changes (Vogel et al. 2016).

Disadvantaged communities: Those that bear the burdens of negative public health effects, environmental pollution, impacts of climate change, and possess certain socioeconomic criteria, or communities comprising high concentrations of low- and moderate-income households. To ensure New York State's investments and actions benefit all communities and address climate inequities, the State's Climate Justice Working Group adopted criteria to identify certain census tracts and households as disadvantaged communities.

Drought: An exceptional period of water shortage for existing ecosystems and the human population (due to low rainfall, high temperature and/or wind) (NOAA 2023).

Ecosystem services: Ecological processes or functions having monetary or non monetary value to individuals or society at large. These are frequently classified as (1) supporting services, such as productivity or biodiversity maintenance, (2) provisioning services, such as food or fiber, (3) regulating services, such as climate regulation or carbon sequestration, and (4) cultural services, such as tourism or spiritual and aesthetic appreciation (IPCC 2022).

Exposure: The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected (IPCC 2022).

Extreme heat: Temperatures that are much hotter and/or humid than average. Because some places are hotter than others, extreme heat depends on what is considered average for a particular location at that time of year (CDC 2023).

Extreme cold: Individual days with a maximum temperature at or below 32°F or below 0°F; threshold used depends on the region within the state (Lamie et al. 2024).

Extreme weather: A period of abnormal weather conditions that can negatively affect humans, natural and human-made resources. Extreme weather is used in this report as an umbrella term referring to a combination of extreme heat, extreme cold, extreme precipitation, or extreme wind.

Flood or flooding: The overflowing of the normal confines of a stream or other water body or the accumulation of water over areas that are not normally submerged (IPCC 2021).

Flash flood: A flood caused by heavy or excessive rainfall in a short period of time, generally less than six hours. Flash floods can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance, after a levee or dam has failed or after a sudden release of water by a debris or ice jam (NWS 2023).

Greenhouse gas (GHG): Any gas that absorbs infrared radiation in the atmosphere: examples include carbon dioxide, methane, nitrous oxide, ozone, and water vapor.

Hazard: The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources (IPCC 2022).

Heat wave: A sustained period of abnormally high ambient temperatures lasting for several days. In the projections generated for the New York State Climate Impacts Assessment (2024), a heat wave is defined as three or more consecutive days with maximum temperatures at or above 90°F (Stevens, A., & Lamie, C., Eds. 2024).

Housing growth areas: Areas where future housing growth is anticipated based on municipal zoning, specifically areas zoned for multi-family residential development on town and village zoning maps. In this Plan, housing growth areas are referenced as identified in the New York Metropolitan Transportation Council's (NYMTC) Moving Forward 2055 Regional Transportation Plan, which draws on locally provided zoning ordinances and maps. The term describes where growth may occur and is not a County designation (NYMTC 2025).

Maladaptation: Actions that may lead to increased risk of adverse climate-related outcomes, including via increased greenhouse gas (GHG) emissions, increased or shifted vulnerability to climate change, inequitable outcomes, or diminished welfare, now or in the future. Most often, maladaptation is an unintended consequence (IPCC 2022).

Mitigation (climate change): Actions that reduce the levels of greenhouse gases in the atmosphere; includes reducing emissions of greenhouse gases and enhancing sinks (things that absorb more greenhouse gases than they emit). Examples include switching to renewable energy sources and implementing energy efficiency measures. Mitigation (hazard mitigation): Any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards (FEMA 2024).

Monitoring and evaluation (M&E): Mechanisms put in place to [...] monitor and evaluate efforts to reduce greenhouse gas emissions and/or adapt to the impacts of climate change with the aim of systematically identifying, characterizing and assessing progress over time (IPCC 2022).

Nature-based solutions (NbS): Actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (IUCN 2016).

Resilience: The capacity of interconnected social, economic, and ecological systems to cope with a hazardous event, trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure. Resilience is a positive attribute when it maintains capacity for adaptation, learning, and/or transformation (IPCC 2022).

Scenario: A plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (e.g., rate of technological change, prices) and relationships. Scenarios are neither predictions nor forecasts but are used to provide a view of the implications of developments and actions (IPCC, 2022).

Sensitivity: The degree to which a system or species is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea level rise) (IPCC, 2022).

Sustainable Development: Development that accommodates growth in a more efficient and environmentally friendly manner, including through affordable housing, a mix of land uses with access to jobs and services, and downtowns near transit and other transportation services (NYMTC). The term sustainable development is used in this report to refer to corridors and downtowns identified in NYMTC's Moving Forward 2055 Regional Transportation Plan as potential locations for future mixed-use growth. These are not County designations, endorsements of specific projects, or environmental performance standards.

Vulnerability: The degree to which physical, biological, and socioeconomic systems are susceptible to and unable to cope with adverse impacts of climate change. (SOCCR2, 2018). Generally, systems that are sensitive to climate conditions and less able to adapt to changes are considered to be vulnerable to climate change impacts.

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Executive Summary

Natural hazards have and will continue to pose challenges for the residents, businesses, infrastructure, and natural resources that make Putnam County a great place to live and work. Events like Hurricane Ida in 2021, the Sedgewood Fire in Kent in 2024, or numerous instances of flooding have caused significant damage and costs over time. Projections suggest that the County could face increased vulnerabilities to natural hazards in the future. Protecting the long-term health, safety, and resilience of Putnam County requires proactive planning and preparation.

This Climate Change Adaptation & Resilience Plan (CCARP) aims to support Putnam County in responding to and preparing for the impacts of a changing climate. Specifically, Putnam County could face increasing temperatures, changing precipitation patterns, and rising sea levels in the coming decades. While Putnam County is not a coastal community, rising sea levels can impact river levels and flood potential along the Hudson River.

Adaptation and resiliency planning can guide proactive preparation for these potential trends by considering how the County can reduce its susceptibility to climate-related challenges and increase its ability to rebound from natural hazards events in the future. In particular, the CCARP:

- Reviews data and projections related to climate trends,
- Analyzes potential risks to infrastructure, communities, social programs, and environmental resources,
- Assesses progress and opportunities for growth within the County's existing policies and plans, and
- Proposes actionable strategies to reduce risks and maximize positive outcomes into the future.

Informed by stakeholder and public input, this plan seeks to reflect the concerns and goals of the Putnam County community to support long-term planning and projects. Examples of priorities that emerged through the planning process include:

- Furthering reliable access to power and energy;
- Ensuring stormwater infrastructure can accommodate expected precipitation;
- Reducing risks from the dams located in Putnam County;
- Planning for continuous access to healthcare facilities and services;
- Ensuring strategies support vulnerable communities;
- Addressing wildfire risks; and
- Supporting the County's ecosystems, agricultural lands, and food systems.

The strategies outlined in the Plan aim to support the County in achieving these and other related goals. They include recommendations related to outreach, data collection, planning, infrastructural upgrades, and additional projects. While the primary audience for the Plan is county staff and officials, it also seeks to compile information and resources that can support community education and engagement.

Land use and zoning authority in New York State rests with local municipalities, and the CCARP does not supersede municipal plans or authorities. The Plan focuses on actionable measures within the County's role, particularly integrating climate risk considerations into planning for County facilities, assets, and infrastructure, while supporting partnerships with municipalities, stakeholders, nonprofits, and residents.

The CCARP fits into a larger planning and programmatic context within Putnam County. For example, the County:

- Actively participates in the New York State Climate Smart Communities program;
- Has an existing Hazard Mitigation Plan that reviews potential climate impacts;
- Offers programs to support vulnerable populations;
- Conducts community outreach and education; and
- Can utilize a variety of emergency services and alert systems.

This plan augments the County's ability to prepare for natural hazards and changing climate conditions through its focus on stakeholder engagement; holistic consideration of environmental, social, and infrastructural assets; and long-term, future-oriented outlook.

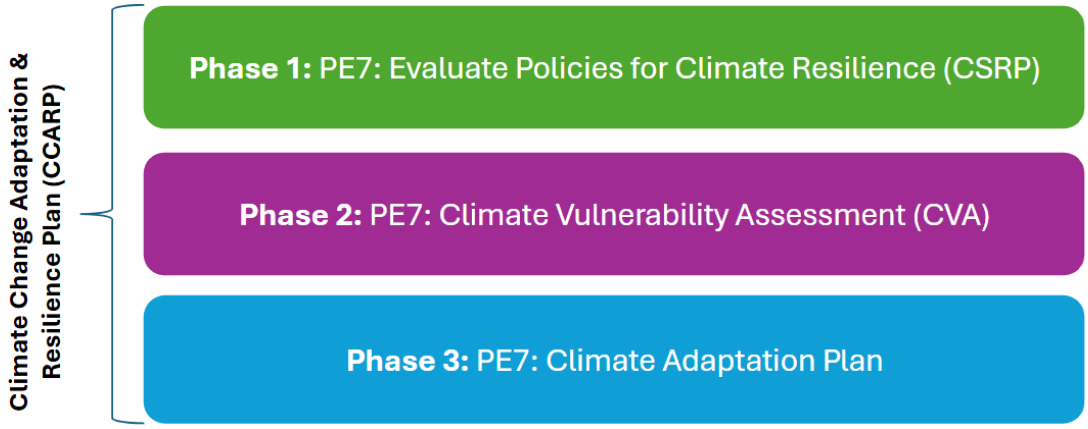
Introduction

Putnam County is susceptible to climate risks including increasing temperatures, changing precipitation patterns, and rising sea levels that impact water levels and flood potential along the Hudson River. To assess and plan for these risk patterns, Putnam County signed a resolution in September 2025 to work with Hudson Valley Regional Council (HVRC) on a Climate Change Adaptation and Resilience Plan (CCARP). The CCARP aims to increase County-level resilience and adaptive capacity by identifying climate risks, analyzing vulnerable assets, and identifying strategies to proactively adapt to expected impacts. The purpose of this plan is to support Putnam County in preparing for a safe, resilient future under expected climate impacts.

The CCARP focuses on actionable measures within the County's role and authority. In New York State, the authority to regulate land use and zoning rests with local municipalities , and this Plan is not intended to supersede municipal plans or authorities. Instead, it guides County

efforts toward climate risk reduction, particularly by integrating climate risk considerations into planning for County facilities, assets, and infrastructure, while supporting partnerships and local engagement with municipalities, stakeholders, nonprofits, and residents.

The CCARP planning process used a three-phase approach. Phase 1 involved reviewing existing plans and policies for climate resilience measures, following guidance from the Climate Smart Communities (CSC) program PE7: Evaluate Policies for Climate Resilience action. This phase included a collaborative stakeholder workshop and background research to create an inventory of existing plans and their resiliency strengths and gaps. Phase 2 used a combination of research and a public-facing survey to identify key infrastructure, social, and environmental assets in the County and to analyze how/if they are vulnerable to expected climate impacts. This phase was informed by the steps outlined in the CSC PE7: Climate Vulnerability Assessment action. Phase 3 used the outputs of Phases 1 and 2 to create a set of recommendations for Putnam County to build county-level resilience and adaptive capacity. It involved two stakeholder workshops to identify and prioritize climate adaptation strategies, a public engagement Lunch & Learn webinar event and survey, and additional background research to ensure strategies align with County contexts and priorities. This step was informed by guidance from the CSC PE7: Climate Adaptation Plan action.



The three-phase process was outlined at a preliminary CCARP meeting with members of Putnam County and HVRC staff | Graphic created by HVRC.

The development of the CCARP also included a separate, parallel planning process to create a Climate Change Adaptation and Resilience Vision Statement for Putnam County. This process explored what a climate resilient Putnam County would look like in order to guide and inspire adaptation planning efforts. The Visioning process was driven by a public-facing survey and a stakeholder workshop exercise.

Through its three-phased process, the CCARP engaged County staff, local leaders, community partners, and Putnam County residents in furthering resilience and adaptive capacity in the Putnam County. It also builds on the County's track record of leadership, as a Bronze Certified Climate Smart Community currently progressing towards Silver Certification.

CCARP Leadership Team, Participatory Engagement Process, and Framework

This CCARP was created through a participatory process, driven by stakeholder and public engagement. A CCARP Leadership Team convened at the start of the planning process. The Leadership Team included members from Putnam County's Department of Planning, Development, and Public Transportation and from the Hudson Valley Regional Council. Members included:

- Barbara Barosa (Commissioner, Putnam County Department of Planning, Development, and Public Transportation)
- Ilona Campo, (Planner / Climate Smart Coordinator, Putnam County Department of Planning, Development, and Public Transportation)
- Matthew Covucci (Deputy Commissioner, Putnam County Department of Planning, Development, and Public Transportation)
- Sofie diTommaso (former Resilience & Adaptation Coordinator, HVRC)
- Mary Lambert, (former Climate Action Planning Manager, HVRC)

Members of the Leadership Team met on a routine basis to discuss the CCARP process and content. A list of meeting agendas and participants can be found in Appendix A.

Stakeholder and public engagement were critical components of the CCARP process. During their second meeting on October 6, 2025, the CCARP Leadership Team reviewed the concepts from the "Spectrum of Community Engagement to Ownership", cited in the Climate Smart Communities Program's Inclusive Engagement Primer, and began preliminary conversations on intended stakeholder engagement strategies.[i]

Through this and subsequent conversations, the following stakeholder and public engagement strategies were included as part of the CCARP planning process:

Stakeholder Engagement

Presentation to the Putnam County CSC Task Force:		
Date: October 24, 2025	**Location:** Virtual	**Documentation:** Meeting Slides

Description: HVRC joined a Putnam County CSC Task Force meeting to provide an introduction to the CCARP planning process and expected timeline.

Presentation to the Putnam County Physical Services Committee:		
Date: November 17, 2025	**Location:** In-person: County Office Building Room #318 in Carmel, NY 10512	**Documentation:** Meeting information
Description: HVRC presented about the CCARP process and provided a project status update at a Putnam County Physical Services Committee meeting.		

Climate Smart Resiliency Planning Workshop:		
Date: November 20, 2025	**Location:** Hybrid: Donald B Smith Campus, 110 Old Route 6, Carmel, Bureau of Emergency Services Classroom	**Documentation:** Appendix B includes the CSRP Tool, Summary Report, and workshop documentation

Description: Putnam County and HVRC hosted a 2-hour long Climate Smart Resiliency Planning (CSRP) Workshop to assess resiliency strengths and gaps in existing policies and plans in Putnam County. The workshop included three components:

- Opening remarks from County Executive Kevin Byrne;
- A presentation about the CCARP planning process as well as top climate hazards facing the County; and
- A collaborative exercise to inventory resiliency strengths and gaps in county plans and policies.

The Workshop was attended by 19 people, including participants and facilitators. This included members of Putnam County staff, an elected official, a partner organization, and members of HVRC's staff. Prior to the workshop, members of the CSRP Leadership Team compiled an initial list of existing plans and policies in the County and assessed their existing resiliency measures using a spreadsheet-based, CSRP Tool. During the workshop, participants reviewed the draft CSRP Tool and shared additional insights from their respective departments and organizations. Following the workshop, the CSRP Tool went through a feedback process before a final draft and summary report was produced. (See "Community Plans Consistency Report" section for additional information about the process and outcomes).

Partner Organization Survey		
Date: January 2026-May 2026	**Format:** Virtual Survey	**Documentation:** Appendix C includes a copy of the Partnership Survey and survey outreach.

Description: The CCARP Leadership Team distributed a partner organization survey to over 130 organizations in Putnam County. The survey was also posted on the County's CCARP webpage. The purpose of this survey was to assess whether and how organizations in the County were interested in participating in the CCARP process. The survey collected information on resilience-related capacities within organizations; whether/how organizations would like to be involved in the CCARP process; upcoming events where information about the CCARP could be shared; and interest in writing a letter of support for the CCARP.

CCARP Working Group		
Date: February 9, 2026-July 2026	**Kick-Off Meeting Location:** Planning Dept. Conference Room - 841 Fair St., Carmel, NY 10512	**Documentation:** Appendix D

The CCARP Leadership Team also invited a subset of county and additional stakeholders to participate in a CCARP Working Group. The purpose of the Working Group was to provide guidance on the Climate Adaptation Plan component of the CCARP and support engagement efforts.

Participants invited to join the CCARP Working Group included:

- Barbara Barosa (Commissioner / CSTF Member, Putnam County Planning Department)
- Marlene Barrett (Director, Putnam County Office of Senior Resources)
- Joe Bellucci (Deputy Commissioner / CSTF Member, Putnam County Department of Public Works)
- Ilona Campo (Planner / Climate Smart Coordinator, Putnam County Planning Department)
- Matt Covucci (Deputy Commissioner, Putnam County Planning Department),
- Sofie diTommaso (former Resilience & Adaptation Coordinator, HVRC)
- Ralph Falloon (former Deputy Commissioner, Putnam County Bureau of Emergency Services)
- Mary Lambert (former Climate Action Planning Manager, HVRC)
- Nancy Montgomery (Legislator – District 1, Putnam County Legislature)
- Joe Montuori (Executive Director, Sustainable Putnam)
- Gary Redlon (Coordinator of Engineering Projects, Putnam County Department of Public Works)
- Shanna Siegel (Supervising Public Health Educator / Public Information Officer, Putnam County Department of Health)

While many of these members participated in the CSRP Workshop, the first official meeting for the CCARP Working Group took place on February 9, 2026, as part of an Exploratory Scenario Planning Workshop (see "Exploratory Scenario Planning Workshops.")

Exploratory Scenario Planning Workshops:		
Dates: February 9, 2026 March 9, 2026	**Locations:** Feb 9, 2026: Planning Dept. Conference Room - 841 Fair St., Carmel, NY 10512 Mar 9, 2026: Donald B Smith Campus, 110 Old Route 6, Carmel, Bureau of Emergency Services Classroom #1	**Documentation:** Appendix E

Description: The CCARP process included a two-part, exploratory scenario planning process. Exploratory scenario planning is a stakeholder engagement tool designed to support planning for an uncertain future. It is beneficial for identifying strategies that can be successful across a range of potential future conditions, and involves:

- Identifying uncertainties about future conditions,
- Using these uncertain variables to craft narrative descriptions—or "scenarios"—about what the future could look like, and
- Leveraging these scenarios to evaluate potential planning strategies.[ii]

The CCARP scenario planning process included two workshops on February 9 and March 9, 2026. The first workshop focused on collaboratively generating scenarios to inform the adaptation planning process. It also served as the kick-off meeting to the CCARP Working Group (see "CCARP Working Group"). The second workshop used the scenarios generated to assess a list of potential adaptation strategies for inclusion into the CCARP and to generate new ideas for adaptation strategies. A word cloud exercise was also completed to inform the Resilience and Adaptation Vision Statement.

Following the workshop, an updated list of adaptation strategies was generated that incorporated feedback and suggestions from workshop participants. The updated strategies list was shared with stakeholders in the County in a survey format for additional input/comments. The survey was available from March 20-April 3, 2026. (See "Community Future Scenarios" section for additional information.)

Public Engagement

CCARP Website

Date: November 2025-Indefinitely	**Format:** Website	**Documentation:** Appendix F
Description: A webpage was created on Putnam County's website to host information about the CCARP. The webpage includes information on the CCARP process, the benefits of resiliency planning, and a project timeline. It also served as the central location for sharing all stakeholder/public engagement opportunities and resources relevant to the planning process. The CCARP webpage was actively updated as needed throughout the CCARP planning process and will remain available indefinitely as a public resource.		

Vision Statement Survey		
Date: November 2025-April 2026	**Format:** Survey	**Documentation:** Appendix G includes information about the Draft Vision Statement and Vision Statement survey
Description: As part of the CCARP process, Putnam County created a Resilience & Adaptation Vision Statement. The visioning process was informed by the CSC PE7 Climate Adaptation Plan action. The CCARP Leadership Team wrote a draft Vision Statement, drawing inspiration from preexisting vision statements in the County. The draft was posted to the CCARP website, along with a short survey to provide feedback. The Vision Statement survey was also promoted at the Climate Smart Resiliency Planning Workshop, through the Partner Organization Survey, and at the two Scenario Planning Workshops. The same set of survey questions was also included as an optional component of the Climate Vulnerability Assessment Survey (see "Climate Vulnerability Assessment Survey").		

Climate Vulnerability Assessment Survey:		
Date: Nov 25, 2025-Jan 5, 2026	**Format:** Survey	**Documentation:** Appendix H includes information about the survey content, outreach strategies, and results.
Description: The CCARP Leadership Team administered a public-facing survey to inform the Climate Vulnerability Assessment component of the CCARP. The purpose of the survey was to provide a qualitative perspective on climate hazards and assets in the County. The survey was open to anyone who lives or works in Putnam County, and it gathered information on: • Prior experiences with severe weather events, • Concerns about future climate-related events, • Priorities related to social, environmental, and infrastructural assets, and		

- Personal stories and lived experiences.

Through the survey, participants were also invited to provide feedback on Putnam County's Resilience and Adaptation Vision Statement (see "Vision Statement Survey"). Demographic information was collected as an optional component of the survey to understand the survey sample. Overall, every village and town in the County was represented, although the majority of responses came from the Town of Carmel, Town of Philipstown, and Town of Putnam Valley (see Figure 1).

The survey was available in English and Spanish. The English version of the survey was posted from Nov 25, 2025-Jan 5, 2026 and the Spanish version was posted from Dec 5, 2025 to Jan 5, 2026. Surveys were posted at different times due to staff time needed to translate and format the survey.

Outreach for the survey included mailing the chief elected officials of all municipalities in Putnam County, promoting the survey on Putnam County's social media, including a link to the survey on the desktops of the computers used by Putnam County staff, posting a press release to the County website, and emailing additional Putnam County contacts. Outreach for the survey was further supported by partners and local leaders. For example, Sustainable Putnam advertised the survey through their newsletter, and the Town of Philipstown included a link to the survey on their website. In total, 143 people responded to the survey. Two additional responses were submitted following the closure of the survey. While those additional responses were not incorporated into the summary statistics, their feedback was reviewed to inform the CVA.

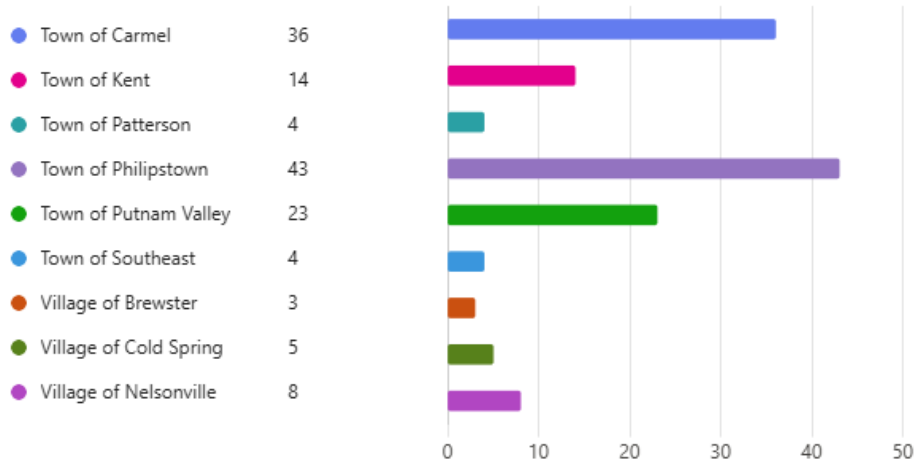


Figure 1 Breakdown of Climate Vulnerability Assessment stakeholder survey responses by municipality | Putnam County Climate Vulnerability Assessment Survey 2025-2026

CCARP Lunch & Learn Webinar & Public Engagement Survey		
Date: April 21st 12:00-1:00 pm	**Format:** Lunch & Learn Webinar & Public Engagement Survey	**Documentation:** Appendix I

Description: A Lunch & Learn webinar was held on April 21st from 12:00-1:00 pm. The Lunch and Learn event included opening remarks from Ilona Campo (Planner and CSC Coordinator, Putnam County Planning Department) and a presentation by HVRC. Following the presentation, there was time for Q&A.

The presentation covered:

- The CCARP process,
- Public/stakeholder engagement,
- An overview of the draft Climate Vulnerability Assessment, and
- An introduction to adaptation planning strategies.

After the Lunch & Learn webinar, the presentation component was rerecorded and uploaded to Putnam County's CCARP website as a public-facing resource.

From April 23-May 11, 2026, a survey was also uploaded to the CCARP webpage that allowed community members to weigh in on adaptation strategies. Participants who joined the Lunch & Learn webinar who either lived or worked in Putnam County were encouraged to fill out the survey. Putnam County also promoted the survey while tabling at the Earthfest event at Boscobel House and Gardens on April 25, 2026. The survey received 16 responses.

CCARP Public Comment		
Date: July 30, 2026-September 15, 2026	**Format:** Survey	**Documentation:** Appendix J

Description: The Draft CCARP was posted on Putnam County's CCARP webpage for public review and comment from July 30, 2026 through September 15, 2026. The public comment period gave community members and stakeholders a final opportunity to review the Draft Plan and provide feedback before it was finalized and considered for adoption. Comments could be submitted:

- Through an online Public Comment Survey posted on the CCARP webpage,

- By email to climatesmart@putnamcountyny.gov, or
- By mail to the Putnam County Planning Department, 841 Fair St., Carmel, NY 10512.

Outreach for the public comment period included:

- A notice in the Putnam County Press & Times and a press release on the County website.
- Posts on the Facebook and Instagram pages of Putnam County Government and the County Health Department, and on the Facebook page of the Bureau of Emergency Services.
- A flyer displayed on the desktops of County staff computers and an announcement to County employees.
- Emails to Town Supervisors, Village Mayors, Town Clerks, the County Legislature, the Climate Smart Task Force, the Putnam Climate Partners distribution group, organizations that responded to the Partnership Survey, and local news outlets, with a final reminder sent on September 8, 2026.

Partners and local media also helped spread the word. For example, Sustainable Putnam advertised the comment period in its newsletters, and The Highlands Current and Mid-Hudson News published articles about it.

In total, 11 comments were received: nine through the Public Comment Survey and two by email. Comments addressed topics including local land use authority, flood mapping and stormwater management, social vulnerability, climate change mitigation, and wildfire risk. The County reviewed each comment and revised the Plan where appropriate. Comments, County responses, and resulting Plan revisions are summarized in Appendix J.

Place Narrative

Socioeconomic Survey

Putnam County is located approximately 50 miles north of New York City and is comprised of six towns and three villages.[iii] The County is bordered by Dutchess County, western Connecticut, Westchester County, and the Hudson River.[iv] It includes the towns of Carmel, Kent, Patterson, Philipstown, Putnam Valley, and Southeast as well as the villages of Brewster, Cold Spring, and Nelsonville.[v] The County has a mixture of rural and urban areas, based on housing density thresholds used by the US Census.[vi] As of 2022, the US Census Bureau reported the population of Putnam County to be 98,045 - 1.6% down from the population in

2010. As of 2020, the population density stands at 424 per square mile.[vii] Putnam County covers about 157,000 acres, of which roughly one-quarter to nearly one-third is protected.[viii] [ix]

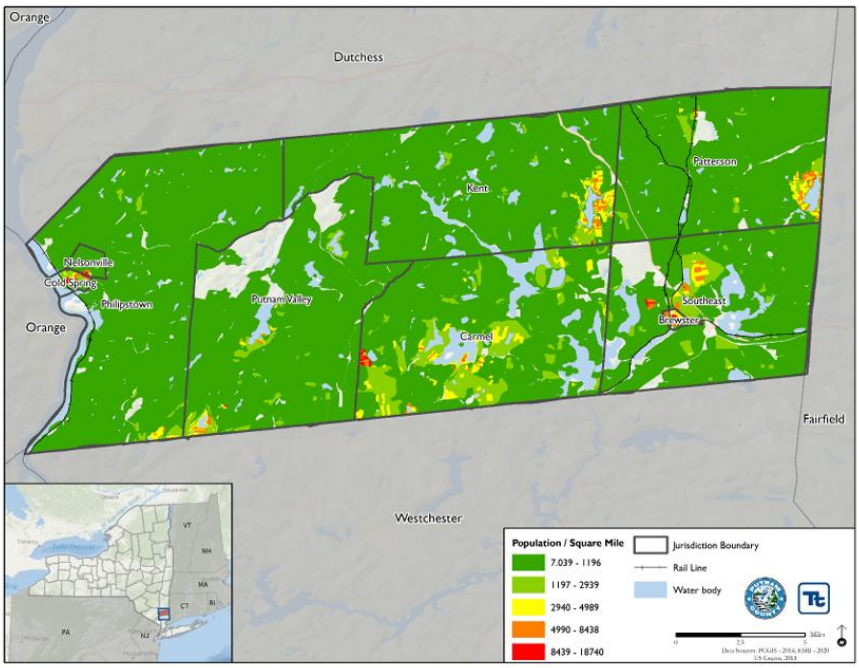


Figure 2: Population Density Map for Putnam County | HMP Section 4, p. 10

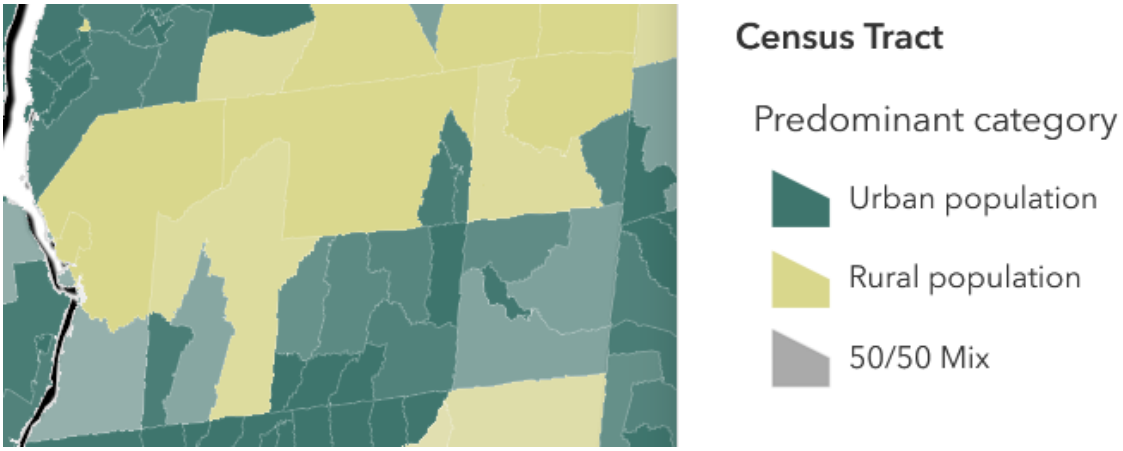


Figure 3 : Urban vs. Rural population percentages in Putnam County by Census Tract | 2020 US Census

History: Putnam County has been inhabited by Indigenous Peoples since time immemorial; evidence of their presence on the land dates from nine to 12 thousand years ago.[x] By the seventeenth century, it was home to the Eastern Algonquian dialect of Munsee Lenape speakers known as the Wappinger People, which means "Easterner" in many Algonquian

dialects.[xixii] In that time, they lived east of the Hudson River, reaching from present-day Poughkeepsie to Manhattan Island, into the lower Connecticut River Valley.[xiii] The Wappinger were a confederacy, separated into bands. Each band was headed by a chief.[xiv] The Nochpeem and Tankiteke were two bands in Putnam County.[xv] The Wappinger moved "seasonally between fixed sites" and relied primarily on agriculture.[xvi] Maize was their primary food source and was primarily cultivated by women, supplemented by hunting, fishing, and collecting. [xvii xviii] The Wappinger are believed to be independent from, but related to, the Lenape.[xix]

Putnam's designation as a County occurred in 1812, when it was formed and split from portions of land originally included within Dutchess County.[xx xxi] From the mid-19th century to mid-20th century, the County's identity spanned a manufacturing location, an agricultural hub, a New York summer tourism destination, and, eventually, an outer suburb of New York City.[xxii] Today, the County continues to attract residents commuting to New York City and working locally as well as visitors drawn to the area's scenic beauty; cultural, arts, historic, and spiritual centers; and vibrant local businesses.[xxiii xxiv xxv]

Demographics: Putnam County is generally considered an affluent County in both the state and country, with a medium household income of $121,485.[xxvi xxvii] The County has an ~84.6% homeownership rate, which is substantially higher than the state average.[xxviii] The percentage of the population who has earned a Bachelor's degree or further education is slightly higher than the state average, at 48.4%.[xxix]

According to the 2024 American Community Survey (ASC) 5-Year Estimates, 4.7% of the population is less than age 5; 33.7% is 5-34; 42.3% is 35-64; and 19.3% is over the age of 65.[xxx] For comparison, in New York State as a whole, 5.4% of the population is less than age 5; 38% is 5-34; 38.6% is 35-64; 17.8% is over the age of 65.[xxxi] The population of older adults has increased over time. For example, the population of adults age 65 or older grew by ~7,462 people between the 2010 ASC 5-year estimate and 2024 ASC 5-year estimate, despite the overall population of Putnam County decreasing slightly.[xxxii xxxiii] Based on the 2024 ASC 5-year estimate data profile, the racial demographic makeup of Putnam County is 70.9% White; 20% Hispanic/Latino; 3% Multiracial; 2.8% Black; 2.3% Asian; and 0.1% American Indian and Alaska Native. 0.9% of the population identified as "some other race."[xxxiv]

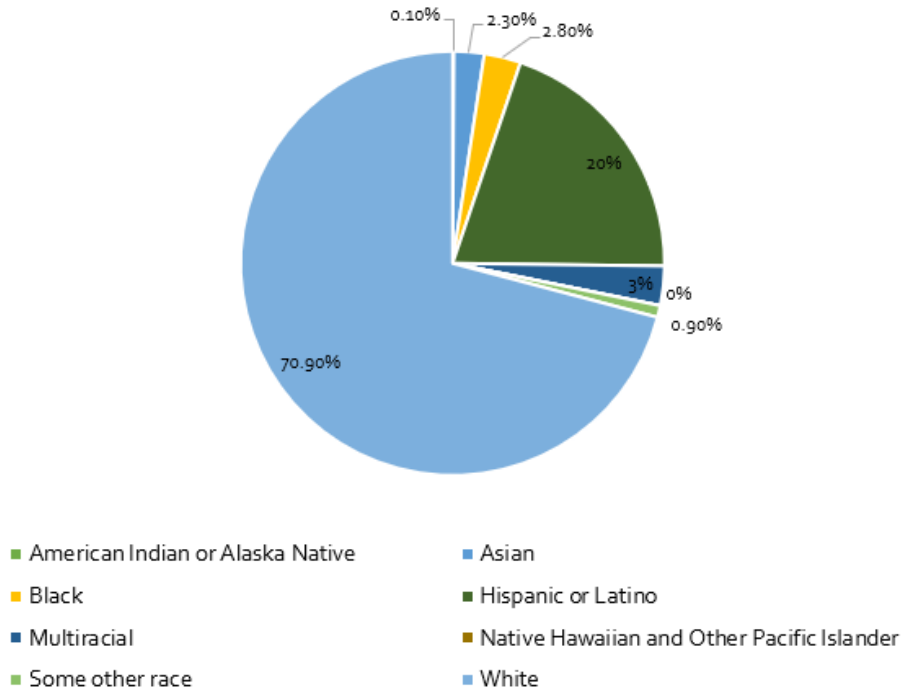


Figure 4: The racial breakdown of Putnam County, New York, based on 2024 ACS 5-Year Estimates | Chart created by HVRC using 2024 ACS 5- Year Estimates data

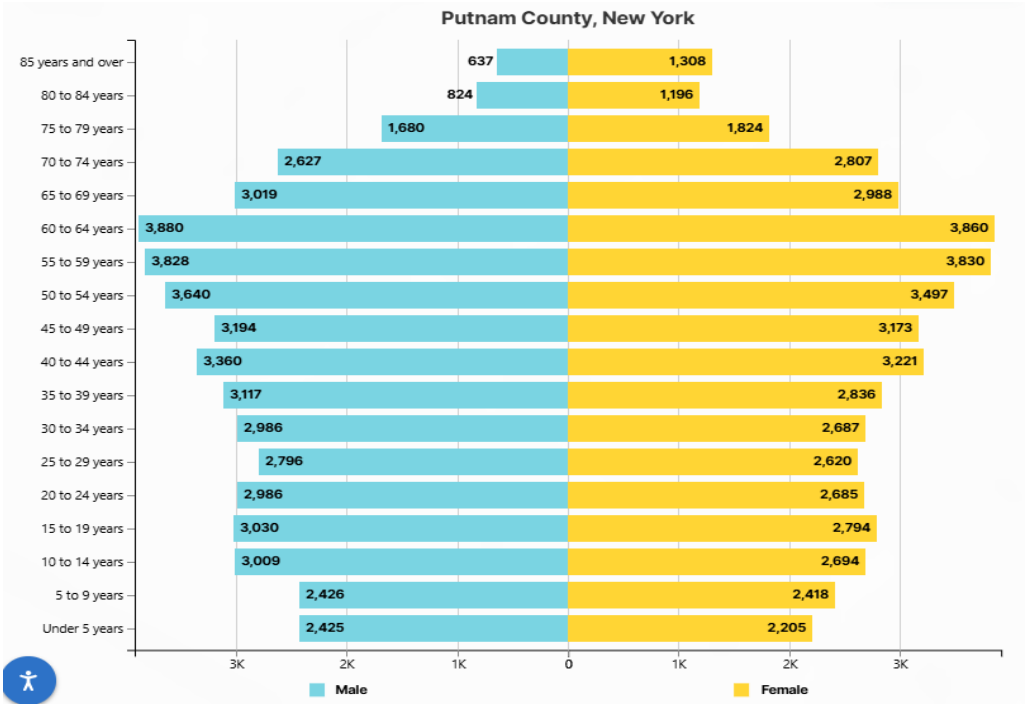


Figure 5 : Age pyramid of Putnam County, New York, based on 2024 ACS 5-Year Estimates; split by sex: male in blue, and female in yellow | U.S. Census Bureau

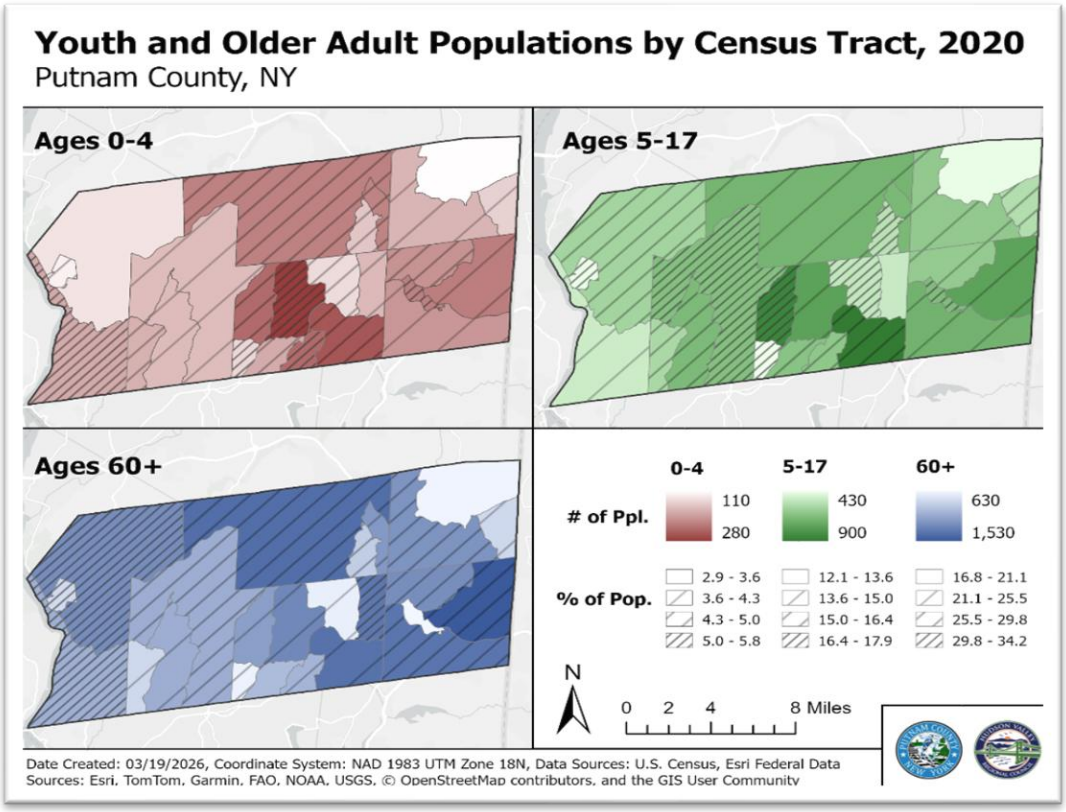


Figure 6: Youth and older adult age groups (0-4, 5-17, and 60+) in Putnam County by census tract. Increasing color intensity indicates a greater number of people, while denser hatching indicates a higher share of tract population. Age groups are separated by map panels, and value ranges vary by group | Data from 2020 Decennial U.S. Census

Social Vulnerability: Social vulnerability is the susceptibility of vulnerable groups to experience the adverse impacts of natural hazards, such as death, injury, and loss of property or income, as defined by the Federal Emergency Management Agency's (FEMA) National Risk Index (NRI).[xxxv] These groups include children, senior citizens, people with disabilities, and low-income residents.[xxxvi] Putnam County's social vulnerability index is categorized as "very low.[xxxvii] However, social vulnerability is not evenly distributed within the County, with portions of Patterson categorized as a very high level of vulnerability (See Figure 7).[xxxviii] The December 2025 FEMA NRI uses Social Vulnerability data sourced from the 2023 US Census Community Resilience Estimates Social Vulnerability Measure.[xxxix] [xl]

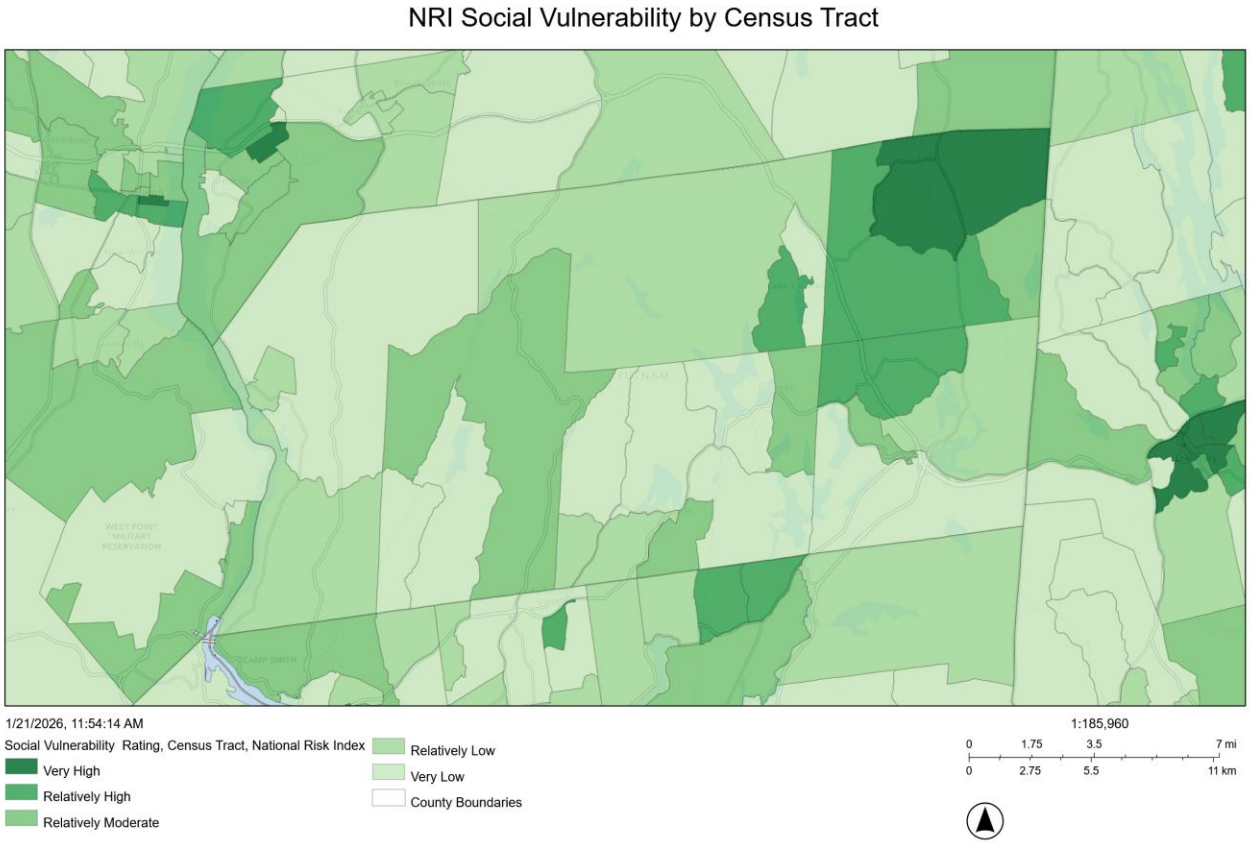


Figure 7 Putnam County Social Vulnerability Component of the NRI by Census Tract | US Census cited by [FEMA Resilience Analysis and Planning Tool]

Additionally, the County does not contain any designated Disadvantaged Community census tracts based on New York State criteria.[xli] However, the County includes a variety of populations that may face greater vulnerability to climate hazards including older adults, low-income populations, residents who do not speak English, and people with disabilities. As of the 2023 ACS, 18.7% of Putnam County's population is over the age of 65,[xlii] 6.5% is below the poverty level,[xliii]English,[xlivd] 10.2% have one or more disabilities.[xlv xlvi]

Employment: The County has varied employment sectors. Using US Census categories, top industries include:

- educational services, health care and social assistance;
- retail trade;
- professional, scientific, management, administrative, and waste management services; and construction.[xlvii]

Agriculture also continues to play an important role in Putnam County. As of 2025, the County had 172 parcels in the Agricultural District, comprised of 5,642.5 acres.[xlviii] Agricultural lands

also shape the landscape of Putnam County, creating an identity for the community, a draw for outside visitors, and habitat for plants and animals.[xlix]

The following table includes a list of the largest employers, listed alphabetically, in the County and their locations. The largest employers list is sourced from the mid-Hudson Region's 2025-2030 Comprehensive Economic Development Plan.[l]

Employer	Location
Ace Endico Corp	Brewster
Brewster Central School District	Brewster
Carmel Central School District	Carmel
Green Chimneys	Brewster & Carmel
Mahopac Central School District	Mahopac
Putnam County	Carmel
Putnam Valley Central School District	Putnam Valley
Putnam Hospital	Carmel
Putnam Precision Products Inc	Brewster
The Arc of Mid-Hudson	Carmel

Governance: Planning and regulations in Putnam County are molded by federal, state, and local-level planning capabilities. County departments relevant to adaptation and resiliency planning include the:

- **Bureau of Emergency Services,** which is charged with emergency "response, remediation/mitigation, and recovery from natural and manmade disasters."[li]
- **Department of Planning, Development, and Public Transportation,** which is tasked with land use reviews including review of referrals submitted pursuant to New York State General Municipal Law Section 239, public transit operations, and climate-smart initiatives.lii
- **Department of Public Works,**[liii] which houses the Engineering Department and the Putnam County Parks Division.[liv]
- **The Soil and Water Conservation District,** which supports conservation of soil, water, and natural resources.[lv]
- **Agricultural & Farmland Protection Board,** which "was formed in 1997 by the County Legislature to protect and promote the availability of land for farming purposes." [lvi]
- **Department of Health,** which manages disease, environmental hazards, disaster response, and public health-related topics.[lvii]

- **Office of Senior Resources,** which supports senior populations in the County.[lviii]
- **Department of Social Services & Mental Health,** which provides financial and social services to eligible Putnam County community members. The department also manages the Supplemental Nutrition Assistance Program (SNAP) for the County.[lix]
- **Department of Parks & Recreation,** which includes management of donated or purchased land for conservation, preserving open space, protecting environmentally sensitive areas, and promoting smart stewardship of County owned lands[lxlxi]

Local-level governance decisions play a key role in the County's overall resilience. In Putnam County, the municipalities are responsible for implementing comprehensive plans, zoning, site plans, and subdivision review requirements, and building codes. [lxii] The State of New York has relevant building codes, real-estate disclosure requirements, and environmental regulations. Additionally, New York is a Home Rule state, which counties, cities, towns, and villages have an elected legislative body with the powers to adopt local laws in order to, "regulate the quality of life in communities and to provide direct services to the people."[lxiii]

Community Preparedness: Putnam County has taken strides toward building resilience and adaptive capacity that have created the groundwork for this Climate Change Adaptation and Resilience Plan. For example, Putnam County became a registered Climate Smart Community through the New York State Climate Smart Communities program in 2019 and earned Bronze Certification in 2024. Through the CSC program, Putnam County has already completed multiple PE7 Actions to "Enhance Community Resilience to Climate Change." For example, the County has worked to promote cooling centers that are accessible via public transportation (PE 7 Action: Cooling Centers); purchased land for open space conservation (PE7 Action: Conserve Natural Areas), and replaced culverts and a bridge. It also manages information on the condition of dams in the County (PE7 Action: Culverts and Dams). As a part of this Climate Change Adaptation and Resilience Plan (CCARP), the County has completed the Climate Smart Resiliency Planning (CSRP) Tool, an inventory tool used to assess existing resiliency measures in plans and policies. This process drew from guidance in the PE7 Action: Evaluate Policies for Climate Resilience.

In 2023, the Hudson Valley Regional Council (HVRC) updated Putnam County's Community-wide Greenhouse Gas (GHG) Emissions Inventory using data from 2020, 2021, and 2022.[lxiv] The inventory estimated total community-wide emissions of 959,826 metric tons of carbon dioxide equivalent (MTCO2e), with transportation (57%) and the built environment (32%) together accounting for more than 89% of the total. HVRC is currently updating the inventory to provide a more detailed understanding of community-wide emissions and their key sources and to inform future emissions reduction opportunities and climate action planning. Building on this

work, the County aims to develop a Government Operations GHG Inventory and establish associated emissions reduction targets as staff capacity, funding, and administrative priorities allow. These efforts complement the CCARP's primary focus on integrating climate risk considerations into planning for County-owned facilities, assets, and infrastructure. More information about the County's ongoing climate initiatives is available on the Putnam County Climate Smart Communities webpage.

The County's 2021 Hazard Mitigation Plan also includes substantial consideration of climate effects. For example, adaptive capacity to different climate hazards is assessed in Section 9.1.[lxv] Sections 5.4.1-5.4.10 also address relevant "Hazards of Concern," and detail expected climate impacts for each hazard. This CCARP will continue to build on the County's track record of progress.

Putnam County is well-positioned to take this next step in its climate resilience and adaptation planning. In August 2025, the Physical Services Committee passed a resolution to support the creation of a Climate Change Adaptation and Resilience Plan in collaboration with the Hudson Valley Regional Council. The resolution was formally signed by the County Executive on September 5, 2025. Throughout the CCARP process, there have been multiple avenues for stakeholder and public engagement to increase alignment with community goals and priorities.

Ecosystem Survey

Geology: Putnam County's landscape and rivers are influenced by its bedrock.[lxvi] Most of the County lies within the Hudson Highlands Range, part of the Reading Prong in the Appalachian Range.[lxvii] The most rugged terrain exists in the western areas of the County.[lxviii] The County's highest elevation is 1,540 feet at Scofield Ridge in Philipstown.[lxix]

Land Use: Given the high percentage of protected lands and the relatively low population density across much of the County, substantial areas remain available for forests, open space, and other natural landscapes. These lands include large, contiguous tracts of mature forest, wetlands, stream corridors, ridgelines, and grasslands that support wildlife habitat, protect water resources, and contribute to the County's scenic and rural character. Together, these natural areas provide important ecological functions, opportunities for passive recreation, and long-term environmental resilience.

According to Putnam County's 2021 Hazard Mitigation Plan, forests take up the highest amount of space in the County out of all land uses, spanning more than 68% of the County's land area, with large blocks of forested and vacant land mostly in the western portions of the

County's area. Developed land only accounts for 16.9% of the County's area.[lxx] Outside of the hamlets and villages, development density is not a contributing factor to increased stormwater runoff; flooding from runoff in these areas is typically caused by undersized infrastructure (i.e., culverts) and storm magnitude.

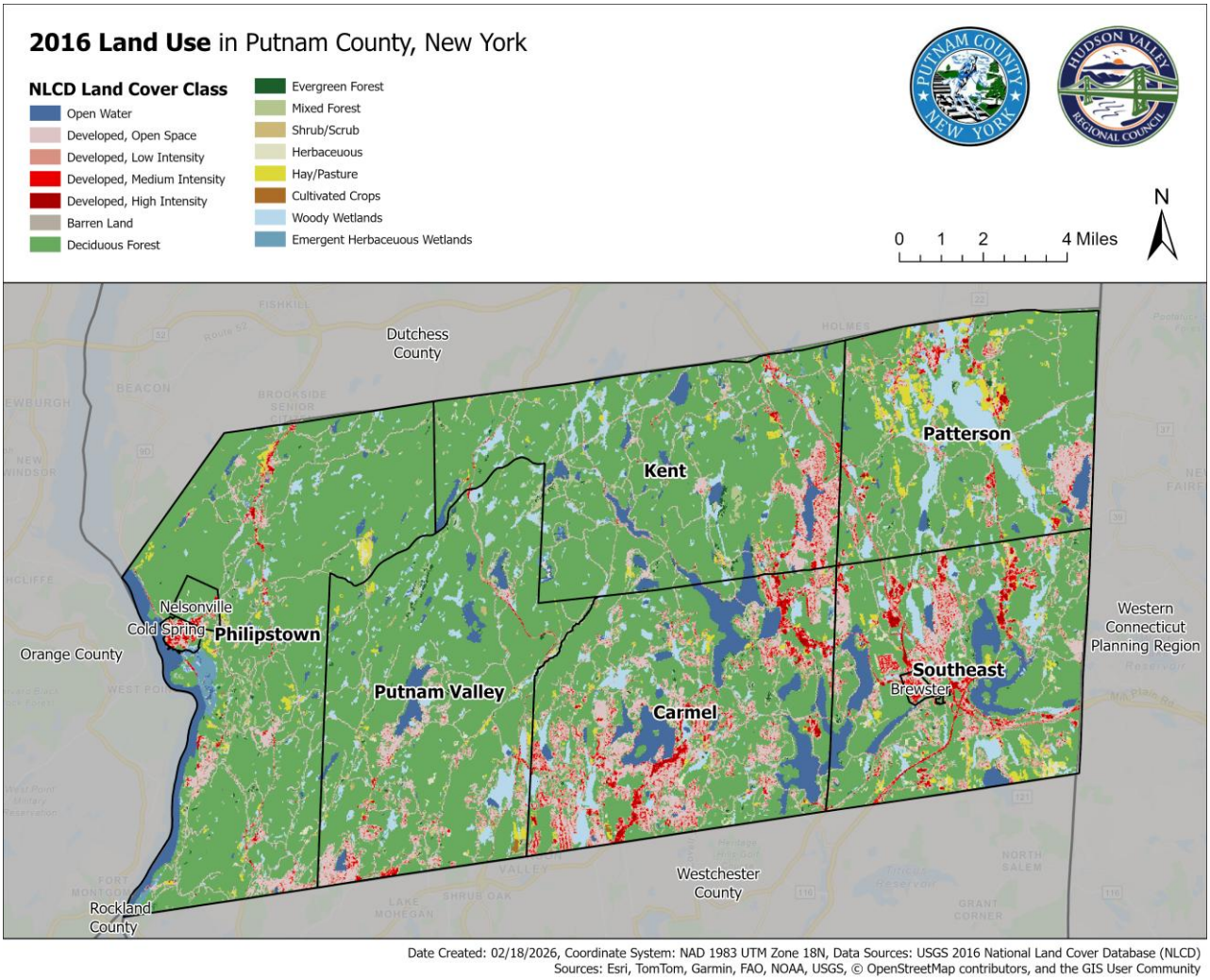


Figure 8: *Land Use Map for Putnam County | National Land Cover Database (NLCD) 2016, via [Cornell University Geospatial Information Repository](#).*

In addition to forests, the County has a variety of noteworthy ecosystems including wetlands, ponds, lakes, rivers, creeks, and mountains.[lxxi] Some notable waterways in the County include East Branch Reservoir, West Branch Reservoir, Croton Falls Reservoir, East Branch Croton

River, West Branch Croton River, Canopus Creek, and the Hudson River.[lxxii] A full map of waterbodies in Putnam County can be found below.

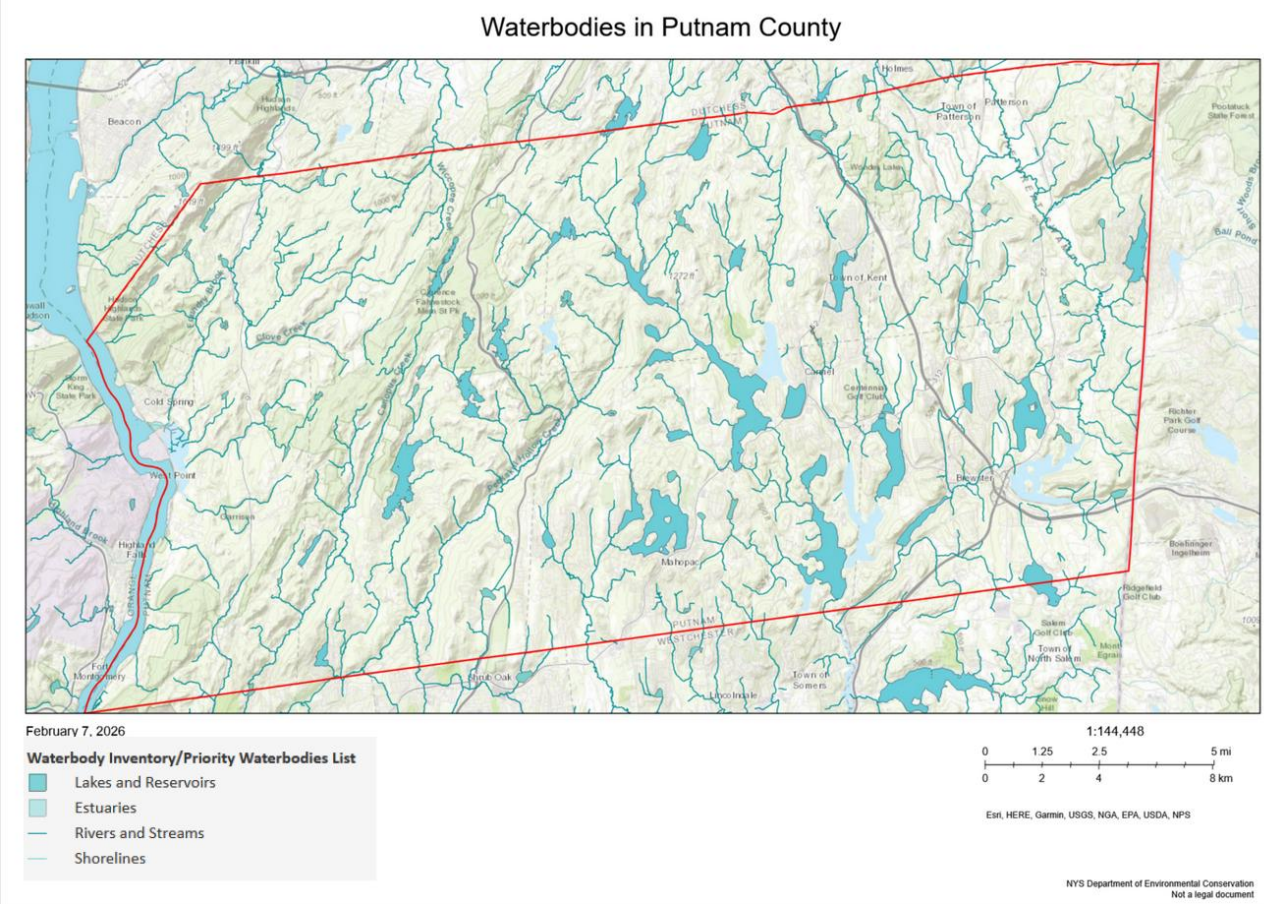


Figure 9: Waterbodies in Putnam County | [NYS Department of Environmental Conservation Environmental Resource Mapper]

Watershed: Putnam County is located in the Lower Hudson Watershed, which is part of the larger Hudson/Mohawk River Basin and extends from Manhattan to north of Albany.[lxxiii] Specifically, much of the County lies within the Croton Watershed (Fig. 10), which provides 10% of daily water consumed in New York City during regular conditions, and 30% during droughts.[lxxiv lxxv] Boyds Corner Reservoir, West Branch Reservoir, and Lake Gleneida are connected to the more northern Catskill/Delaware Watershed via the Delaware Aqueduct, which runs through the center of the County.[lxxvi] Together, the Croton, Catskill, and Delaware Watersheds provide an average of 1.2 billion gallons of water each day to a majority of the > 9 million people living in New York City and Westchester, Putnam, Orange, and Ulster Counties in aggregate.[lxxvii]



Figure 10: Croton Watershed | NYC DEP: Current Water Distribution; [Croton System]

Beyond providing drinking water, Putnam County's water resources provide habitat, social, and economic benefits and contribute to the County's scenic character, and beaches exist throughout the County along lakes and the Hudson River. However, some water resources are

threatened by harmful algal blooms—especially by blue-green algae—which can pose health concerns.[lxxviii] Ponds and lakes are particularly vulnerable to harmful algal blooms.[lxxix]

Ecosystems: Other features of Putnam County's landscape provide many social and environmental assets. Every municipality within the County includes wetlands >12.4 acres, which are important for water filtration, flood mitigation, erosion control, and habitat.[lxxx] Amongst its wetlands, the County contains portions of the Great Swamp, a wetland that spans ~4,200 acres.[lxxxi] The Town of Patterson in northeastern Putnam County contains the large majority of the Great Swamp's protected land in the County.[lxxxii]

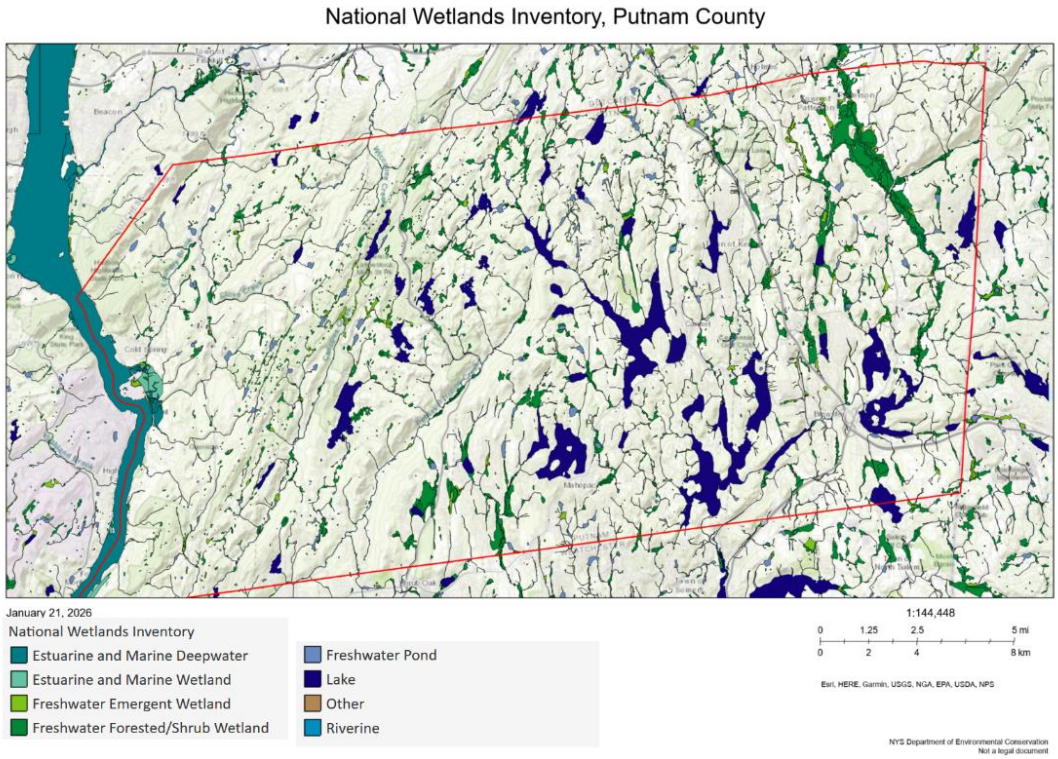


Figure 11*: National Wetlands Inventory in Putnam County* | *National Wetlands Inventory, via [NYS DEC Environmental Resource Mapper]*

Biodiversity: Beyond providing aesthetic beauty and ecosystem services, the County's landscapes host a variety of rare, threatened, or protected plant and animal species including certain species of bats, rabbits, birds, fish, snakes, and dragonflies.[lxxxiii] For example, the Great Swamp provides habitat for rare turtles, snakes, salamanders, frogs, and butterflies.[lxxxiv] It provides habitat for 180 recorded bird species and dozens of butterfly, dragonfly, damselfly, bee, and wasp species. It also contains wet meadow habitat, among the rarest of wetland types.[lxxxv lxxxvi lxxxvii]

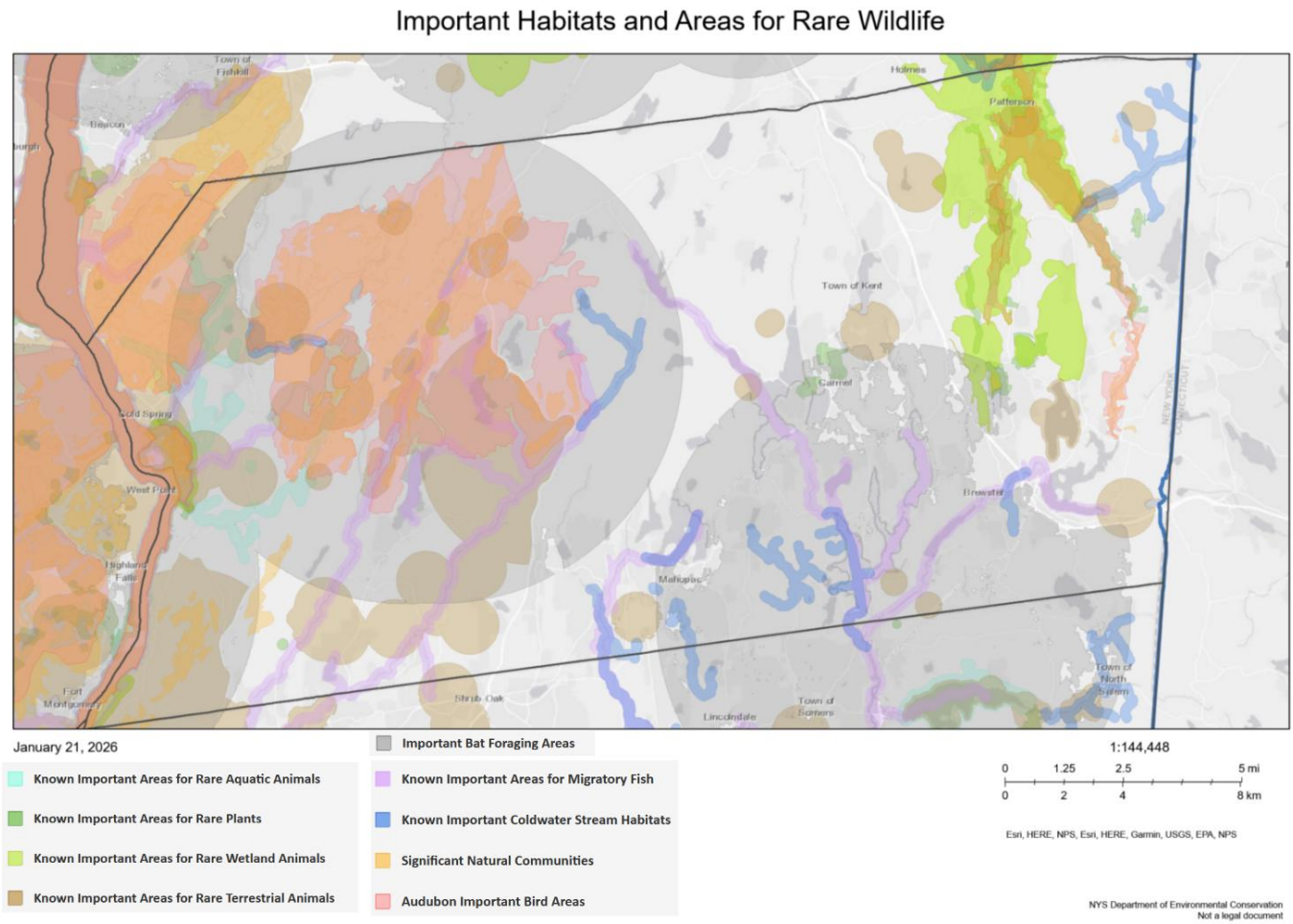


Figure 12: Important habitats and areas for rare wildlife in Putnam County | New York Natural Heritage Program; Audubon New York, via NYS DEC [Hudson Valley Natural Resource Mapper]

Recreation: There are several natural recreation areas throughout Putnam County, which also serve as habitat for biodiversity. These include the Fred Dill Wildlife Sanctuary, the Hudson Highlands State Park Preserve, the Michael Ciaiola Conservation Area, the Putnam County Trailway, Veterans Memorial Park, the Great Swamp, Wonder Lake State Park, California Hill State Park, Donald J. Trump State Park, Ice Pond Conservation Area, Cranberry Mountain Wildlife Management Area, Maybrook Trailway, and Clarence Fahnestock Memorial State Park. [lxxxviii] [lxxxix] [xc] [xcixcii] For humans, these areas provide space for hiking, boating, fishing, hunting, and birding. [xciii] The Thunder Ridge Ski Area, located in Patterson, is a popular winter attraction for visitors throughout Downstate New York looking to take advantage of Putnam County's location within the Appalachian Mountains.[xciv]

Land Ownership: The largest landowners in Putnam County are the State of New York, which owns ~260 parcels comprising ~25,500 acres (~39.9 square miles) primarily in Putnam County's

state parks, and the City of New York, which owns ~500 parcels in the County to provide protection to its water resources, totaling over 16,500 acres (~25.75 square miles).[xcv] New York City is the top taxpayer in the County, and its land includes many of the reservoirs and lakes in the central and southeastern areas of the County, aligning with the Croton Watershed system.[xcvi] Putnam County and the United States federal government own the next greatest land areas, and most of the County's remaining land is owned by nonprofit organizations, businesses, individual owners, the towns and communities that comprise Putnam County, and utilities.[xcvii]

Some of Putnam County's publicly accessible preserved lands are owned by land trusts and conservation organizations, including the Hudson Highlands Land Trust, the Putnam County Land Trust, the Westchester Land Trust, the Open Space Institute, and Scenic Hudson. Private organizations such as camps and social clubs also manage natural areas across the County, although their lands may not be generally accessible to the public.[xcviii]

Fahnestock Park is by far the largest protected area encompassing roughly 15,600 acres that span Putnam and Dutchess counties.[xcix] The largest Putnam County-owned protected area is Michael Ciaiola Conservation Area, which is over 800 acres.[c]

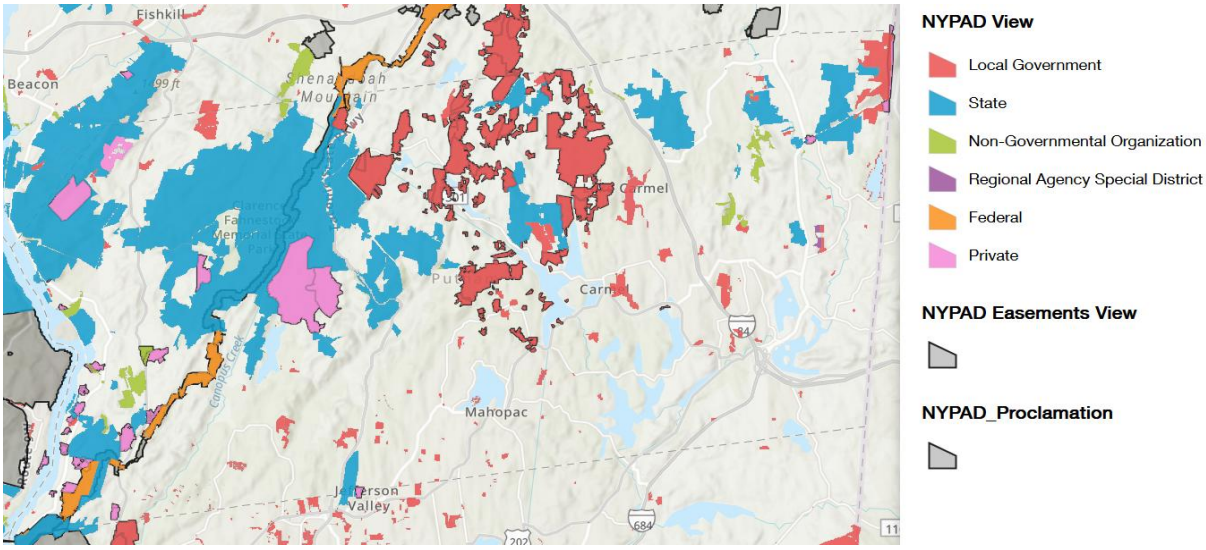


Figure 13 Map of protected land in Putnam County by landowner | New York Protected Areas Database

Dams: Dams exist across Putnam County, and they can support power production, agriculture, water supply, recreation, and flood protection.[ci] That said, they may inhibit habitat connectivity, and they pose a hazard in the case of failure.[cii] According to New York State data, 121 dams are present throughout Putnam County. Dams are owned privately or by local and state governments, including New York City.[ciii] Most of these dams pose little risk;

however, there are 21 dams in Putnam County are classified as high hazards according to the New York State Department of Environmental Conservation (NYSDEC).[civ]

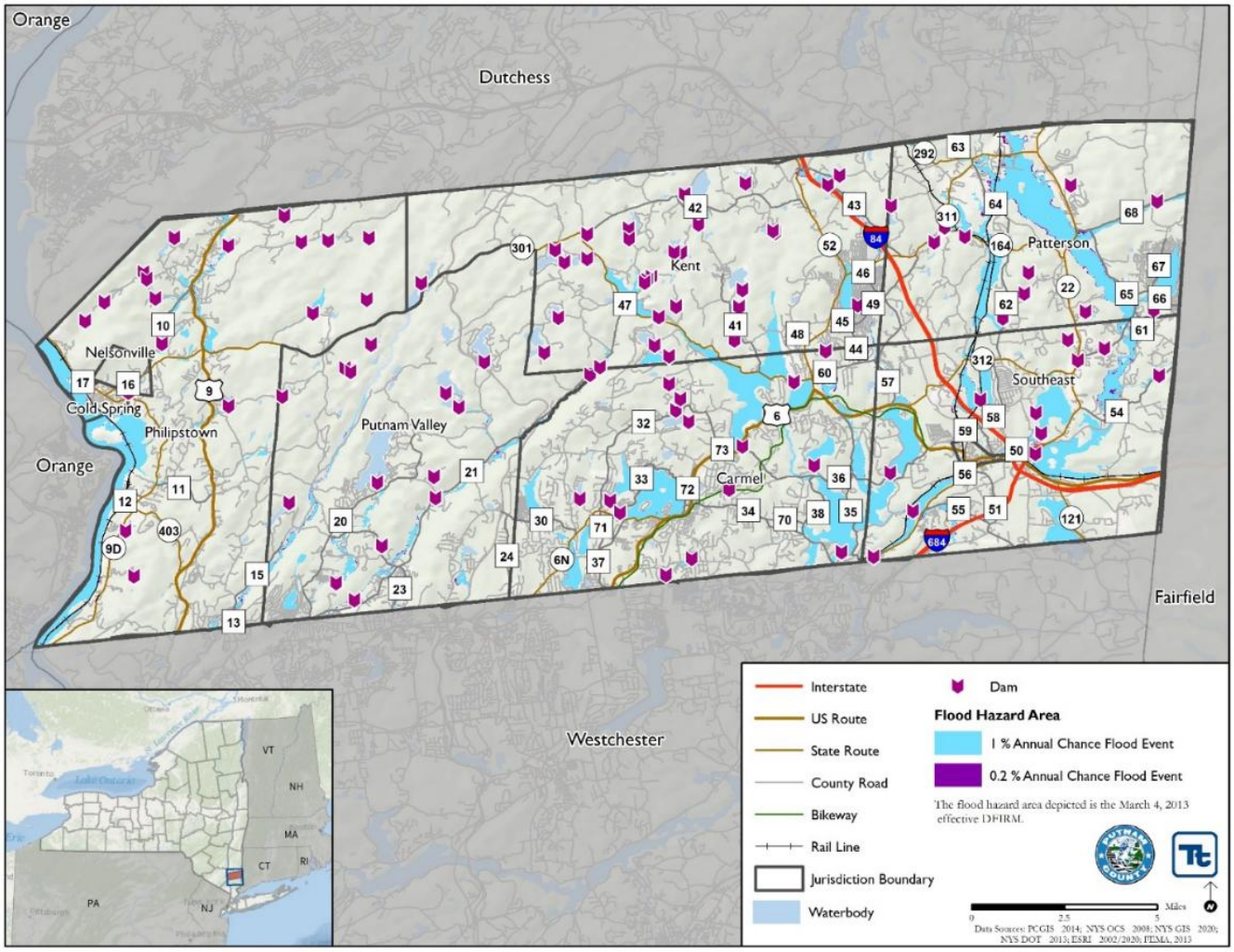


Figure 14 Dams in Putnam County, overlaid with 100-year and 500-year flood hazard area | *Putnam County Hazard Mitigation Plan Section 5.4.5, p. 11*

Development Pressures: Development pressures in Putnam County remain fairly low, although there are several areas in the County projected for future development, posing some risk for the County's ecosystems and natural resources. According to the NYMTC Moving Forward 2055 report, most of these areas are in the western portion of the County.[cv] Potential corridors for mixed-use sustainable development exist along Route 6 and Interstate 84, and housing growth areas are in Carmel, Brewster, Patterson, and Cold Spring.[cvi] Several downtowns in the County are projected to be centers for sustainable development, including Cold Spring, Mahopac, Carmel, Brewster, and Patterson.[cvii] These corridor, housing growth area, and downtown designations are drawn from the NYMTC Moving Forward 2055 Regional

Transportation Plan. They are not County designations or environmental performance standards, and they describe locational suitability for growth rather than the design of any specific project. The Regional Transportation Plan's underlying data is compiled through NYMTC's member agencies, including Putnam County, and incorporates locally provided information such as zoning ordinances and maps.

Given its uniqueness as an ecosystem, the Great Swamp is an important environmental area in the County that may be vulnerable to future planning and development.[cviii] For example, housing growth areas in Patterson intersect with the Great Swamp, posing potential development concerns.[cix] [cx] Several additional protected environmental areas in Putnam County may constrain or be vulnerable to development. These include, but are not limited to, the Hudson Highlands State Park Preserve, which lies near a housing growth area in Cold Spring, and land owned and protected by New York City, intersecting with several housing growth areas and corridors identified for development in the eastern portion of the County.[cxi] [cxii]

Figure 5.4.5-5 New Development and 1- and 0.2-Percent Annual Chance Flood Event Hazard Area in Putnam County

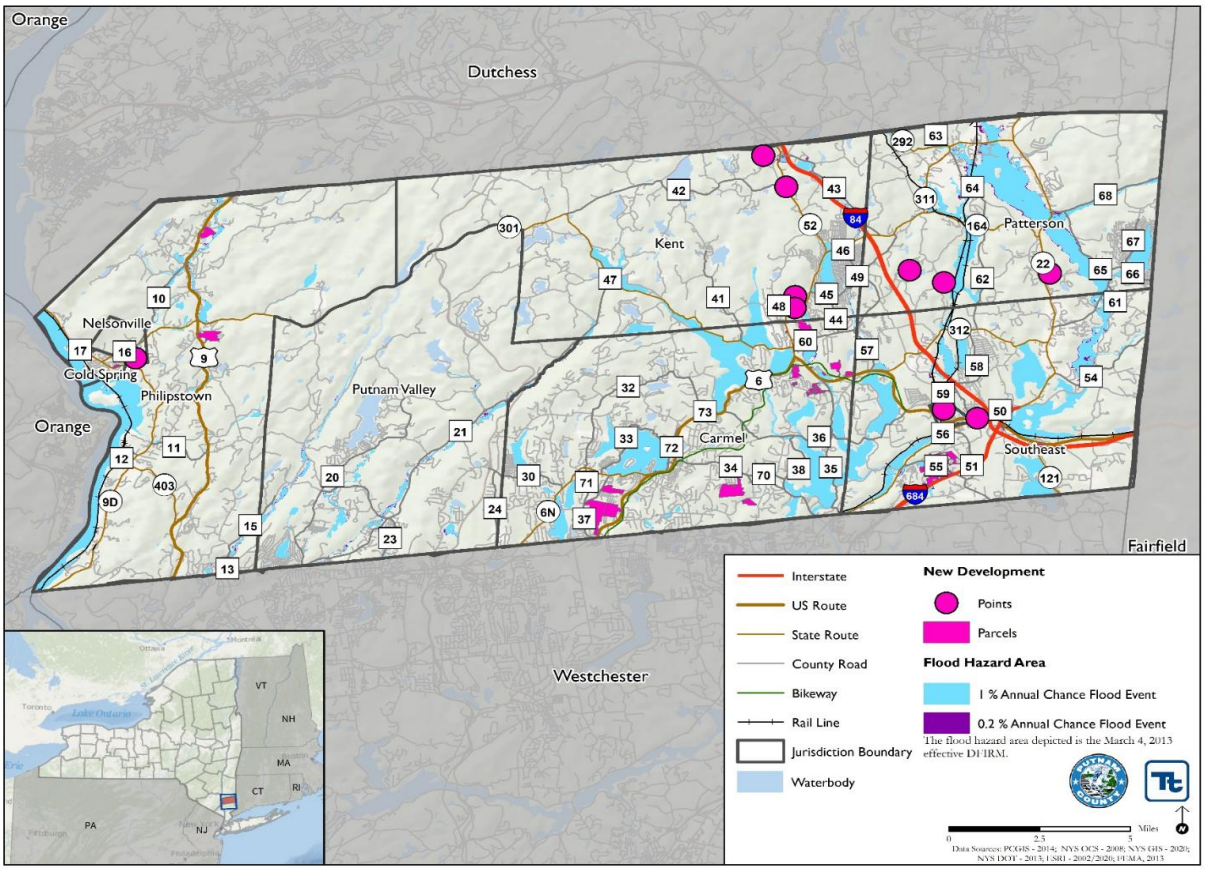


Figure 15: Potential New Development (as of 2020) in Putnam County with Flood Hazard Areas | Putnam County Hazard Mitigation Plan Section 5.4.5, p. 28

Future Ecosystem Pressures: While Putnam County does not have a current Natural Resource Inventory, inventories completed at the community level note certain challenges and long-term concerns for their respective locations. For example, Kent's Natural Resources Inventory mentions concerns about habitat fragmentation, light pollution, surface and ground water contamination, non-native and invasive species, deer, and climate change within the town.[cxiii] Putnam Valley's Natural Resources Inventory includes concerns about drinking water resources, point-source and diffuse pollution into water bodies, aquatic connectivity, wetland encroachment, maintaining forest connectivity, biodiversity, and preserving farmland.[cxiv]

History of Extreme Weather Events

Putnam County experiences humid, continental weather, with large temperature variations spanning -24°F to 106°F and a temperature average of 50°F.[cxv] Putnam County has experienced a variety of past extreme weather experiences, including extreme storms, severe winter storms, flooding, drought, extreme heat, and wildfire.

The impacts of climate change are expected to affect many existing trends related to extreme weather events in the County. According to Putnam County's Hazard Mitigation Plan (2021), the County can anticipate:

- Exacerbated extreme heat, flooding, and potentially drought;[cxvi] [cxvii] [cxviii]
- A decrease in extreme cold;[cxix] and
- Variable impacts on severe storms and severe winter weather. (See "Observed and Projected Climate Change Effects" section for more information.)[cxx]

These changing weather patterns will have disproportionate impacts on the most vulnerable populations.[cxxi]

The following section summarizes the history of extreme weather events in Putnam County, focusing on events from the past 10 years (2016-2025), and includes information on expected climate effects. Additional information on each weather event is available in Appendix K, including dates, descriptions, and impacts (if available) of extreme weather events separated by event type and data source.

Data for this section is sourced from Putnam County's Hazard Mitigation Plan, NOAA National Center for Environmental Information Storm Events Database (NCEI SED), the United States Drought Monitor (USDM), the Federal Emergency Management Agency (FEMA), and desktop research. As the NCEI SED compiles information from several sources, including officials and trained spotters, it may not be exhaustive. Appendix K also includes additional information on data sources used in the History of Extreme Weather Events section of this plan.

Extreme Storms

Background: Extreme storms are common in Putnam County, and include thunderstorms, lightning, hail, tornadoes, high winds, and hurricanes/tropical storms.[cxxii] Collectively, they are estimated to have caused $26.5 million in damages to the County from 1950 to April 2020.[cxxiii] This is likely an underestimate, as full reporting did not begin until 1996.[cxxiv]

Expected Climate Effects: In New York State, high-precipitation storms with a historic 1% chance of occurring each year are now occurring nearly twice as often. Under climate change, thunderstorms are generally expected to occur more frequently in southern New York, and storms may bring more intense wind and rain, even if the number of storms stays consistent with historic levels.[cxxv]

Extreme Storm History: 32 extreme storm events were reported in the County from 2016 to 2025.[cxxvi] Of 29 events reported by the NCEI SED, seven caused $10,000 or more in damages across Putnam County.[cxxvii] Four storms have been declared as Emergencies or Major Disasters by FEMA since 2016, one of which was included in the NCEI SED database.[cxxviii] [cxxix] [1]

Severe Winter Storms

Background: Severe winter storms are those where the main types of precipitation are snow, sleet, or freezing rain, and they can bring heavy or blowing snow and dangerous wind chills. Putnam County's winter storms include blizzards, snowstorms, Nor'Easters, and ice storms.[cxxx] Heavy snow events have been the most common type of Severe Winter Storm in Putnam County between 1954 and 2019, and the County has historically seen an average within 25-50 inches of annual snowfall.[cxxxi]

Expected Climate Effects: Under climate change, winter precipitation is projected to increase by 5-15% by the 2050s, although snow cover overall may decrease as a result of warming temperatures and shorter winters.[cxxxii]

Severe Winter Storms History: 88 winter weather events occurred in Putnam County between 1996 and April 2020, along with five FEMA Declarations in the County since federal declarations began in 1954.[cxxxiii] Between 2016 and 2025, 35 events were logged in total.[cxxxiv] [2]

Flooding

Background: Putnam County is susceptible to:

[1] Information compiled from OpenFEMA Datasets and the NOAA NCEI. Specific storm events noted in Appendix K.
[2] Information compiled from the NOAA NCEI. Specific winter storm events noted in Appendix K.

- Coastal flooding, caused by seawaters rising above regular tidal levels;
- Riverine flooding, which occurs along non-tidal river channels and includes overbank and flash flooding;
- Stormwater and urban floods caused by drainage issues and high groundwater levels;
- Ice jam flooding, which occur when pieces of floating ice float downstream and create an obstruction; and
- Flooding from dam failure.[cxxxv]

The primary sources of flooding in Putnam County are the Hudson River and its tributaries and floodplains. Floodplains are defined as water-adjacent land inundated during flood events, which exist throughout the County. That said, stormwater and urban floods can occur outside standard floodplains.[cxxxvi]

Expected Climate Effects: Under future climate change, the County may experience increases in several kinds of flooding, caused by precipitation increases and a rising Hudson River due to global sea level rise. Precipitation amounts are projected to increase by 11-12% in the Southern Hudson Region by the 2080s, and the Hudson River may rise 21-35 inches up to Albany within the same time frame.[cxxxvii]

Flooding History: 30 flood events occurred between 1996 and 2019 in Putnam County, causing an estimated $1.96 million in property damage.[cxxxviii] Since then, there have been an additional logged four flooding events in the County from the NCEI, and one FEMA Disaster Declaration.[cxxxix] [cxl] [cxli] [3]

Drought

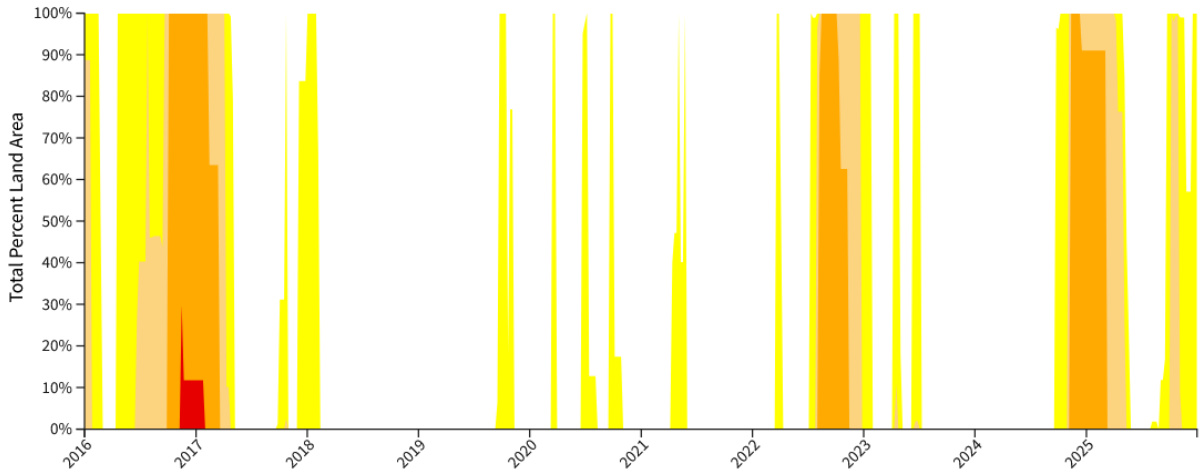
Background: Drought is characterized by below-normal precipitation levels, occurring from shortfalls in precipitation or changes in surface and subsurface water supplies. Droughts are regional, potentially affecting everyone in Putnam County, with downstream effects for those in the lower portion of the state, especially New York City. The County's climate overall is humid, meaning severe or extreme drought conditions are rare, though dry conditions are relatively frequent.[cxlii]

Expected Climate Effects: Under climate change, though precipitation may increase, rising temperatures and heat wave intensity mean that summer droughts are projected to increase in

[3] Information compiled from OpenFEMA Datasets and the NOAA NCEI. Specific flooding events noted in Appendix K.

Putnam County.[cxliii] However, drought is not considered one of Putnam County's top climate hazards.

Drought History: Drought conditions are categorized from D0, Abnormally Dry, to D4, Exceptional Drought, based on water resource levels, water use restrictions, and impacts to agriculture (Fig. 15).[cxliv] Between 2016-2025, the County has seen four distinct drought events where the majority of the County experienced at least Moderate Drought conditions. There were 15 events with Abnormally Dry conditions or where a minority of the County experienced Moderate Drought levels. The duration, severity, and extent of the droughts from 2016-2025 are shown in Fig. 15, and specific severity and duration in Appendix K.[cxlv]



Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought: • short-term dryness slowing planting, growth of crops or pastures Coming out of drought: • some lingering water deficits • pastures or crops not fully recovered
D1	Moderate Drought	• Some damage to crops, pastures • Streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested
D2	Severe Drought	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed
D3	Extreme Drought	• Major crop/pasture losses • Widespread water shortages or restrictions
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and wells creating water emergencies

Figure 16: Droughts in Putnam County from 2016 to 2025 | NDMC USDM, via NOAA NIDIS: NDMC USDM, via Northeast Regional Climate Center

Extreme Heat

Background: Extreme heat occurs throughout Putnam County for much of the summer, with variations due to altitude. It is measured by both air temperature and relative humidity through a metric called the Heat Index, which provides a measure of how people are physiologically affected by high temperatures.[cxlvi]

Expected Climate Effects: Under climate change, summer temperatures in New York State are projected to rise between 5.3°F and 11.1°F by the 2080s, increasing the frequency of days with high absolute temperatures and Heat Indices, and increasing the frequency and duration of heat waves.[cxlvii]

History: One extreme heat event has been logged in Putnam County between 2016-2025 although this may not be exhaustive.[cxlviii][cxlix] [4] [5] The National Weather Service (NWS) issues alerts based on Heat Index thresholds. In New York, a Heat Advisory is issued when the heat index reaches 95–104°F and remains at or above that level for a minimum of 2 hours. An Excessive Heat Watch is issued 1 to 2 days in advance when Excessive Heat Warning criteria are considered likely. An Excessive Heat Warning is also issued by the County when the heat index reaches 105°F or greater and is expected to persist for 2 hours or more, consistent with National Weather Service criteria. The County also issues seasonal and event-specific public advisories with heat safety information via its website and social media accounts.

Wildfire

Background: Putnam County is at a generally low risk of wildfires, meaning that fires do not ignite readily, and spread tends to be slow and irregular. That said, areas that are heavily forested or contain large tracts of brush and shrubs are still fire-prone, and over two thirds of the County's land area contain houses proximate to wildland vegetation, where wildfire problems are most pronounced.[cl] [cli] From 2003-2017, Putnam County had a high wildfire occurrence rate per square mile compared to the majority of New York State, with highest occurrence in its westernmost areas.[clii]

Expected Climate Effects: Under climate change, wildfires will continue to occur, but the probability of their size and intensity cannot be predicted.[cliii] Their frequency has been projected to increase in New York State, but the probability remains low compared to other regions of the United States.[cliv]

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[5] Information compiled from the NOAA NCEI and Putnam County's 2021 HMP. Specific heat events noted in Appendix K.

Wildfire History: At least five wildfires of variable sizes occurred in Putnam County since 2020 although this list may not be exhaustive.[6]

Underlying threats, challenges, barriers, risks

Due to its social, economic, ecosystem, weather, and climate-related trends, Putnam County can anticipate a variety of potential challenges in building its resilience and adaptive capacity. Relevant challenges or risks related to Putnam County's socioeconomic trends include, but are not limited to, the following:

- Putnam County's large and growing percentage of older adults may require additional outreach or support in adaptation outreach and strategies.
- Due to their outdoor nature, Putnam County's employment sectors like agriculture and construction could be particularly vulnerable to changing climate conditions.
- Many departments and offices within and outside the County government are relevant to resilience and adaptation planning, potentially requiring a significant amount of cross-departmental collaboration.
- Many institutions such as hospitals and schools which serve vulnerable community members are privately or municipally operated, limiting adaptive capacity on the county-level.

From an ecosystems perspective, Putnam County may face the following vulnerabilities:

- Putnam County's large number of lakes, streams, wetlands, and location along the Hudson River face increased susceptibility to flooding.
- Putnam County's ecosystems include habitat for rare and endangered species that may be susceptible to climate impacts, particularly harmful algal blooms, inland flooding, and invasive species, or pest introductions.

Uncertainties or Unknowns

Based on the above Place Narrative, there are data gaps or uncertainties that may impact adaptation and resiliency planning in Putnam County. A partial list of uncertainties includes:

- Social networks contribute to climate change adaptation and resilience. People who belong to a strong social network can share access to information, transportation, or other resources to be resilient in the face of climate impacts. People are more likely to respond to a climate impact if someone they know expresses concern about that impact.[clv] Community organizations can play an important part in resilience, but this requires strong communication and buy-in from residents.[clvi] Each of these effects exist within Putnam County, and they are difficult to quantify.

[6] Information compiled from desktop search. Sources and specific fire events noted in Appendix K.

- Data on storms and severe weather events may be incomplete due to a lack of standardized reporting methods.
- Data on the ownership or protection status of assets may be out of date or become so in the future due to infrastructure repair, infrastructure removal, or the buying/selling of land.
- Areas of development are predictive and may not reflect development projects as they are completed.
- Natural resources and assets may be underreported due to a lack of a county-level Natural Resources Inventory. Additionally, there may be additional natural assets within yards, golf courses, or other private settings.

Climate Vulnerability Assessment

This climate change vulnerability assessment is meant to be an initial qualitative assessment of how climate change impacts community needs, sectors, assets, and values in Putnam County. Climate change is influencing the intensity and frequency of extreme weather events. In addition, climate change acts as a "threat multiplier" by adding additional stress to existing problems, challenges, and risks. In the future, projected changes to temperature, precipitation, and sea level could result in even more significant impacts to the environment, infrastructure, economy, and human health.

The climate of New York State is undergoing various notable shifts in the 21st century. According to the New York State Climate Impacts Assessment, the state is experiencing:

- Increasing temperatures,
- Changing precipitation levels, and
- Rising sea levels.[clvii]

This assessment also provides additional information on extreme weather hazards. These include extreme heat, severe storms, drought, and wildfire.

The following Climate Vulnerability Assessment details the associated risks and human impacts of these climate hazards on Putnam County and its residents. The aim of this assessment is to support planning and implementation of climate resilience and adaptation strategies at the county-level and the municipality-level. By developing, planning, and implementing resilience strategies, communities can reduce and better manage risk under changing climate conditions.

Observed and Projected Climate Change Physical Effects in NY State and Putnam County

Climate Hazard #1 - Increasing Temperatures

According to the 2022 New York State Climate Summary published by the National Oceanic and Atmospheric Administration (NOAA), since the beginning of the 1900s, New York has experienced a temperature increase slightly under 2.5°F.[clviii]

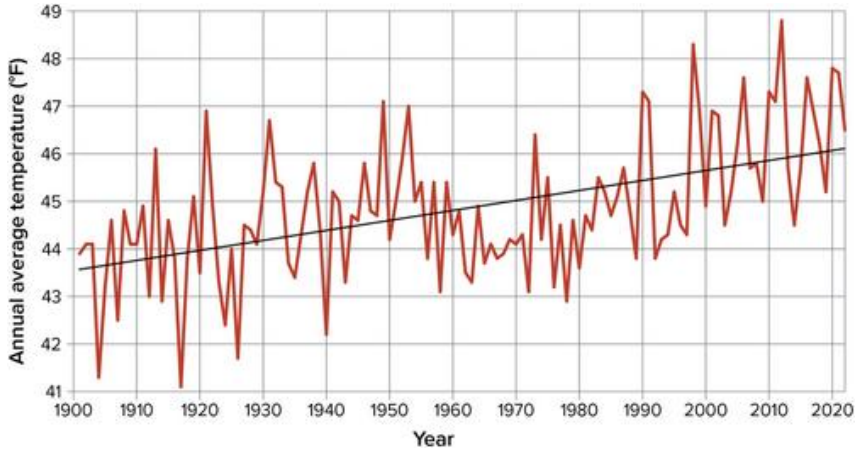


Figure 17: Annual average temperature in New York State, 1901–2022; NYS Climate Impacts Assessment

In a higher emissions scenario, the average temperature in the State is projected to increase to "11°F warmer than the hottest year on record."[clix] Even in the best-case scenario with low emissions, the average temperature is projected to increase by 3°F compared to average historical temperatures.[clx]

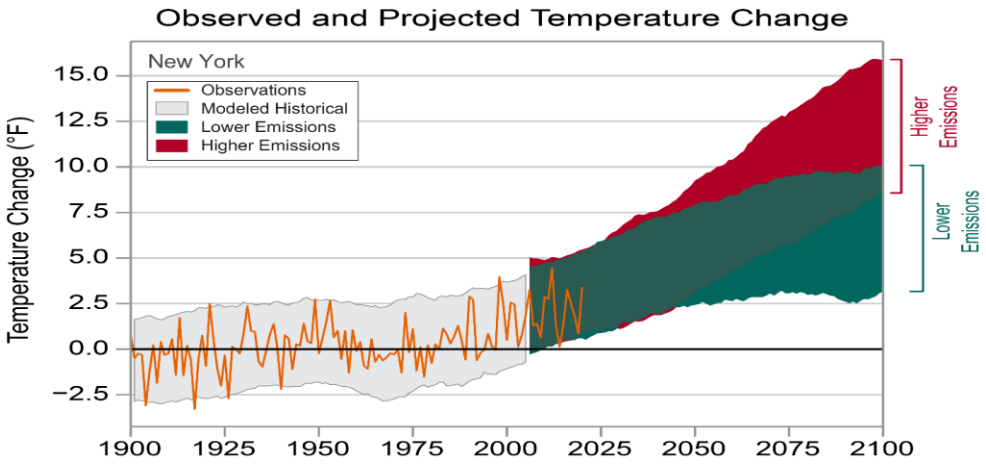


Figure 18: Observed and Projected Temperature Change in New York State | NYS Climate Summaries

The increasing temperatures are estimated to have a two-fold impact on the State's climate – an increase in the number of days with temperatures above 90°F and a decrease in the number of days with temperatures below 32°F. The higher frequency of 'extreme hot days' is expected to disproportionately affect low-income households, outdoor workers, unhoused people, people with disabilities and pre-existing medical conditions, and older adults.[clxi] In Putnam County, approximately 20.3% of the population is over the age of 65.[clxii] This is slightly higher than the average living in Counties across the mid-Hudson region (19.04%).[clxiii] [clxiv]

Increasing Temperature in Putnam County

Data from the New York State Climate Impacts Assessment anticipates an increase in temperature of 4.1°F-6.1°F and 5.7°F-10°F by the 2050s and 2080s respectively in the South Hudson Valley Region, where Putnam County is located. These estimates use a 1981-2010 baseline average.[clxv]

As a result of the increase in temperature, Putnam County is also projected to witness an increase in the number of heatwaves (defined as three or more consecutive days with temperatures above 90°F). On average, the South Hudson region records 18 days with temperatures greater than 90°F per year. By 2050, this is anticipated to rise to 41- 64 days, and by 2100, this could rise to 48-87.[clxvi]

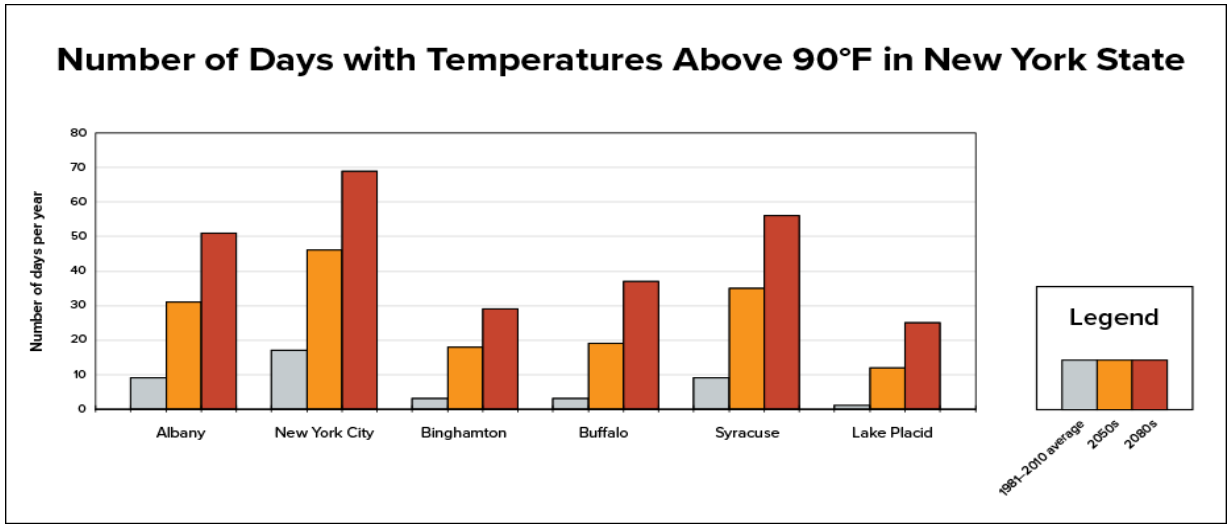


Figure 19: Projected changes to the number of days per year with temperatures above 90°F at six locations across New York State | NYS Climate Impacts Assessment

As New York's climate continues to warm, it is possible to compare counties, cities, towns, and villages to other locations around the United States to see where a municipality's new local "norm" would be. Following a high greenhouse gas emissions model, by 2080, the climate of Putnam County may be comparable to that of Ola, Arkansas.[clxvii]

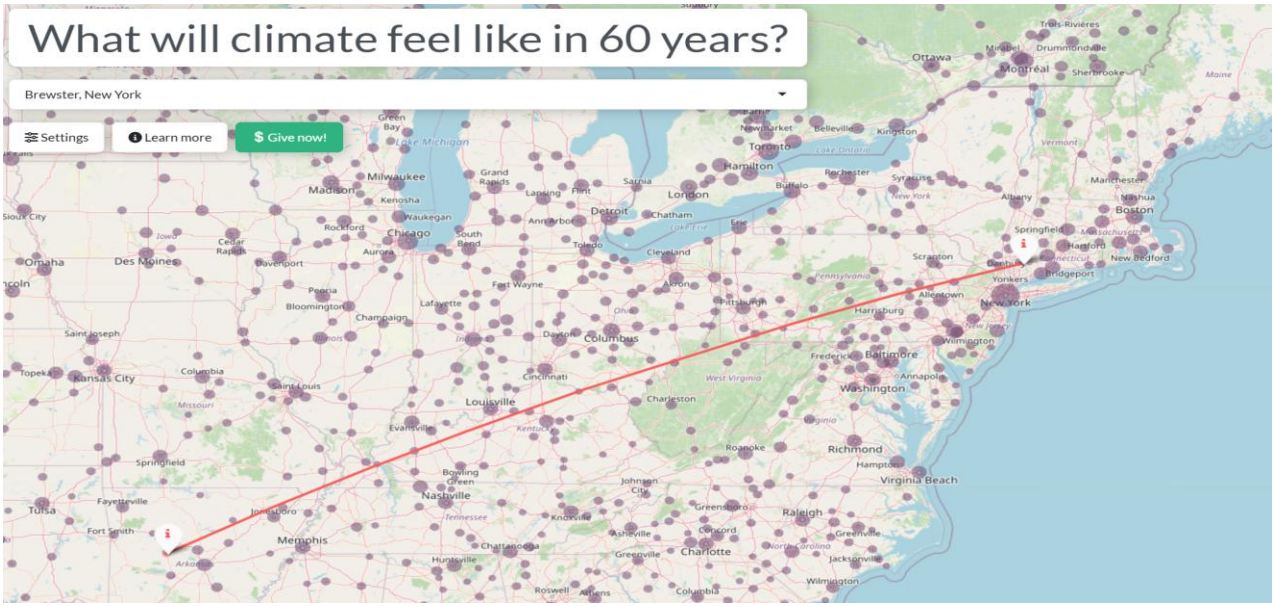


Figure 20: The climate of Brewster (of Putnam County NY) is projected to be comparable to Ola, Arkansas by 2080 under high emissions trajectory | [University of Maryland Center for Environmental Sciences]

The impacts of rising temperatures may not be evenly distributed. The map below illustrates the maximum heat index experienced across Putnam County using data from 2010-2020. Data used to generate the map is sourced from the DEC Urban Heat Island Mapper Tool, highlighting some areas with higher potential heat concern.[clxviii]

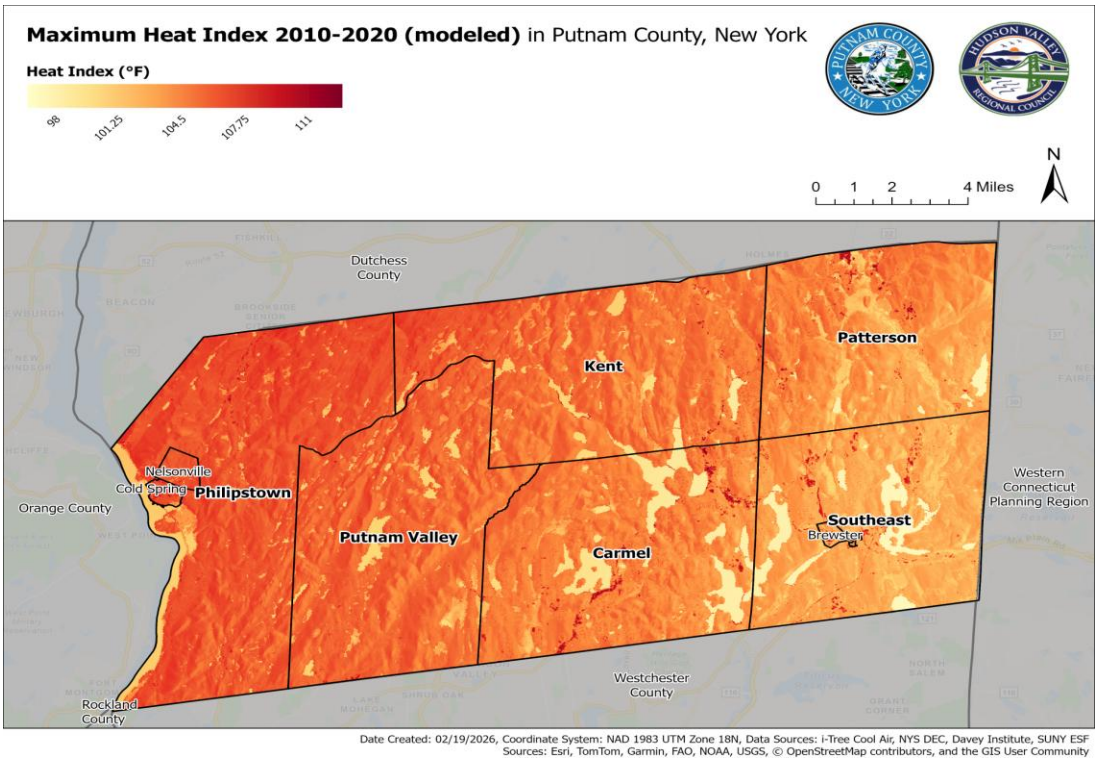


Figure 21: Maximum heat index modeled in Putnam County from 2010-2020, sourced from the i-Tree Cool Air model. This model uses physical environmental variables and station data to reconstruct the hottest temperature experienced between 2010-2020 on a 30-m grid across New York State.

Increasing Temperatures Stakeholder Perspectives: Residents and employees in Putnam County have noted prior experiences with high temperatures. Based on the stakeholder survey, over 75% of participants reported that they had experienced extreme heat (temperatures >90 °F), and 76.2% reported that they had experienced at least one heat wave (3+ days with max temperatures > 90 °F) within the past 5-10 years.

Survey respondents indicated a variety of levels of concern about rising temperatures in the future, with the majority of respondents indicating a high or medium level of concern. Specifically, nearly 50% (49.7%) of respondents reported that they felt high levels of concern about extreme heat in the next 10-15 years, 27.3% reported a medium level of concern, 20.3% reported a low level of concern, and 2.8% reported that they were unsure.

Concerns about heat waves 10-15 years into the future follow similar trends: over 50% (51%) of respondents reported high-levels of concern, 27.3% reported medium concern, 20.3% reported low-levels of concern, and 1.4% reported that they were unsure.

Climate Hazard #2 - Changing Precipitation

The Fifth National Climate Assessment, produced by the U.S. Global Change Research Program (USGCRP), reveals an increase of about 60% for the amount of precipitation on the "heaviest 1% of days" over the northeastern United States – a figure that can likely be attributed to the effects of climate change on natural weather patterns.

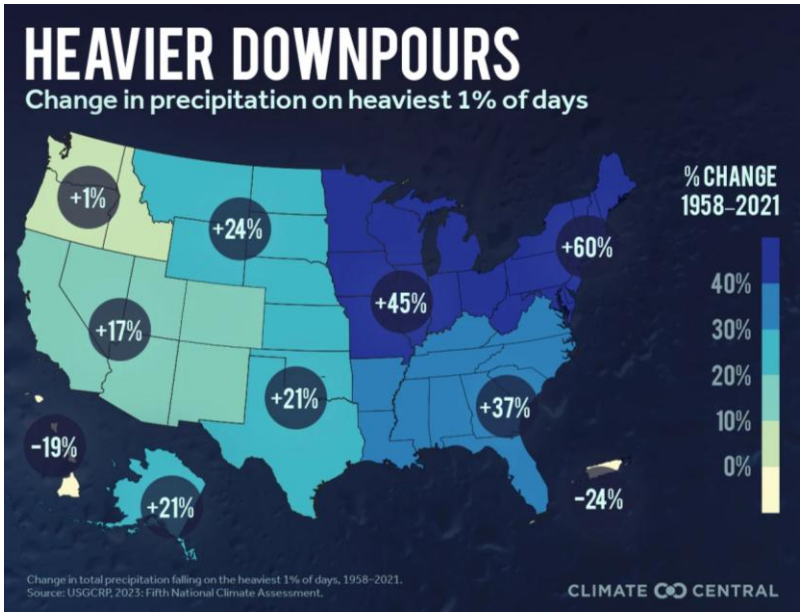


Figure 22: Change in precipitation between 1958 and 2021 across the United States | Climate Central with data from Fifth National Climate Assessment

Within New York State, the State Climate Impacts Assessment highlights that there has been higher precipitation overall and more common occurrences of "heavy precipitation" in the State.[clxix] New York can expect a similar pattern in the future. From 1901 to 2022, the annual precipitation in the State increased 10-20%. By the 2080s, a 6-17% increase in precipitation levels is possible in New York State.[clxx] The lower Hudson Valley and, consequently, Putnam County, is expected to face some of the greatest increases.[clxxi]

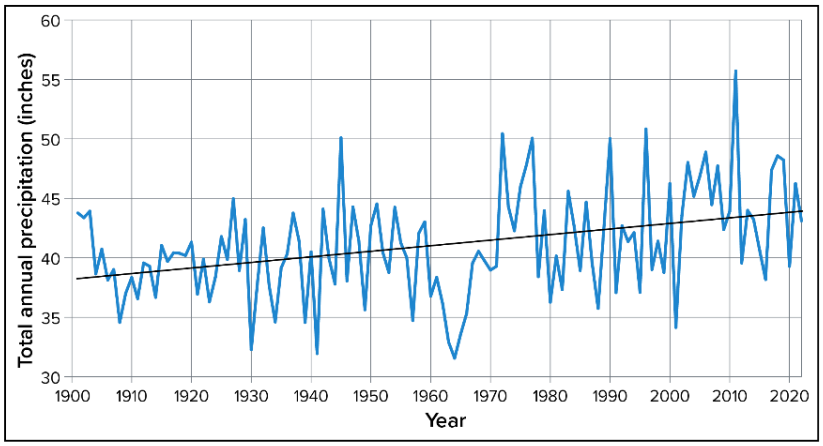


Figure 23: Annual Total Precipitation in New York State, 1901-2022 | NYS Climate Impacts Assessment

Increasing Precipitation in Putnam County

Putnam County and the surrounding lower Hudson Valley are at heightened risk for more drastic increases in precipitation than many areas of New York State. New York City can

anticipate an increase in precipitation of 4-11% and 7-17% by the 2050s and 2080s respectively.[clxxii] Given its relatively close proximity to NYC, the County can expect to experience similar trends.[clxxiii]

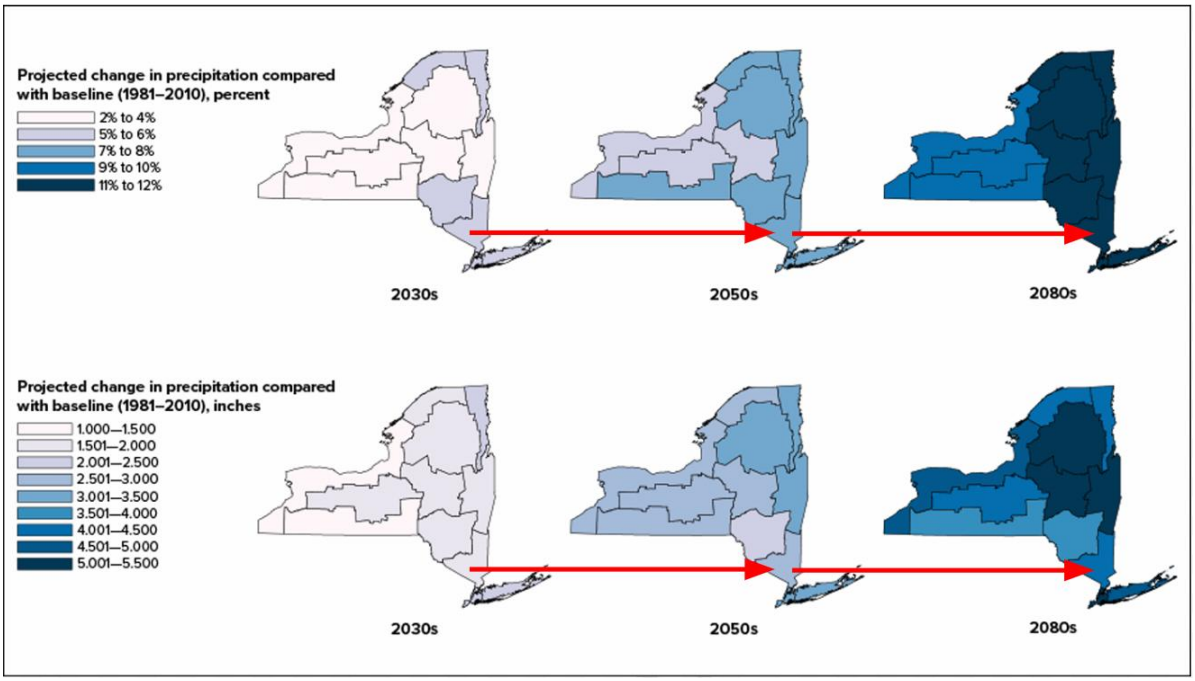


Figure 24: Projected annual precipitation in New York State during the 21st century, relative to the 1981–2010 baseline | NYS Climate Impacts Assessment

The anticipated increase in precipitation could arise from a higher number of rainy days and/or be the result of heavy tropical storms, which could result in flash floods or riverine flooding. Water quality concerns could result from the expected increasing precipitation levels. For example, the New York Climate Impacts Assessment notes that water from extreme storms often is not absorbed by the ground cover and "runs off surfaces into water bodies. Runoff can contaminate water sources with pollutants, pathogens, and sediments."[clxxiv] Putnam County, which has many streams, tributaries, and over 60 lakes, is at heightened risk of water contamination caused by more extreme runoff.[clxxv]

Increases in precipitation can have dire implications as heavy rain feeds into dangerous floods. Although only two flooding events in total were recorded in Putnam County between 2015 and 2020, according to the Putnam County Bureau of Emergency Services, such events are predicted to become more frequent under the projected climate conditions mentioned above.[clxxvi] [7]

[7] List of recorded flooding events may not be exhaustive.



Image 1: Flooding in Cold Spring, NY on December 23, 2022 | Ronald Zorilla, My Coast NY



Image 2: Damage to Hudson Valley InterArts building in Patterson following a rain event in July, 2025 | Patterson Fire Department, accessed via Putnam County Times & Putnam County Press

Changing Precipitation Stakeholder Perspectives: Residents and employees of Putnam County have noted prior experiences with precipitation from severe storms. Based on a stakeholder survey, 68.5% of respondents indicated that they had experienced precipitation-related severe storms in the past 5-10 years. The majority of survey participants reported a high or medium level of concern about severe precipitation 10-15 years into the future: 49% of respondents reported a high-level of concern, 29.4% and medium level of concern, 20.3% a low level of concern, and 1.4% unsure.

While not specifically related to severe storms/precipitation, 53.1% of respondents also indicated that they had experienced flooding in the past 5-10 years and concern levels about flooding in 10-15 years into the future were primarily high or medium: 41.3% of respondents reported high levels of concern, 32.9% medium, 24.5% low, and 1.4% unsure.

As part of Putnam County's 2021 Hazard Mitigation Plan, a Citizen Survey was distributed that also assessed concerns about flooding, although the survey did not have a 10-15 year future outlook. The survey measured concerns about flooding to streets and properties, basements, and first floor levels or above. Out of these flooding types, respondents reported the highest level of concern about flooding to streets and properties: 14.79% reported that were highly concerned or extremely concerned; 60% reported that they were somewhat concerned or concerned; and 25.22% reported that they were not concerned.[clxxvii] The Climate Vulnerability Assessment and Hazard Mitigation Plan surveys are not perfectly comparable. However, the increase in high concern (14.79% to 41.3%) indicates that there may be growing concern about future flooding within the County.

The graph below compares the percentage of survey respondents who reported high, medium, and low concerns about flooding across the two surveys. Data from the Hazard Mitigation

Plan survey represents concerns about street and property flooding. High concern corresponds with highly or extremely highly concerned responses, and medium concern corresponds with somewhat concerned or concerned responses.

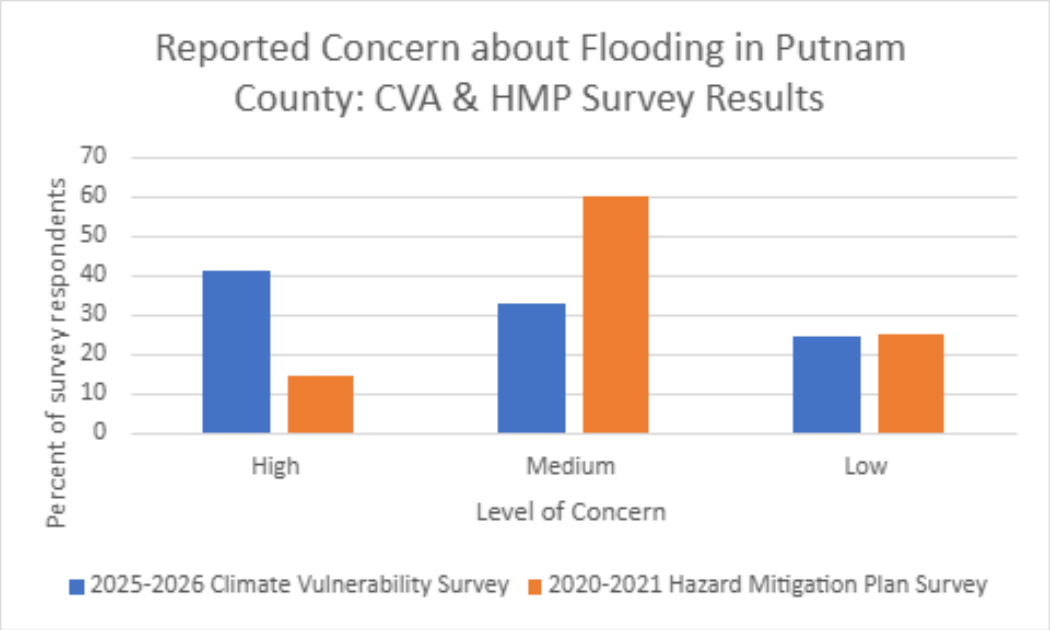


Figure 25: Concern about flooding in Putnam County based on Climate Vulnerability Assessment (2025-2026) and Hazard Mitigation Plan (2020-2021) data.

Climate Hazard #3 - Rising Sea Levels

New York State has experienced about 13 inches of sea level rise, using an 1880 baseline. This increase is higher than the global average of 7-8 inches.[clxxviii] Sea level projections globally span 1-8 feet, although projections of 1-4 feet are considered most likely by 2100, worldwide[clxxix clxxx] The increase is projected to be larger in New York State than globally.[clxxxi]

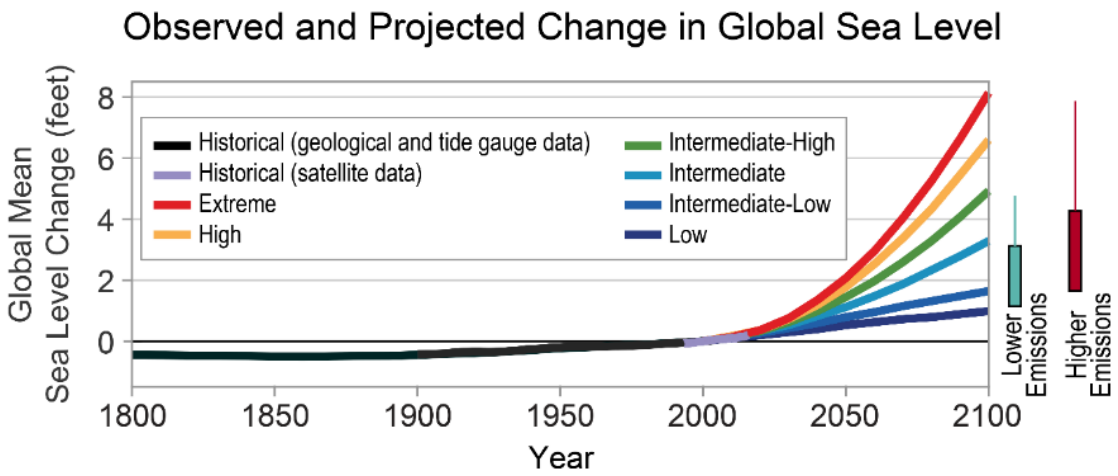


Figure 26: Observed and Projected Change in Global Sea Level | [New York State Climate Summaries]

Rising Sea Levels in Putnam County

There are multiple municipalities within Putnam County situated along the Hudson River and its tributaries. As global sea level rises, people in these areas will begin to face intensifying impacts as the River begins to expand beyond its normal tides. These impacts may include increased salinity in wetlands, in turn altering ecosystems, and saltwater intrusion into freshwater aquifers, which can be absorbed into soils and contaminate drinking water sources. A digital sea level rise mapper from the National Oceanic and Atmospheric Administration (NOAA) illustrates this reality, projecting a likely sea level rise of ~12 inches by 2040 and ~21-77 inches by 2100 in southeast New York and northeast New Jersey.[clxxxii]

Cold Spring, North Putnam (2020-2025) **Cold Spring, North Putnam (2100)**

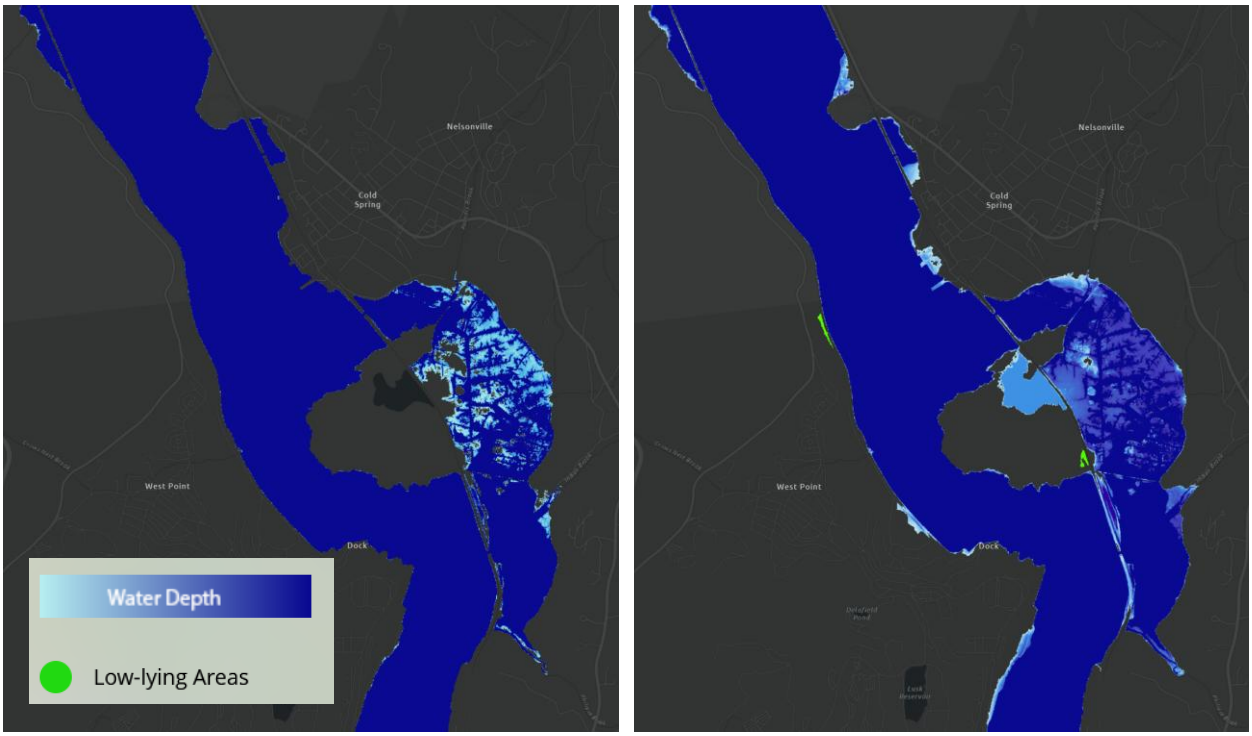


Figure 27: NOAA's Sea Level Rise Viewer illustrates possible changes in water levels near Cold Spring during the Hudson River's high tide. Water depth is shown to increase with darker shades of blue, and low-lying areas at risk of flooding are shown in green. The image to the left indicates shows 6 inches of sea level rise (within the range of likely projections for years between 2020-2025), and the image to the right indicated projections under 48 inches of sea level rise (within the intermediate-intermediate high projections for 2100) | NOAA

Manitou Preserve, South Putnam (2020-2025) **Manitou Preserve, South Putnam (2100)**

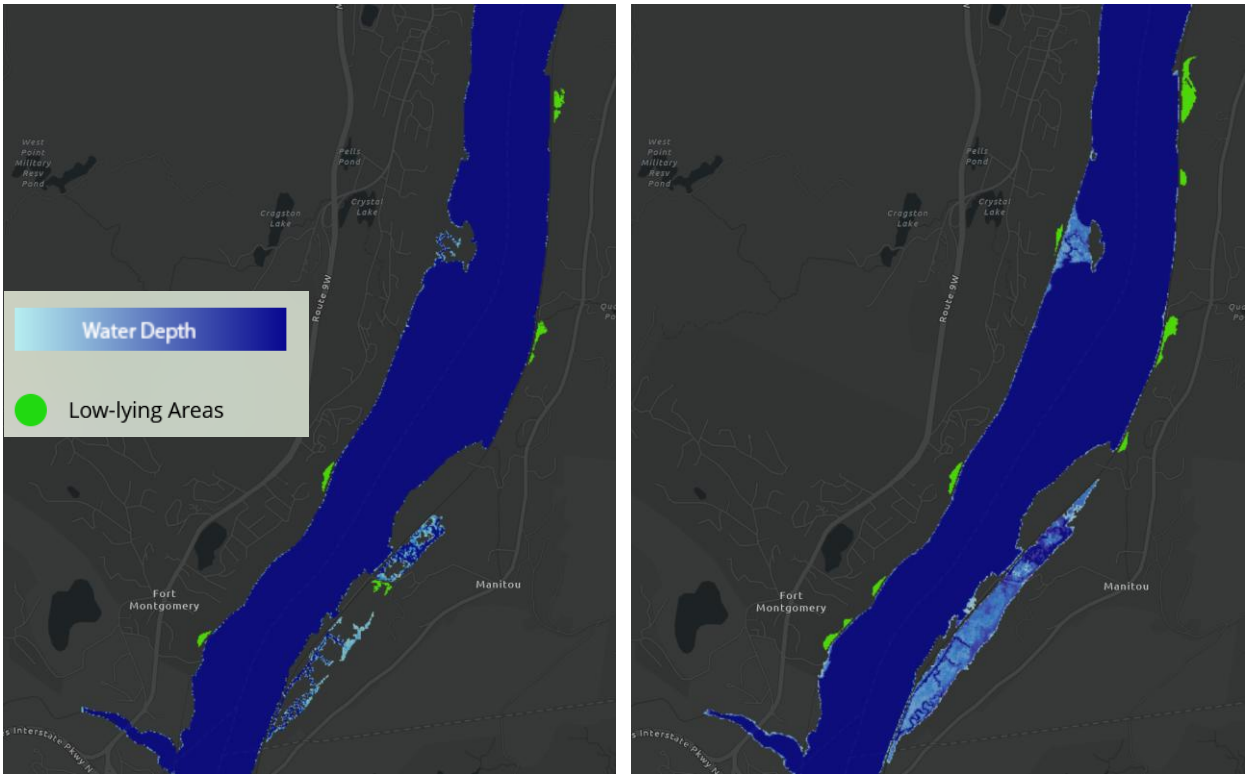


Figure 28: NOAA's Sea Level Rise Viewer illustrates possible changes in water levels near Manitou Point Preserve during the Hudson River's high tide. Water depth is shown to increase with darker shades of blue, and low-lying areas at risk of flooding are shown in green. The image to the left indicates shows 6 inches of sea level rise (within the range of likely projections for years between 2020-2025), and the image to the right indicated projections under 48 inches of sea level rise (within the intermediate-intermediate high projections for 2100) | NOAA

New York State Department of Environmental Conservation also has sea level rise projections for New York City/Lower Hudson Valley, the region where Putnam County is located. Using a 1995-2014 baseline, sea level rise projections under a low, medium, high, and rapid ice melt scenario are included below:

Table 1: Table Adapted from NY DEC, Projected Sea Level Rise in New York City/Lower Hudson Region based on 6 NYCRR Part 490 Projections | NY DEC

New York City/Lower Hudson				
Year	**Low**	**Medium**	**High**	**Rapid Ice Melt**
2050	12 inches	16 inches	23 inches	N/A
2100	25 inches	36 inches	65 inches	114 inches
*Projected sea level rise using 1995-2014 baseline				

Sea Level Rise Stakeholder Perspectives: While not specific to sea level rise, the stakeholder survey indicated that 53.1% of respondents had experienced flooding in the past 5-10 years.[clxxxiii] Concerns about flooding in 10-15 years into the future were primarily high or medium. 41.3% of respondents reported high levels of concern, 32.9% medium, 24.5% low, and 1.4% unsure.

Other Climate Hazards in Putnam County

According to the U.S. Climate Vulnerability Index, Putnam County falls within the 99th percentile of vulnerability to extreme events nationally – 4th out of all 62 New York State counties in this category.[clxxxiv] According to the Index, the County is especially vulnerable to sea level rise, flooding, storms, and heightened precipitation. It has an "average" level of vulnerability to temperature changes and droughts, and "lower vulnerability" to wildfires. As temperature, precipitation, and flooding have already been covered in this document, the following sections will focus on storms, droughts, and wildfires.

Droughts

Drought can significantly impact agriculture, water quantity, and water quality. People living in drought conditions are more prone to experience dust storms and wildfires. The inhalation of wildfire smoke can significantly increase the risk of aggravating respiratory and cardiovascular conditions, since wildfire smoke poses greater health concerns than "non-smoke particulate pollution."[clxxxv] [clxxxvi]

The historical trends of Putnam County's dry conditions and droughts, as well as wet conditions and extreme precipitation, are detailed in the National Integrated Drought Information System (NIDIS) dashboard below. This figure illustrates the occurrence of dry and wet conditions from 1980 to 2025. The blue-green lines represent wet conditions, increasing from light green to light blue to dark blue. The orange-red lines represent dry conditions, increasing from yellow to orange to red.

Although not seen as one of the greatest climate threats, the figure below indicates there have been a series of consecutive dry conditions from 2012 to 2022. Since 2022, conditions have alternated between dry and wet. Simultaneously, while wet conditions are less frequent, they are more intense, as depicted by the deep blue lines in 2012, 2019, and 2024, as compared to 1984 or 1996.[clxxxvii]

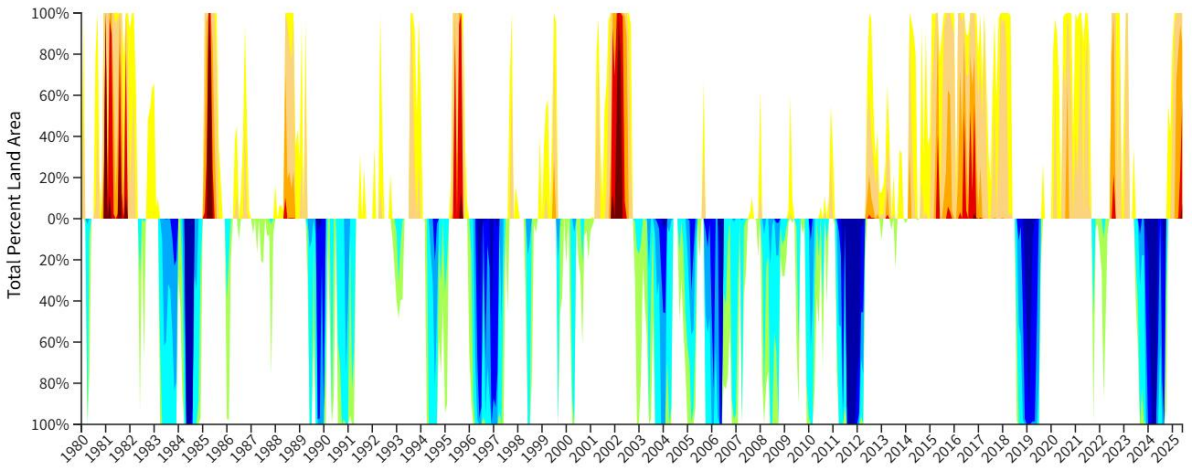


Figure 29: Figure 29: Historical Trend of Dry and Wet Conditions in Putnam County | NIDIS

Residents of Putnam County have also identified drought as an issue and consider it a high concern. In response to a stakeholder survey, 63.6% of respondents indicated that they had experienced drought in Putnam County in the past 5-10 years. Concern about drought 5-10 years in the future were primarily ranked as high or medium by respondents: 46.2% reported high concern, 34.3% medium concern, 19.9% low concern, and 0.7% were unsure.

Wildfires

Wildfires, while natural and essential for the health of forests, can be dangerous and destructive – particularly as they become more frequent in areas where climate conditions become hotter and drier. While Putnam County is classified as lower risk for wildfires, based on the National Climate Index, recent events suggest that wildfire activity is an emerging concern. In the past several years, there have been numerous forest fires in Putnam County and the surrounding region, underscoring the potential for increased risk during dry or windy conditions. Putnam Valley firefighters had to manage a 21-acre fire in April 2025.[clxxxviii] Across the Hudson River, the 2024 Jennings Creek fire burned >5,000 acres of land at the border of New York and New Jersey,[clxxxix] highlighting that wildfire risk is not confined by municipal boundaries and can affect the broader region. More locally, a brush fire also broke out in Kent, NY in October 2024 that impacted 33 acres.[cxc]

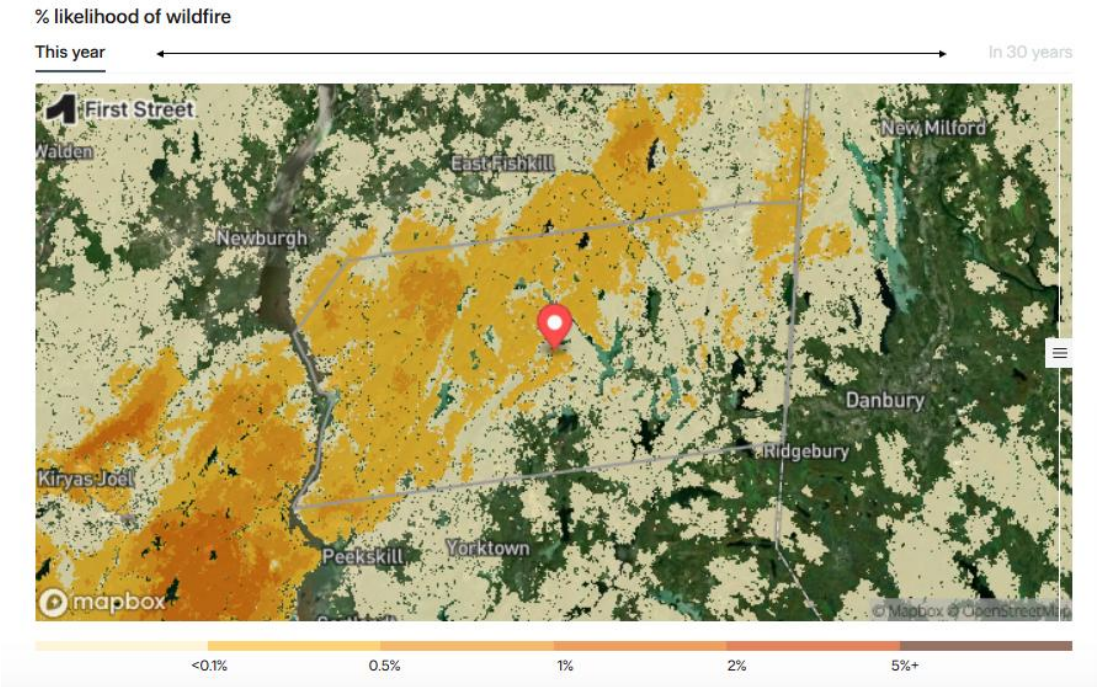


Image 3: Photo of a 2024 wildfire in West Milford, NJ, less than 40 miles from Putnam County, NY | The Guardian



Image 4: Photo of a brush fire in Kent, NY on Oct 26, 2024 | Kent Volunteer Fire Department, accessed via Putnam County Times & Putnam County Press

As wildfire frequency increases, as is predicted across the County,[cxci] the air quality, overall health conditions, tree cover, and water quality will worsen. This may lead to increased incidences of asthma, cardiovascular disease, and other heat and air pollution related health impacts.[cxcii] [cxciii]



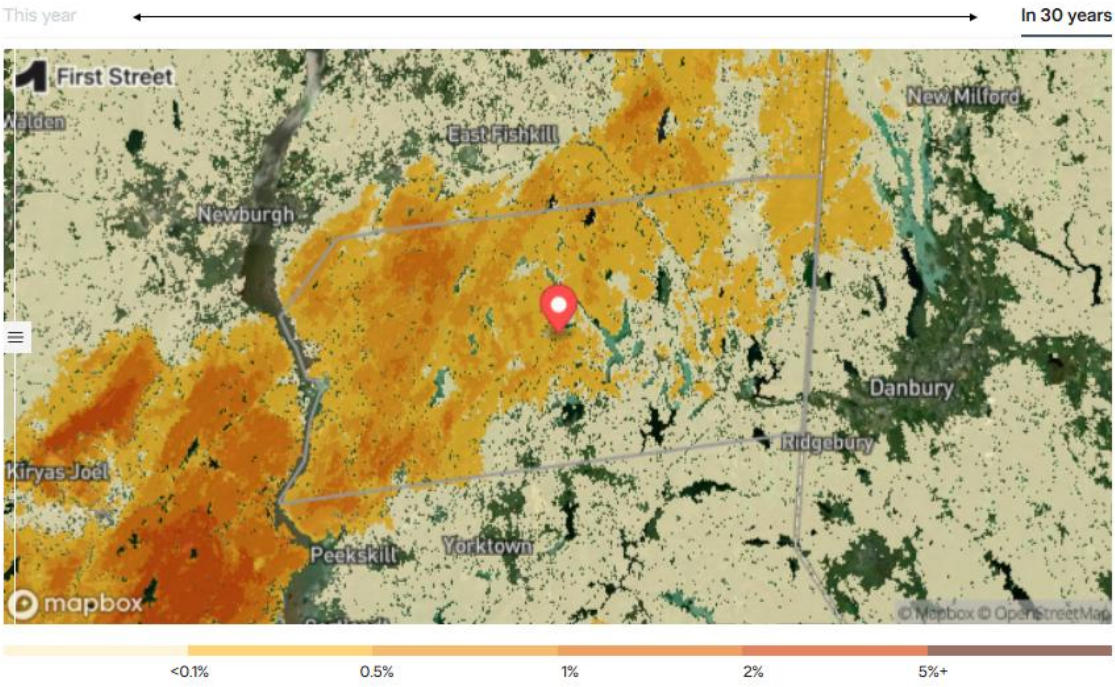


Figure 30: Wildfire likelihood in Putnam County in 2026 (top) and in 2056 (bottom) | First Street Foundation

Based on stakeholder feedback, there were low levels of prior experiences with wildfires in the past and mixed levels of concern about wildfires in the future. In the survey, 21.7% of respondents indicated that they had experienced wildfire 5-10 years in the past and 32.2% reported high levels of concern about wildfire 10-15 years into the future. At 38.5%, the most people reported medium concern, 26.6% reported low concern, and 2.8% were unsure. More respondents had prior experience with poor air quality 5-10 years in the past: 67.1%.[8] Air quality was primarily a high or medium priority 10-15 years into the future based on survey responses.

Storms (Hurricanes, Tornadoes, and Winter Storms)

Climate change is projected to exacerbate the impacts of hurricanes, increasing the amount of rainfall and the severity of storm surges in New York State.[cxciv] Hurricanes can structurally influence buildings, damage transportation infrastructure, flood homes, displace communities, and lead to loss of biodiversity.

Putnam County ranks 14 out of 62 counties in terms of expected annual economic loss from hurricanes, with damages estimated to cost the County $4.2 million.[cxcv] Between 1954 and

[8] The disparity between survey respondents experiencing wildfire compared to poor air quality can likely be attributed to Canadian wildfires, from which smoke and particulate matter has been carried into New York. Of note is the June 2023 wildfires in Quebec, which led to hazy conditions and air quality warnings across much of New York State, including Putnam County.

2020, Putnam has been listed in 12 severe storm-related FEMA declarations, including for Superstorm Sandy and Hurricane Irene. Including all severe storms within the County, there have been 203 events that caused an estimated $26.5 million in property damages.[cxcvi]

In response to a stakeholder survey, many respondents indicated prior experiences with severe storms in the past 5-10 years. Prior experiences with severe storms related to precipitation were the most commonly reported (68.5%), followed by severe winter storms (52.4%), hurricanes (27.3%), and tornados (20.9%). Concern about severe storms 10-15 years into the future followed a similar pattern. 49% indicated a high level of concerns about precipitation-related severe storms; 37.8% for severe winter storms; 24.5% for hurricanes; and 14.7% for tornadoes.

Exposure, Sensitivity and Adaptive Capacity

Putnam County is home to a variety of infrastructure, social, and environmental assets and services. For this analysis:

- **Infrastructure assets** refer to the built components of the community;
- **Social assets** refer to aspects that are important for communities and economies; and
- **Environmental assets** refer to the County's ecosystems and the services that they provide.

Climate trends—including increasing temperatures, changing precipitation, and rising sea levels—can impact infrastructural, social, and environmental assets. The following section seeks to answer three questions:

1. What assets/community services are important to Putnam County?
2. How will climate hazards affect these assets?
3. To what level can adaptive measures be implemented?

Under this framework, each asset is evaluated based on its exposure, vulnerability, and adaptive capacity, in accordance with guidance from the New York Climate Smart Communities (CSC) program. Definitions provided by the CSC program are included below:

- **Exposure** refers to whether an asset or system is located in an area that is likely to experience the effects of a climate change hazard now or in the future.
- **Sensitivity** refers to how an asset or system fares when exposed to a climate hazard.
- **Adaptive capacity** refers to the ability of an asset or system to adjust to actual or expected climate stresses.[cxcvii]

The CVA specifically addresses the following infrastructure, social, and environmental assets:

Infrastructure	Social	Environmental
• Energy and Power • Travel and Transportation • Cooling and Warming Centers • Storm and Emergency Shelters • Stormwater Infrastructure • Dams • Septic Infrastructure • Homes and Residential Properties • Public Buildings • Waste Disposal and Collection	• Healthcare Facilities and Services • Local Jobs and Businesses • Vulnerable Communities • Food Access and Food Security • Historic Preservation • Resources for Youth and Older Adults • Cultural Resources, Tourism, and Community Events	• Drinking Water • Clean Air • Ecosystems, Habitats, and Biodiversity • Parks, Open Space, and Recreational Sites • Agricultural Lands and Soils

Infrastructural Assets

Energy + Power

Asset Description

Access to reliable power and energy is a key asset in the community, both for operations of daily life and for responding when there is a natural hazard. During normal conditions, energy access enables essential activities such as heating and cooling homes, operating businesses, running schools, and maintaining public facilities. During extreme events, its importance becomes even more acute. For example, functional power is critical during heat waves to allow residents—especially older adults, young children, and medically vulnerable populations—to cool their homes, reducing the risk of heat-related illness and mortality.

Energy infrastructure is equally vital during flooding, storms, and winter weather. Emergency shelters require power for lighting, HVAC, refrigeration of medications, and medical equipment. Water and wastewater treatment facilities rely on electricity to maintain safe drinking water and sanitation. Communications systems, traffic signals, and emergency response coordination all depend on uninterrupted or rapidly restored power.

Energy resilience is also an equity issue. Power outages disproportionately affect low-income households, residents of multi-family or manufactured housing, and communities with limited access to backup generation or cooling centers. Counties play a key role in planning for resilient energy systems—such as backup power for critical facilities, microgrids, and coordinated outage response—to ensure that all residents can remain safe during climate extremes.

Survey Response

Access to reliable power and energy was generally ranked as a **high priority** for County resiliency planning based on stakeholder survey input. **Of all infrastructural assets assessed, stakeholders identified this as the highest priority.** A breakdown of participant prioritization levels can be found below for access to reliable power + energy.

	High	Medium	Low
Access to reliable power + energy	86.7%	9.8%	3.5%

Prior experiences with power outages were frequently noted by survey respondents. When asked about personal experiences related to the climate trends assessed, 67 respondents described power outages in the County. Examples of stories shared can be found below:

- *"I've experienced multiple prolonged power outages in my years in this residence. I was able to invest in a whole-house generator (natural gas service to the home) so while I don't suffer the same disruption as my neighbors, it is still a serious issue."*
- *"We bought a generator after repeated and prolonged power interruptions."*
- *"Power outages have been more and more frequent during any type of inclement weather."*

Exposure

Energy and power in Putnam County are susceptible to trends including **rising temperatures** and **changing precipitation patterns**.

Sensitivity

Climate hazards have the potential to impact power and energy in two ways: contributing to power outages and/or impacting financial access to power. First, climate hazards can pose risks for power outages in the area. According to Putnam County's Hazard Mitigation Plan, Section 5.4.7 (Severe Storms), "Municipalities have identified power outages due to downed trees as the most serious and frequently occurring hazard impacting life in County communities."[cxcviii] Putnam County can anticipate an increase in severe precipitation, which could damage power lines and cause additional power outages. Rising temperatures could also lead to brownouts. According to the HMP (2021) Section 5.4.4 "Extreme heat events can sometimes cause short periods of utility failures, commonly referred to as brown-outs, due to increased usage from air conditioners and other energy-intensive appliances."[cxcix]

Second, as the number of warm days increases, there could be additional demand for energy for air conditioning during warmer months. Energy burden is a metric that represents "the percentage of gross household income spent on energy costs."[cc] In Putnam County, the average energy burden is 2% according to the U.S. Department of Energy Low-income

Energy Affordability Data Tool.[cci] "High energy burdened households" are those with over a 6% energy burden.[ccii] While overall energy burden remains low in the County, rising AC demand could pose challenges for low-income households, and could lead to heat exposure during high heat days. This could be particularly challenging for residents with limited mobility to access cooling centers.

Adaptive Capacity

Overall, adaptive capacity for power and energy is **high** in Putnam County due to the ability to support backup power and maintain infrastructure. The County has made progress on adaptation actions that help reduce vulnerability to power outages and support continuity of essential services. For example, the County has secured backup generators on wheels and trailers, making progress on the 2021 HMP goal for the Highway Department to secure "large, fixed generators (800 kW) that can be deployed via tractor trailer to lifeline facilities as well as additional smaller, mobile generators that can power traffic lights."[cciii] Some libraries that serve as cooling centers also have access to generators.[cciv] While not currently in place, Putnam County has a goal in its 2021 Hazard Mitigation Plan to create an incentive program for private gas station/fuel distributors to secure backup power generators.[ccv] Notably, there are still some areas where backup power generation is not available. For example, the Friendship Center in Carmel, NY currently lacks backup power supply—although the facility is located within walking distance to the TOPS building, a cooling/emergency shelter equipped with backup power.

Travel + Transportation

Asset Description

Putnam County's transportation infrastructure is a critical resilience asset that supports daily mobility, economic activity, and emergency response before, during, and after climate-related hazards. Major transportation corridors, including the I-84, the Taconic Parkway, Route 6, Route 9, and Route 9D, serve as vital regional connectors, supporting commuter travel, freight movement, and access to healthcare and emergency services. There are also many County-owned and local roads that are especially important for reaching residential areas, rural communities, and critical facilities.[ccvi]

Public transit further strengthens the County's resilience by providing redundant, equitable, and accessible transportation options, particularly for residents without access to personal vehicles. The Putnam Area Rapid Transit (PART) public bus system includes three regular routes; a complementary paratransit program; one seasonal trolley; a commuter shuttle for the Croton Falls Metro North Station; and a micro-transit service in Patterson, and portions of Southeast and Carmel.[ccvii] [ccviii] As of 2026, MV Transportation operates the PART system and Via Transportation operates the microtransit service.[ccix] [9] Routes outside of the County also provide transportation options to County residents including Housatonic Area Regional Transit (HART) and Westchester County Bee Line routes and further enhance connectivity beyond county borders.[ccx]

Rail infrastructure also plays a key role in resilience. The Metro North Harlem Line and Hudson Line provide train travel options to Albany and New York City. Railroad stops are present in Breakneck, Brewster Village, Southeast, Cold Spring, Garrison, Manitou, and Patterson.[ccxi] Rail transportation is important to the County for daily commutes, travel needs, and access to critical services like healthcare. It also offers alternatives to roadway travel during fuel shortages, extreme weather events, or roadway disruptions.

From a climate resilience perspective, transportation infrastructure is essential for emergency response and evacuation. Specific evacuation routes in Putnam County include: Route 9D, Route 9, Sprout Brook Road, Oscawana Lake Road, Peekskill Hollow Road, Taconic State Parkway, Route 301, Route 84, Route 311, Route 6, Route 22, Route 684.[ccxii] A map of designated evacuation routes in Putnam County can be found below:

[9] MV Transportation operates Putnam Area Rapid Transit on a contractual obligation, which terminates on March 31, 2027 as of the authorship of this report.

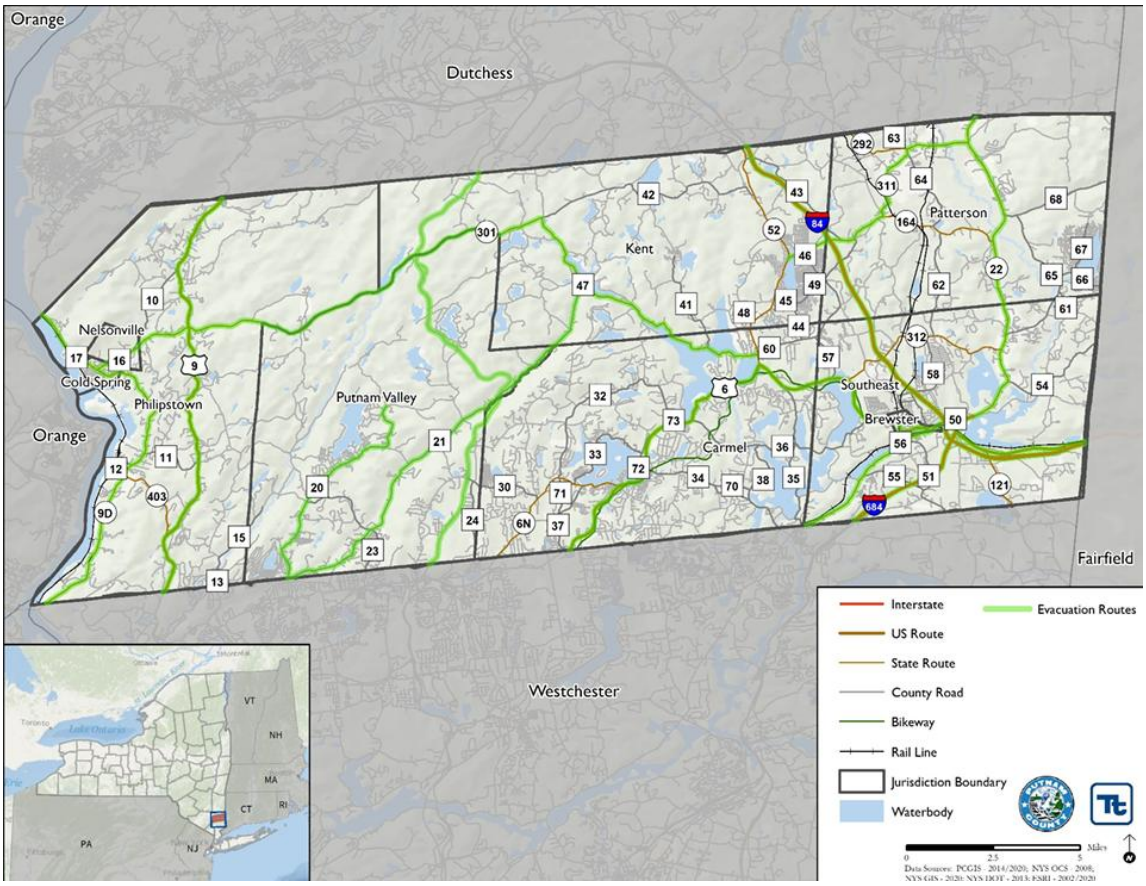


Figure 31: Map of Evacuation Routes in Putnam County | Putnam County Hazard Mitigation Plan (2021) Section 4, p. 60.

Survey Response

Overall, stakeholders indicated that travel and transportation should be a **medium-high priority** for County resilience planning, depending on the specific transportation-related asset evaluated. Within this category, access to safe travel and transportation options was ranked as the highest priority, followed by availability of evacuation routes, and access to public transportation. A breakdown of participant prioritization levels can be found below for travel and transportation-related assets.

	High	Medium	Low
Access to safe travel + transportation options	70.6%	22.4%	7%
Availability of evacuation routes	58.7%	27.3%	14%
Access to public transportation	50.3%	32.9%	16.8%

Travel and transportation disruptions were noted by many survey respondents. When asked about personal experiences with disruptions due to climate hazards, 36 respondents described transportation/travel-related disruptions in the County. Examples of stories shared:

- *"We live on [...] road and there have often been trees and power lines down or roads washed out that prevent us from getting out. Last year our road was washed out by a storm and our driveway was obstructed by an enormous sink hole and we had to get out— our car was irreparably damaged in the process."*
- *"There is flooding on Route 9, also in downtown Cold Spring, power outages happen all the time, mostly from felled trees which happen frequently."*
- *"Route 9D, Route 403 frequently flood or turn into rapids during heavy rain."*

Exposure

Travel and transportation assets in the County are exposed to **increasing temperatures, rising sea levels,** and **changing precipitation patterns.**

Sensitivity

Climate hazards can impact travel and transportation options in the County, including by (1) flooding roadways/rail lines, (2) necessitating evacuation, (3) damaging road infrastructure, and/or (4) impacting transportation users. First, roadways and rail lines are susceptible to flooding, both from sea level rise and from increased precipitation. According to Putnam County's Hazard Mitigation Plan, ~28.7%, or 420 miles of roadways in Putnam County, are at risk under a 1% annual chance flood event scenario. Roads that would be impacted are as follows: "U.S. Routes 6 and 9, Interstate 684 and 84, State Roads NY-164, NY-22, NY-292, NY-301, NY-311, NY-52, NY-6N, and NY-9D and various county roads."[ccxiii] Notably, many of these roads overlap with portions of the County's evacuation routes. See Appendix M for maps of County and non-County roads that fall within the 0.2% Annual Chance floodplain and for additional information about potential flood risks. Rail lines are also susceptible to flooding. According to a 2025 MTA press release, 80% of the Hudson Line—which services Putnam County—could face flooding concerns from both sea level rise and precipitation.[ccxiv]

Second, flooding, severe storms, or other climate hazards could prompt evacuation. Putnam County has existing planning documents—including the Hurricane and Tropical Storm Emergency Evacuation Guide—to support evacuation planning. In the event of evacuation, people without access to personal transportation, elderly adults, and people with disabilities may be particularly vulnerable due to limited transportation access.

Third, road infrastructure is vulnerable to damage from storms, precipitation, and sea level rise as well as to extreme heat. According to the New York State Climate Impacts

Assessment, extreme heat can impact the longevity of asphalt, damage roads, harm concrete, and impact bridge joints. Similarly, "washouts" and damage from fallen debris can impact roadways in the event of severe precipitation or storms.[ccxv] Such damage to roadways has been documented in the County in the past. For example, flooding in July 2025 led to "cobblestone-sized rocks strewn across major roadways from water washout,"[ccxvi] and a major rainfall event in 2023 led to storm damage including at Peekskill Hollow Road in Putnam Valley and Old Manitou Road in Garrison.[ccxvii] Sea level rise could pose additional risks to roads, bridges, and protective infrastructure/natural landscapes near roads.[ccxviii]

Fourth, climate hazards can present challenges for road users. High temperatures can pose health risks for people waiting for public transportation or using active transportation. Debris, flooding, and severe precipitation can also impact road/driving safety.

Adaptive Capacity

Overall, adaptive capacity for travel and transportation is **high** in the County, although there is some variation depending on the mode of transportation and ownership models. For example, Putnam County has greater control over county-owned roads and bridges than rail lines or bus systems operated by external entities.

Putnam County has undertaken—and continues to plan—actions that strengthen the adaptive capacity of its transportation system. Past efforts include culvert and bridge replacement projects that improve system reliability and reduce vulnerability to flooding and extreme weather. [ccxix] Furthermore, creating an Emergency Transportation Plan is a current goal for the County, according to the 2021 Hazard Mitigation Plan.[ccxx] This plan could support coordinated evacuation, emergency response, and continuity of transportation services during climate-related events.





Image 5: Damage outside Ludington Court Highway Garage in July 2023 in Kent, NY | Kent Highway Department.

Image 6: Flooding outside Ludington Court Highway Garage in Kent, NY. Kent is working to reduce the vulnerability of this facility by building an alternative driveway to the site that is less prone to flooding | Kent Highway Department.

Cooling/Warming Centers

Asset Description

Cooling and warming centers are critical community resilience assets that protect public health during extreme temperature events. Many libraries and town halls serve as designated cooling centers in Putnam County, providing safe, air-conditioned spaces where residents can seek relief during heat waves. These facilities are typically open to the public, centrally located, and familiar to residents, making them effective and accessible locations for emergency use. A full list of cooling centers can be found below:

Cooling Centers

Putnam County continues to promote awareness and outreach to residents about available cooling centers during the summer months via the County's Department of Health and Bureau of Emergency Services website, Facebook, Instagram, and Twitter accounts. Select local libraries, town halls, senior centers, and other public facilities are available as a cooling centers, though residents are encouraged to call ahead to confirm hours of operation. All PART routes (1, 2, and 5), the seasonal Cold Spring trolley (operating Saturdays and Sundays, Memorial Day to Labor Day weekend), and the Putnam On-Demand service area have designated stops or options to stop at or near the libraries and town halls. As of 2026, below is an outline of the cooling centers available during the summer months.

LOCATION	CONTACT	HOURS OF OPERATION (CALL AHEAD TO CONFIRM)
• Brewster Public Library	845-279-6421	Monday-Thursday: 9am-7pm
• Desmond Fish Public Library (Garrison)	845-424-3020	Monday-Friday: 10am-5pm
• Julia L. Butterfield Library (Cold Spring)	845-265-3040	Monday & Wednesday: 10am-8pm Tuesday & Thursday: 10am-5pm Sunday: 10am-3pm
• Kent Public Library	845-225-8585	Monday-Wednesday: 10am-8pm Thursday: 10am-5pm
• Mahopac Public Library	845-628-2009	Monday-Thursday: 9:30am-8pm
• Patterson Library	845-878-6121	Monday-Thursday: 10am-8pm Friday: 10am-5pm
• Putnam Valley Library	845-528-3242	Wednesday: 10am-8pm Friday: 10am-5pm
• Reed Memorial Library (Carmel)	845-225-2439	Monday & Wednesday: 10am-5pm Tuesday & Thursday: 10am-7pm
• Patterson Recreation Center	845-878-7200	Monday-Thursday: 9am-9pm
• Hudson Valley Regional Community Health Center (Brewster)	845-878-9078	Monday-Thursday: Open 24 hours
• Putnam Valley Senior Center	845-808-1730	Monday-Thursday: 9am-2pm
• Town of Carmel Town Hall	845-628-1500	Tuesday-Thursday: 9am-4pm
• German American Club (Putnam Valley)	845-528-5800	Thursday-Friday: 9am-9pm
• Knights of Columbus (10 Fair Street, Carmel)	845-225-6318	*Call Ahead

Table 2: Cooling Centers in Putnam County | Putnam County

According to Putnam County's Hazard Mitigation Plan, when warming shelters are needed, their locations are shared via the Putnam County website and social media, as well as on municipal websites.[ccxxi] For example, in winter 2025-2026, the Carmel Town Hall was used as a warming center. The County also has a "Code Blue" policy that can be enacted during

winter weather conditions. Bel Air and Henry Van Motels in Brewster have previously been used as emergency shelters during "Code Blue" situations.

Survey Results

Access to cooling and warming centers was generally ranked as a **medium priority** for County resilience planning based on stakeholder survey responses. A breakdown of participant prioritization levels can be found below for access to cooling and warming centers.

	High	Medium	Low
Access to cooling and warming centers	48.3%	35.7%	16.1%

When asked about personal experiences with disruptions due to climate hazards, one respondent described disruptions related to cooling/warming centers.

Exposure

Access to cooling/warming centers could be impacted by **rising temperatures** and **changing precipitation**.

Sensitivity

Climate hazards could impact cooling and warming centers by (1) increasing demand for cooling centers, (2) impacting the accessibility of centers, and/or (3) damaging physical infrastructure. First, as temperatures rise, there may be an increase in the number of days that require opening cooling centers. This increase in demand could have variable impacts on different communities within the County, depending on the availability of cooling centers. For example, Putnam Lake is one of the most vulnerable places in the County to heat, based on the New York State Department of Health Heat Vulnerability Index.[ccxxii] However, it currently does not have a cooling center.

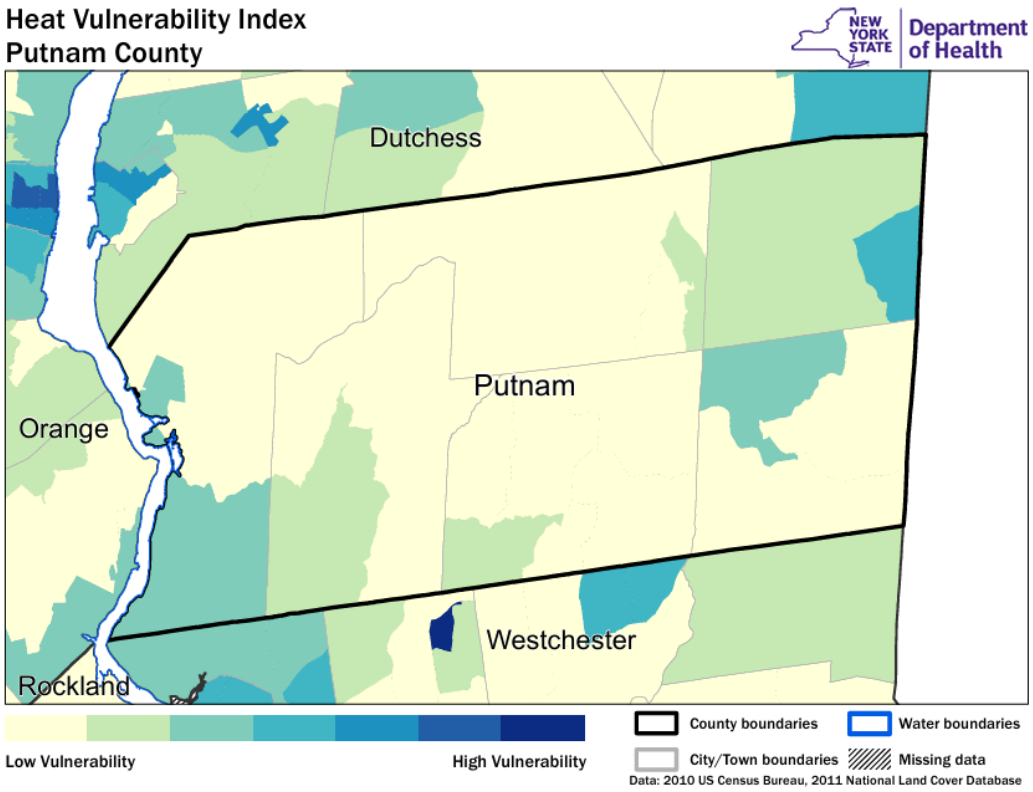


Figure 32: The New York State Department of Health developed a Heat Vulnerability Index, based on language, socioeconomic, environmental, and elderly isolation/vulnerability characteristics, to inform where heat vulnerable communities may be located. In Putnam County, heat vulnerability is generally low to moderate, coded between 1-4 on the 7-color Heat Vulnerability Index scale (see map below). Putnam Lake has a heat vulnerability index level that scores 4 out of 7, which is the highest level of heat vulnerability present in the County. | New York State Department of Health.

Second, there are potential compounding climate impacts that could impact the accessibility of cooling centers. For example, if extreme heat and severe precipitation events co-occur, transportation to cooling shelters could be disrupted. Vulnerable populations may also face increased barriers to accessing cooling centers due to language barriers in accessing communications materials about cooling centers or mobility challenges related to reaching cooling centers.

Third, flooding from precipitation could also impact the physical infrastructure of cooling centers. For example, the Patterson Library is located within a 0.2% Annual Change Flood Hazard Area, and the Putnam Valley Library is located close to a regulatory floodway and 0.2% Annual Chance Flood Hazard Area.[ccxxiii]

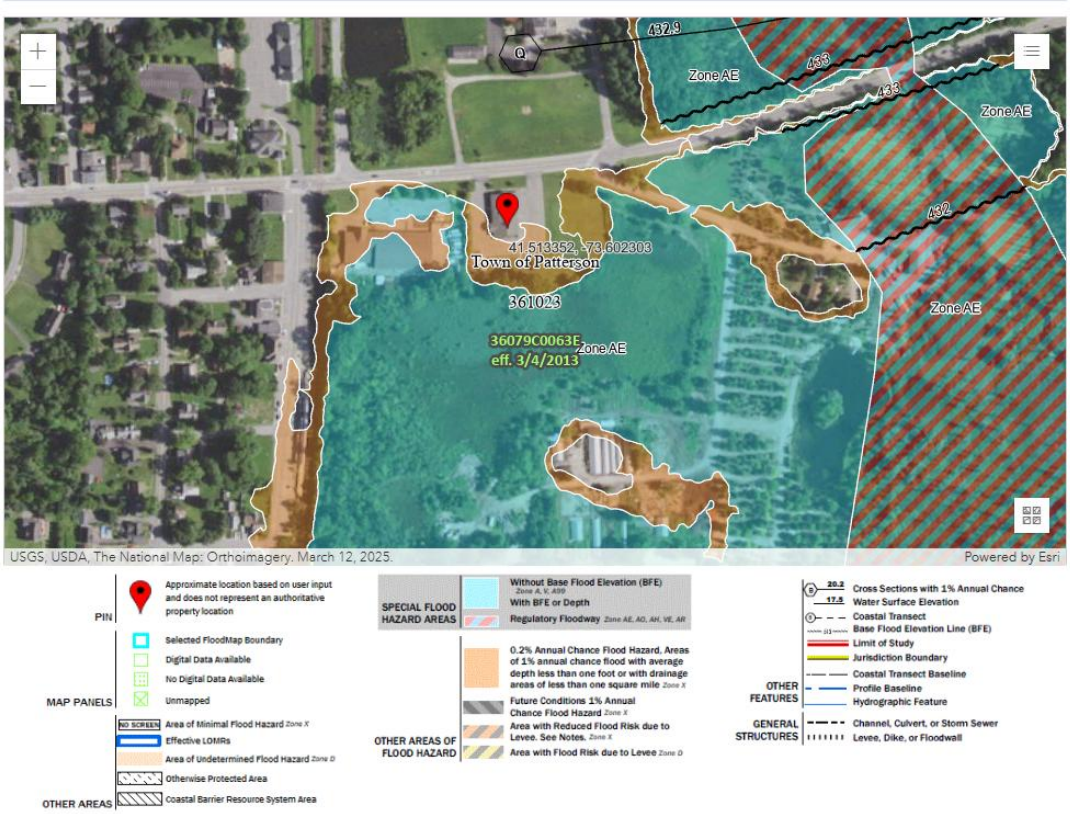


Figure 33: Patterson Public Library is located in a 0.2% annual chance flood hazard area. | *FEMA's Flood Mapping Center*

Adaptive Capacity

Overall, the adaptive capacity for cooling and warming centers is **high** in Putnam County. While the physical infrastructure of cooling centers (i.e. library and town hall buildings) is not controlled by the County, Putnam County can support adaptive capacity in other ways. For example, it can conduct outreach about cooling center locations and heat risks. Further, there has been progress increasing the adaptive capacity of cooling centers in Putnam County. For example, some libraries have generators that can withstand power outages, and cooling centers at libraries and town halls are currently accessible by public transportation.[ccxxiv] [ccxxv]

Storm + Emergency Shelters

Asset Description

Emergency shelters are a vital component of Putnam County's emergency management and climate resilience framework, providing safe, temporary refuge for residents displaced by severe weather and other hazard events. Putnam County has a storm shelter at the

Donald B. Smith Government Center Campus in Carmel, although it is not operated as a full-time storm shelter.

Most storm shelters are available through partnerships with municipalities, churches, and local organizations. Coordination with shelter partners is facilitated by Red Cross, helping to ensure consistency with established sheltering standards and emergency protocols. From a resilience perspective, this flexible, partnership-based sheltering model allows the County to scale shelter operations based on the severity and duration of an event. When a hazard event is forecasted that will require sheltering, partners are either contacted or will reach out to volunteer their facilities. When an unanticipated hazard event occurs, partner organizations are contacted directly to quickly activate shelter locations.

Emergency shelters also play a critical role in addressing the needs of vulnerable populations, including residents without safe housing, those living in flood-prone areas, individuals with limited mobility, and households experiencing prolonged power outages. Currently the County also has one deployable trailer for pets. Locations for storm shelters are advertised through social media and/or the County website.

Survey Results

Access to adequate storm and emergency shelters was generally ranked as a **medium-high priority** for County resilience planning based on stakeholder survey responses. A breakdown of participant prioritization levels can be found below for access to storm and emergency shelters.

	High	Medium	Low
Access to adequate storm and emergency shelters	55.2%	30.1%	14.7%

Exposure

Storm shelters could be impacted by **changing precipitation, sea level rise,** and **increasing temperatures**.

Sensitivity

Storm shelters face variable sensitivity to climate hazards. Because storm shelters are coordinated for each hazard event, maps of all storm shelters are not available. However, storm shelters are generally believed to be located outside of flood and hazard areas. Increases in precipitation and severe storms could increase the need for storm shelters and the number of events that require shelters. Power outages from brownouts due to extreme heat and/or from storm events could impact the ability to communicate information about storm shelter locations if residents lose access to power to check for website/social media updates. Flooding from sea level rise and/or from precipitation events could impact travel and transportation to storm shelter locations. Reaching vulnerable populations could also

be a particular challenge for storm shelter coordination due to outreach and communications barriers and/or transportation barriers.

Adaptive Capacity

Adaptive capacity for storm shelters is **medium** in Putnam County. Operations of shelters run by partner organizations are not controlled by the County, and different shelters may have different rules. As such, the County has limited ability to influence the adaptive capacity of individual shelters. Nonetheless, the County can influence the coordination of storm shelters and outreach to residents. It also has current goals that could expand access to shelters for County residents. For example, Putnam County's 2021 Hazard Mitigation Plan includes a goal to create a shelter facility that can accommodate pets and service animals at Tilly Foster Farm.[ccxxvi]

Stormwater Infrastructure

Asset Description

Stormwater infrastructure is a critical component of community resilience, as it manages runoff from storm events and reduces the risks associated with flooding, erosion, and water damage. Stormwater infrastructure addresses runoff from storm events by diverting water away from sites (gray infrastructure) or supporting its storage/infiltration into sites (green infrastructure).[ccxxvii]

When stormwater infrastructure is undersized, degraded, or absent, excess runoff can overwhelm roads, bridges, buildings, and emergency facilities, leading to flooding, infrastructure damage, and service disruptions. Green stormwater infrastructure provides additional resilience benefits by slowing runoff, reducing peak flows, improving water quality, and lowering long-term maintenance costs. These systems can also offer co-benefits such as urban cooling, groundwater recharge, and enhanced ecological function, making them particularly valuable in developed areas and flood-prone locations.

Survey Results

Maintaining stormwater infrastructure was generally deemed a **high priority** for county resilience planning based on stakeholder survey feedback. It generated the second highest prioritization level from survey respondents out of all infrastructural assets. A breakdown of participant prioritization levels can be found below.

	High	Medium	Low
Maintaining stormwater infrastructure	78.3%	16.1%	5.6%

When asked about personal experiences with disruptions due to climate hazards, six respondents described experiences or challenges with stormwater and/or stormwater infrastructure.

Exposure

Stormwater infrastructure in Putnam County is susceptible to **changing precipitation**.

Sensitivity

Right-sized stormwater infrastructure can help protect communities from flooding and damage. However, if not equipped to handle expected water levels, inadequate stormwater infrastructure can pose significant resiliency risks. Locations prone to flooding along "roadways with underlying culverts" have already been identified in the County's 2021 Hazard Mitigation Plan. Specific locations of concern include the "area surrounding Lake Mahopac in the Town of Carmel, the vicinity of Wiccopee Road in the Town of Putnam Valley, and Holmes in the Town of Patterson."[ccxxviii]

Additional challenges with stormwater infrastructure have also been documented within the County. For example, a July 2025 news article noted that a rain event exceeded storm drain capacity in Patterson, after the County received ~5 in of rain in < 2 hours.[ccxxix] A Putnam County News and Press Release article described a July 2023 storm event that led to a State of Emergency in the County and damaged "numerous roads, bridges, and culverts."[ccxxx]

As precipitation and severe storms increase, stormwater infrastructure may face increased susceptibility to flooding and damage. However, data gaps in the condition of crossings in Putnam County present potential challenges to fully assess sensitivity to climate impacts. Crossings are areas where roads cross a stream or wetland. While some crossings in the County have already been assessed—particularly in Putnam Valley and Philipstown—a significant number of crossings remain unassessed.

Adaptive Capacity

Adaptive capacity for stormwater infrastructure is **high**. Generally, the ability to upgrade stormwater infrastructure to address expected climate impacts is possible, including at the County-level. For example, Putnam County has previously completed culvert replacement projects. One project involved resizing a culvert "from 15.5' to 18' to accommodate aquatic connectivity and 50-100 year flooding risks."[ccxxxi] Cost could present one barrier to improving the adaptive capacity of stormwater infrastructure.

Putnam County's draft Stormwater Management Plan has not yet been adopted. Under New York State MS4 requirements, individual towns and villages are responsible for developing and implementing their own Stormwater Management Programs (SWMPs), including measures addressing impervious cover. Stormwater management on the County level is limited to infrastructure under County jurisdiction, including County roadways and facilities. The towns and villages, particularly the Village of Cold Spring, are undertaking

stormwater resilience projects that are outside the scope of this Plan but could contribute to broader County-wide resilience benefits.

Dams

Asset Description

Dams can be used to store water for recreation, power, drinking water, and irrigation. **While often used for beneficial purposes, dams can pose significant resilience-related liabilities in the event that they overtop or fail.** Specifically, the NY DEC highlights that potential energy from stored water could threaten human safety as well as damage properties.[ccxxxii]

Putnam County's numerous dams present potential challenges and opportunities for advancing County resilience. The New York State Inventory of Dams, published through the New York State Department of Environmental Conservation, indicates that there are 121 dams in Putnam County. Many of these dams are in need of maintenance or repair, increasing vulnerability to climate change.[ccxxxiii] A map of dams located in Putnam County can be found below:

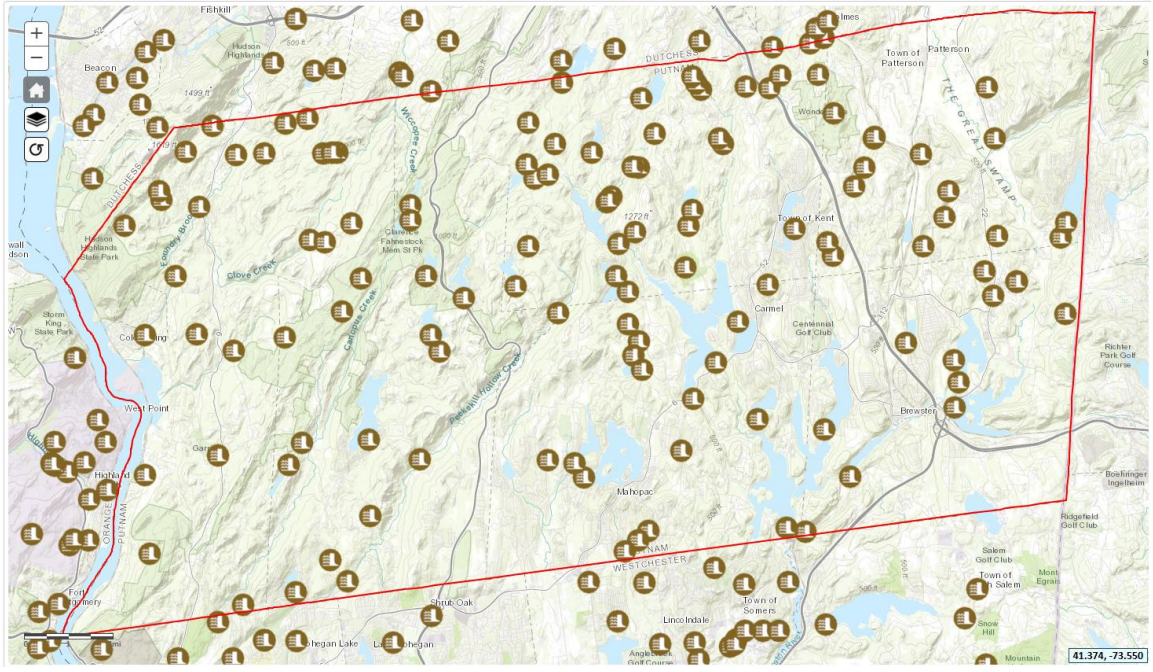


Figure 34: Map of dams in Putnam County | DEC Info Finder

Survey Results

Overall, preventing dam failure was ranked as a **high priority** for County resilience planning based on stakeholder survey responses. Preventing dam failure was ranked as the third

highest priority for County resilience planning out of all infrastructural assets. A breakdown of participant prioritization levels can be found below:

	High	Medium	Low
Preventing dam failure	77.6%	15.4%	7%

Exposure

Dams in Putnam County are particularly vulnerable to **changing precipitation.**

Sensitivity

Dams, particularly if poorly maintained, could pose significant risks under projected increases in precipitation. Specifically, significant precipitation events could lead to dams overtopping or failing. Consequences of dam failure are most significant for large dams, although failure at smaller dams can lead to negative environmental impacts through water quality impairment.[ccxxxiv] Many of the dams in Putnam County are in need of repair or maintenance, increasing vulnerability to changes in precipitation/severe precipitation events. Of the 21 High Hazard dams in Putnam County, 11 have a "last condition rating" of either "unsound - deficiency recognized," (6 dams), "unsound-fair" (3 dams), or "deficiently maintained" (2 dams).[ccxxxv] Across all the dams located in Putnam County, 81 were "not rated;" 13 had "no deficiencies noted;" 4 were "deficiently maintained;" 15 were "unsound with deficiencies recognized;" 5 were "unsound-fair;" 2 were "unsound [with] more analysis needed," and 1 was "unsafe."[ccxxxvi]

Adaptive Capacity

Adaptive capacity for dam infrastructure in Putnam County is **medium**. In general, data access poses a significant challenge for assessing the vulnerability of dams. For example:

- Because dams are owned by a variety of different parties, the County does not have up-to-date information about the status and maintenance of all dams.
- If any dams were constructed and not reported, this could be a potential data gap.
- Putnam County also does not currently have maps that illustrate potential flood impacts from dams.

Additionally, Putnam County cannot directly control the operations/maintenance of all dam infrastructure, because dams in the County are owned by a variety of entities including: Putnam County, New York City, state government, and private entities.[ccxxxvii] However, the County would be negatively impacted should a dam fail, regardless of who owned the dam. Primary avenues available for the County to influence adaptive capacity for dams include outreach, education, data collection, coordination with dam operators, and maintenance of County-owned facilities.

Septic Infrastructure

Asset Description

Septic systems provide critical services in Putnam County but could face increasing risks due to climate impacts. Septic systems are a decentralized wastewater treatment strategy.[ccxxxviii] They include two parts: a septic tank (used to digest organic matter and sort out materials) and a drain field (used to release effluent).[ccxxxix] When functioning properly, septic systems can treat wastewater in a relatively low-cost way.[ccxl] However, septic systems can pose risks to communities if not properly maintained or if drain fields are compromised. Within Putnam County, the majority of homes use septic systems, making this a critical asset for County resilience planning.[ccxli]

Survey Results

Preventing damage to septic infrastructure was generally ranked as a **high priority** for County resilience planning by stakeholder survey participants. A breakdown of participant prioritization levels can be found below for septic infrastructure.

	High	Medium	Low
Preventing damage to septic infrastructure	76.2%	16.1%	7.7%

When asked about personal experiences with disruptions due to climate hazards, 1 respondent described damage to a septic system.

Exposure

Septic infrastructure is vulnerable to flooding from **changing precipitation** and **sea level rise.**

Sensitivity

Climate hazards could impact the safe operation of septic systems, primarily by interfering with drainage areas. Septic systems need unsaturated drainage systems to function properly.[ccxlii] Flooding and soil saturation from changing precipitation or sea level rise could damage drainage capacity, posing a variety of potential challenges to Putnam County. For example, according to the NY Climate Impacts Assessment, saturated soils surrounding a septic system can reduce treatment and can cause groundwater and surface water contamination.[ccxliii]

Adaptive Capacity

Overall, adaptive capacity for septic systems is **medium** at the county level. The County has full oversight of septic systems. For example, the Health Department is charged with reviewing septic repair permits to ensure compliance. The Health Department has also previously conducted education related to septic maintenance that could modestly impact adaptive capacity. For example, a January 2024 News & Press Release addressed septic maintenance.[ccxliv] However, management of individual septic systems is conducted at the

unit level, which could lead to data gaps and uncertainties. Changing climate conditions impacting soil moisture and drainage could be challenging to address.

Homes and Residential Properties

Asset Description

Homes and residential properties can contribute to the safety and wellbeing of residents but may face high climate vulnerability. Residential properties play a key role in the day-to-day experiences of residents. They represent a major source of financial investment and may hold intrinsic value. Within Putnam County, the vast majority of residential properties are single family homes, and most homes are owner-occupied (83.8%).[ccxlv] [ccxlvi]

Residential properties also impact resilience and hazard preparedness within Putnam County. For example, maintaining safe, well-adapted homes and residential properties can provide a critical lifeline during major hazard events: homes can be places of refuge during storm events, provide access to necessary cooling during extreme heat days, or serve as protection against poor outdoor air quality. These functions may be particularly important for vulnerable communities to maintain health and safety during hazard events. Given that residential buildings comprise ~96% of all buildings in the County, protecting homes and residential buildings is a key challenge.[ccxlvii]

Survey Results

Overall, survey participants ranked protecting homes from property damage as a **high priority** for County resilience planning. A breakdown of participant prioritization levels can be found below for residential properties.

	High	Medium	Low
Protecting homes from property damage	66.4%	25.2%	8.4%

When asked about personal experiences with disruptions due to climate hazards, eight survey respondents described experiences related to residential buildings/properties. An example of a story shared can be found below:

- *"Flooding disrupts & damages nearly everything & is often accompanied by power outages; I lost a months old water heater because of flooding & associated power outage, septic was compromised, a good portion of run off could be managed in many areas by splitting & diverting run-off and continuing evaluation, but at what cost?"*

Exposure

Residential properties face risks from **rising temperatures, sea level rise,** and **changing precipitation.**

Sensitivity

Climate hazards can impact residential properties due to direct impacts from rising temperatures and flooding as well as by exacerbating social and financial challenges related to housing. First, increasing temperatures could pose challenges to building integrity, comfort, and maintenance costs. According to the NY Climate Impacts Assessment, higher temperatures can negatively impact building materials and require more frequent repair.[ccxlviii] Changing temperatures will also impact the ability to maintain comfortable temperatures in residential buildings, potentially requiring less heating in the winter months, but more air conditioning in the warmer months.[ccxlix] Putnam County has many older and historic buildings as part of its residential building stock that may be particularly vulnerable to these impacts (see "Historic Preservation" section).

Flooding from severe precipitation events and sea level rise could also impact residential properties. For example, flooding could result in health concerns due to mold and could bring risks of expensive water damage.[ccl] The HMP estimates that $31.3 million in losses due to building and content losses could arise from a 1% chance flood event in the residential sector.[ccli] Susceptibility to flood damage varies across the County. About 894 people reside in 1% annual flood event hazard areas, and 1,097 people reside in 0.2% annual flood event hazard areas, according to Putnam County's Hazard Mitigation Plan.[cclii] Properties located along the Hudson River could also face higher risks due to sea level rise, particularly in Cold Spring and Philipstown.

The map below illustrates the distribution and exposure density of residential properties in the County. This metric demonstrates the value of residential properties—including building structures and content—per square mile. While there are areas along lakefronts that have high concentrations of residential value per square mile, the County's Hazard Mitigation Plan specifies that much of the development near lakes and reservoirs is not within the floodplain. However, there can be "unmapped areas of flood hazard and localized drainage issues [that] contribute to flood hazards throughout the County along creeks and lakeshores."[ccliii]

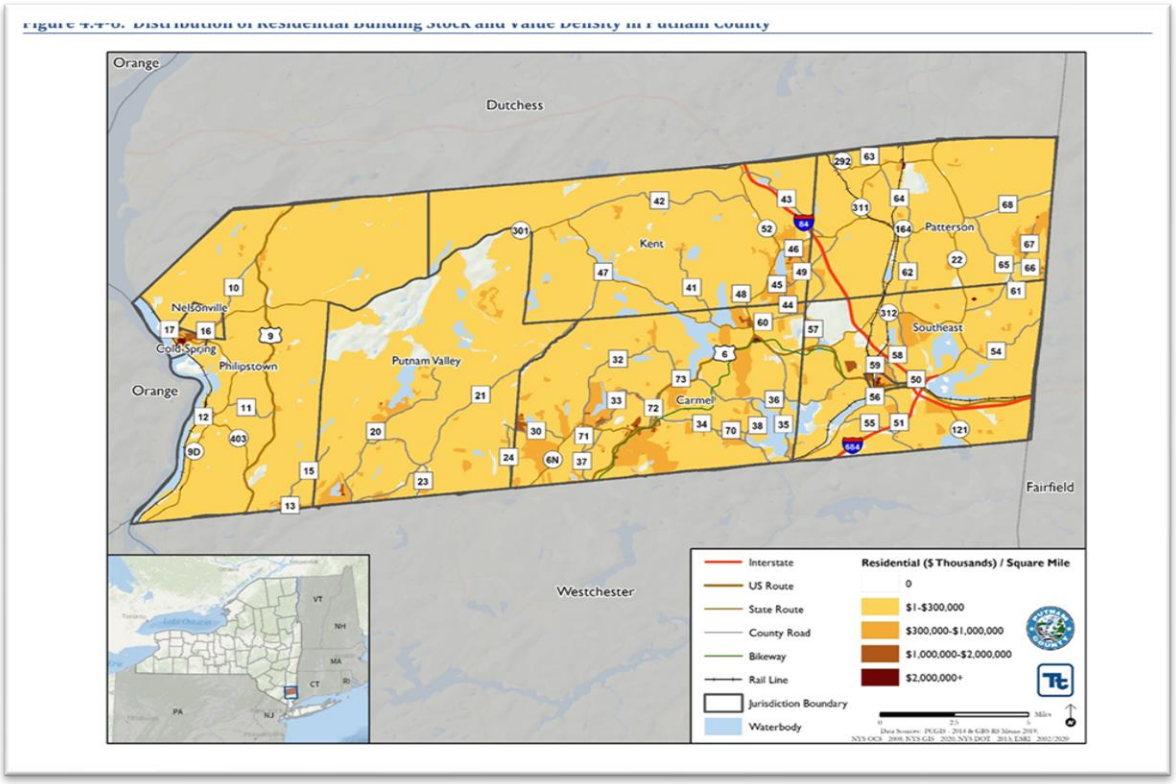


Figure 35: Distribution and exposure density of residential properties in the county | [Putnam County Hazard Mitigation Plan Section 4,](#) p.19.

Second, damage to homes and properties could cause social and financial implications for homeowners and renters. For example, there could be costs associated with:

- recovering from structural, storm, or flooding damage
- increased air conditioning demand.

These financial impacts could be particularly impactful for vulnerable populations or for those without insurance. According to Putnam County's 2021 Hazard Mitigation Plan, "the Town of Patterson is estimated to have the lowest percentage of flood insurance given the number of buildings in the floodplain, with approximately one-third of buildings in the flood zone being insured. In Nelsonville, Putnam Valley, Philipstown, and Southeast, the estimated percentage of insured buildings in the floodplain ranges between two-thirds and 86 percent."[ccliv]

Adaptive Capacity

Overall, adaptive capacity for residential properties in Putnam County is **medium**. Many land use decisions that could impact residential properties and exposure to hazards are completed on the local level (i.e. zoning). However, there are actions that can be taken at the County-level. For example:

- Putnam County's Hazard Mitigation Plan has already identified areas suitable for relocating housing or for building new housing away from high hazard areas.[cclv]

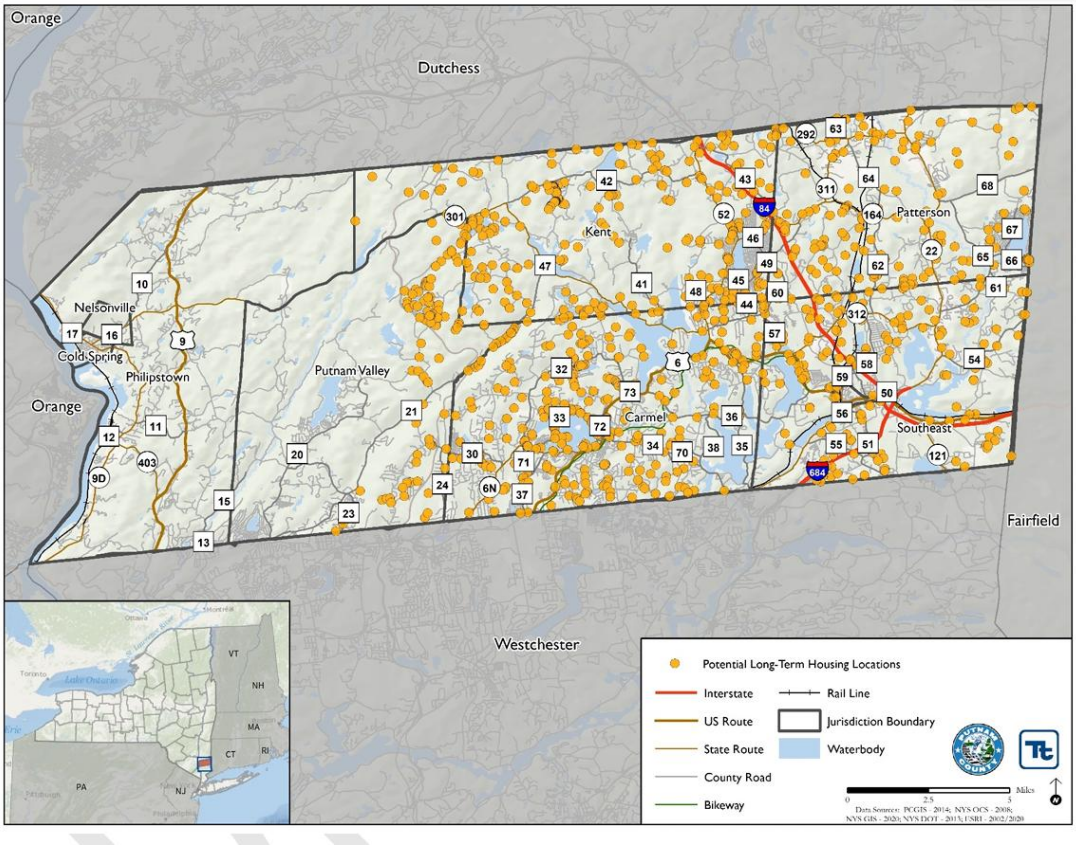


Figure 36: Potential Long-Term Housing Locations in Putnam County, New York | Putnam County Hazard Mitigation Plan Section 4, p.58.

- The County has also previously considered conducting a "County-Wide Housing Location/Relocation Planning Initiative for Disaster Displaced Residents and Structures," although this project was discontinued.[cclvi]
- Putnam County has existing outreach strategies that could be built upon. For example, the County often conducts outreach following a storm/hazard event, although proactive outreach about hazard preparedness can be improved upon.

Public Buildings

Asset Description
Public buildings are important for County resilience, as they are used by departments to conduct relevant work and represent major financial assets that could be damaged. For example, the Donald B. Smith campus can be used as a storm shelter; the County runs an Emergency Operations Center to organize response during emergencies; and solar panels are used to generate power on the roofs of the Kern Building, the County Office Building,

and some buildings within the Donald B. Smith (DBS) Government Campus.[cclvii] [cclviii] Putnam County owns 39 buildings in addition to many non-building properties.[cclix] Additional public buildings are critical for county-level resilience including firehouses and schools, although these properties are managed at more local levels.

Survey Results

Maintaining the operation of public buildings was generally deemed a **lower priority** for county resilience planning based on stakeholder survey responses. A breakdown of participant prioritization levels can be found below for public buildings.

	High	Medium	Low
Maintaining the operation of public buildings	37.8%	47.6%	14.7%

Exposure

Like any building, public buildings could be impacted by all climate hazards, including **sea level rise, changing precipitation patterns,** and **increasing temperatures**.

Sensitivity

The building sector can anticipate increased cooling costs, black and brownouts, negative impacts on building materials from heat exposure, flooding from sea level rise, and flooding from rivers or extreme precipitation, amongst other impacts.[cclx] A complete analysis of all county buildings was not completed for this assessment due to availability of publicly accessible data. While many buildings appear to be located out of high-risk areas based on FEMA's Flood Map Service Center, at least one County building is potentially susceptible to flooding. Specifically, the Board of Elections Building and County's Records Building could be impacted by increased precipitation and severe storms. It is currently located within an AE zone, based on FEMA's flood mapping service.[cclxi] AE zones are Special Flood Hazard Areas, which are locations that would be inundated by a 100-year flood event.[cclxii]

Adaptive Capacity

Overall, adaptive capacity for public buildings is **high** in the County, due to direct ownership of properties. However, the adaptive capacity of specific buildings and land parcels could vary due to how land was acquired. For example, vulnerable properties are sometimes acquired via foreclosure, and land acquired by the County could potentially contain vulnerable assets or features. A full assessment of adaptive capacity for public buildings would require further analysis of each land/building property owned by the County as well as county building management priorities and budgetary constraints.

Waste Disposal & Collection

Asset Description

Proper collection and disposal of waste is important for maintaining healthy communities, but waste services and facilities can be disrupted by climate hazards. In general, Putnam County does not control or operate most of the waste infrastructure in the County. According to the DECinfo Locator Tool, there are no active landfills, combustion facilities, household hazardous waste collection facilities, or recyclables handling and recovery facilities within Putnam County—although there are several inactive solid waste landfills.[cclxiii] While not county-operated, there are three town-owned transfer stations in Patterson, Kent, and Philipstown. However, the County does run a variety of waste-related programs including two Hazardous Waste Drop-Off Days and drop boxes for medications.[cclxiv] The County also conducts public outreach on the proper disposal of items such as batteries, medical materials, and cooking and motor oils; encourages at-home composting; and promotes waste reduction practices that residents can adopt[cclxv]. The County has also recently developed a Local Solid Waste Management Plan, which is anticipated to be finalized and adopted in early Fall 2026. .[cclxvi]

Maintaining proper waste disposal and collection is important for preventing pollution, safeguarding water quality, and protecting public health. Disruptions to waste facilities—whether or not county-owned—could negatively impact quality of life and safety in local communities.

Survey Results

Stakeholders generally ranked maintaining reliable waste disposal systems (waste pickup, recycling etc.) as a **medium-high priority** for County resilience planning. A breakdown of participant prioritization levels can be found below for waste disposal systems.

	High	Medium	Low
Maintaining reliable waste disposal systems	56.6%	35%	8.4%

When asked about personal experiences with disruptions due to climate hazards, two respondents described experiences related to waste disposal and collection.

Exposure

Reliable waste disposal and collection could be impacted by **changing precipitation** and **rising temperatures** in the County.

Sensitivity

Climate hazards could impact waste and disposal facilities directly and indirectly. Town-owned transfer stations are not located within the floodplain based on the FEMA Flood Map Service Center. However, waste collection services could be impacted by disruptions to transportation routes that hinder residents from dropping off waste or curbside pickup

programs from reaching residents (see "Travel and Transportation" section). High heat conditions could impact worker health for municipal curbside pickup programs.

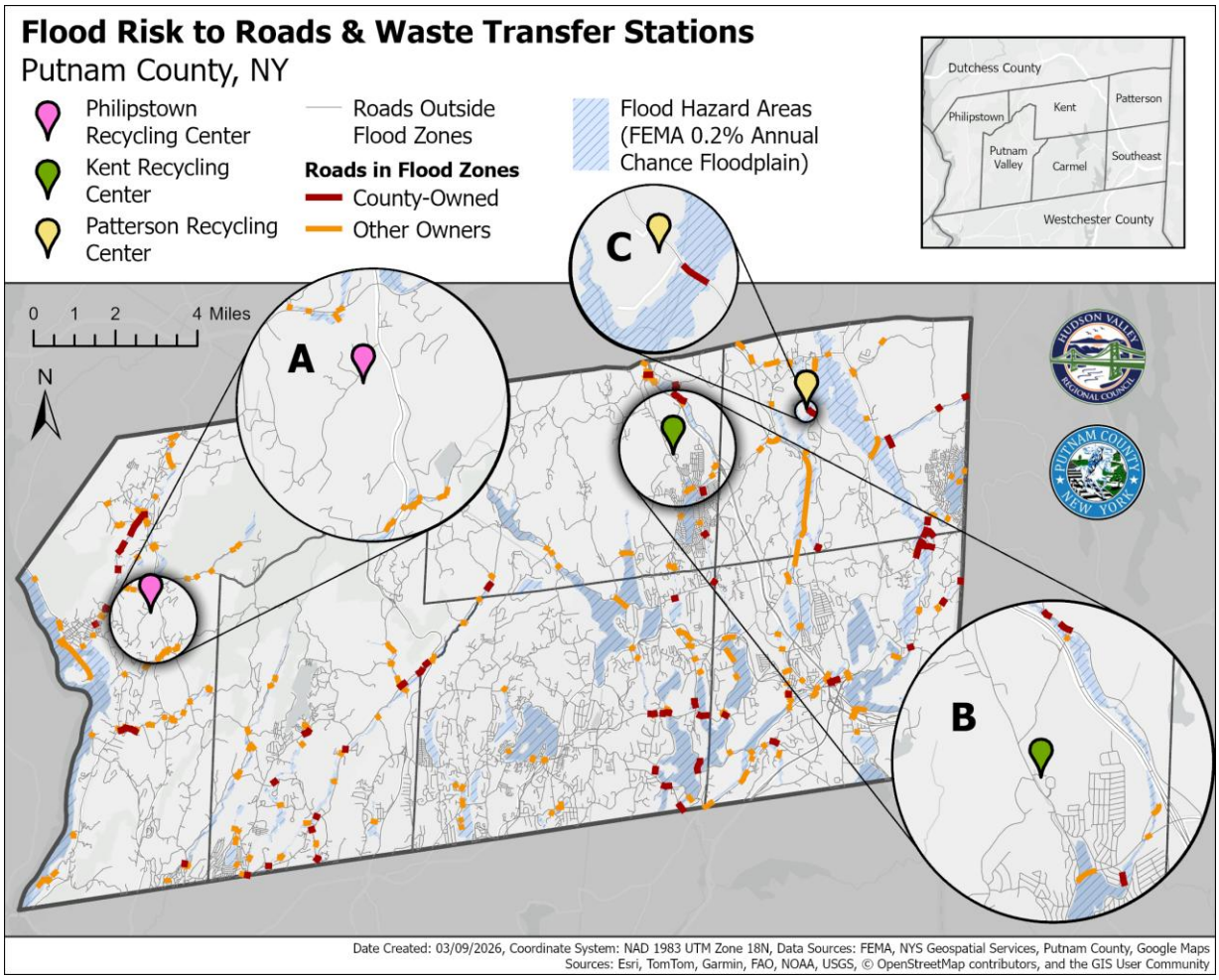


Figure 37: The map above identifies waste transfer stations relative to the FEMA 0.2% Annual Chance Floodplain in Putnam County. Road networks (separated by County and non-County ownership) are also mapped to indicate where routes to and from transfer stations fall within the floodplain. Flood zones were last updated in 2013 for Putnam County. The age of the current FEMA mapping is a limitation when considering present-day flood risk, and other available, current information should also be considered when evaluating flood risk [cclxvii] [cclxviii] *While none of the transfer stations are run by the County, disruptions to transfer stations could impact County residents.*

Callouts A, B, and C show the proximity of each transfer station to the floodplain and nearby vulnerable roads. No transfer stations are located within the 0.2% Annual Chance Floodplain. Callout C (top) highlights a County-owned road that intersects the floodplain and leads to the Patterson transfer station. Map callouts do not obstruct floodplains.

Adaptive Capacity

Overall, adaptive capacity for waste disposal and collection systems at the county-level is **low** due to low exposure (see Fig. 36) and the lack of county-level control over waste disposal sites and collection programs. County-level decisions relevant to waste disposal and collection include those related to maintaining transportation infrastructure and/or outreach to residents.

Healthcare Facilities and Services

Asset Description

Healthcare facilities and services are critical resilience assets that protect life, support public health, and enable effective emergency response during both routine conditions and hazard events. There are seven medical or hospital facilities in Putnam County according to the 2021 Hazard Mitigation Plan. This includes one hospital: Putnam Hospital in Carmel, although additional hospitals are available in neighboring communities.[cclxix] Medical facilities identified in the Hazard Mitigation Plan are located in Brewster, Carmel, and Southeast.[cclxx]

In addition to physical healthcare facilities/infrastructure, the County also runs a volunteer Medical Reserve Corps (MRC) to aid in disaster or emergency health needs,[cclxxi] and partners with Empress EMS for emergency medical services.[cclxxii] The MRC provides trained medical and non-medical volunteers who can augment staffing at shelters, vaccination, or medication distribution sites, and other emergency operations. Empress EMS provides rapid response during emergencies, facilitates transport to hospitals within and outside the County, and plays a critical role in life-saving care during extreme weather events and disasters.

During climate-related hazards such as extreme heat, severe storms, flooding, and extended power outages, healthcare facilities and services must remain operational to treat injuries, manage chronic conditions, and respond to increased demand for emergency and urgent care. The hospital and medical centers rely on continuous power, water, transportation access, and communications, making their protection and resilience essential to the County's overall emergency preparedness.

Survey Results

Access to healthcare facilities and services was generally ranked as a **high priority** for County resilience planning based on stakeholder survey responses. **Of all the social assets, this was ranked as the highest priority.** A breakdown of participant prioritization levels can be found below for healthcare access and services.

	High	Medium	Low
Access to healthcare facilities and services	77.6%	17.5%	4.9%

When asked about personal experiences with disruptions due to climate hazards, four respondents described experiences related to healthcare facilities and services or health more broadly.

Exposure

Access to healthcare facilities and services can be impacted by **rising temperatures, increasing precipitation,** and **sea level rise.**

Sensitivity

Climate hazards have the potential to impact healthcare facilities/services in the County through impacts on infrastructure and human health. First, climate hazards can cause infrastructural impacts that influence access to healthcare facilities or services. For example, power outages could impact the storage of medications, the operations of medical facilities, and/or the provision of medical care.[cclxxiii] According to the 2021 Hazard Mitigation Plan, the status of backup power generation at each of the seven medical facilities in Putnam County is unknown or unavailable.[cclxxiv] Furthermore, while Putnam Hospital is located outside of the floodplain, flooding on roads could also impact access to the hospital or other healthcare facilities.[cclxxv]

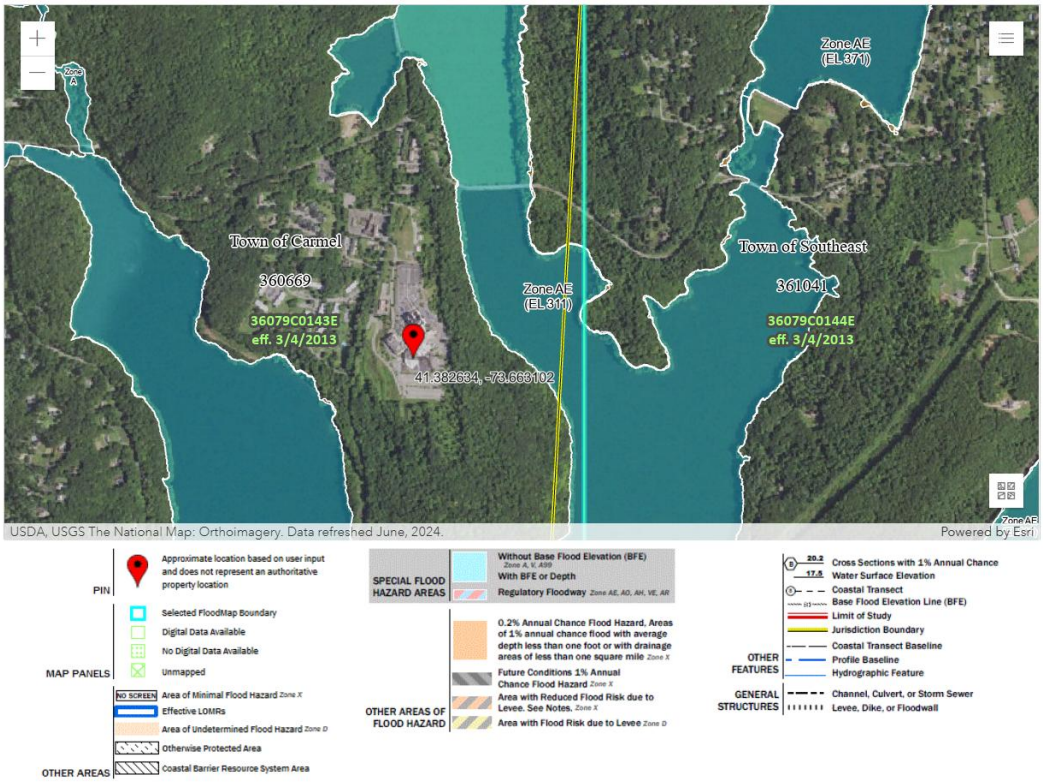


Figure 38: Putnam Hospital is located outside the floodplain | FEMA's Flood Map Service Cente r[cclxxvi]

Second, according to the World Health Organization (WHO), climate hazards can adversely affect human health. These impacts are especially prevalent in people with pre-existing medical conditions, disabilities, children, and senior citizens. For instance, increased storms

and flooding can cause waterborne illnesses to spread, while wildfires can adversely affect air quality and can aggravate lung and heart conditions.[cclxxvii]

Within Putnam County, all three of the top climate hazards—precipitation, sea level rise, and rising temperatures—could impact health and, consequently, demand for health facilities. For example, high heat exposure can lead to physical health concerns; severe precipitation events can lead to injuries or mortality risks; and subsequent flooding can mobilize hazardous substances or lead to moldy conditions.[cclxxviii] Wait times at Putnam Hospital were identified as an area of concern, especially with changing climate conditions.

Vulnerable populations could also be particularly affected. In 2022, 3.5% of the County population had no health insurance, asthma hospitalizations occurred at a rate of 3.5 per 10,000 population, and heart disease caused 52.7 hospitalizations per 10,000 population.[cclxxix] In 2021, 30.2% of the population was categorized as obese – slightly higher than the New York State average of 29.1%.[cclxxx] Additionally, those aiding in response/recovery can face greater health risks for some hazards.[cclxxxi]

Adaptive Capacity

Overall, the adaptive capacity of healthcare facilities and services in Putnam County is **medium**. Resilience to climate hazards at physical healthcare facilities would most likely be controlled by factors outside the County's control, such as facility-level decisions. However, actions at the County level can influence access to healthcare facilities and services including emergency preparedness and response, management of travel and transportation routes, and provision of public health services. For example, Putnam County's volunteer Medical Reserve Corps is trained to support in the event of an emergency and to provide emergency preparedness.[cclxxxii]

Local Jobs and Businesses

Asset Description

Maintaining strong local jobs and businesses is critical for County resilience. Local jobs and businesses provide services to the County, support economic wellbeing, and contribute to the routine operations of county life. For example, some major industries in Putnam County include healthcare and social services, retail, management and science, and construction.[cclxxxiii] Strong local jobs and employment opportunities help ensure residents have enough resources to recover from disasters and can provision necessary goods and services.

Survey Results

Maintaining local jobs and businesses was generally ranked as a **high priority** for county resiliency planning based on stakeholder survey responses. A breakdown of participant prioritization levels can be found below for local jobs and businesses.

	High	Medium	Low
Maintaining local jobs and businesses	65%	30.8%	4.2%

When asked about personal experiences with disruptions due to climate hazards, eight respondents described experiences related to local jobs and businesses. Examples of comments shared by residents include:

- *"Storms stop public transport meaning my neighbors can't get to their jobs which has a ripple effect that hurts our whole county. It means they have difficulty paying their rent, buying food, and staying healthy."*
- *"Downed trees prevented me from getting to work after the Tornado in 2018. As did many rainstorms and unplowed roads during the winters. I missed work many days due to the unsafe conditions of the roads in Lake Carmel."*

Exposure

In Putnam County, a variety of local employment sectors and businesses could be impacted by climate hazards, including **increasing temperatures, sea level rise,** and **changing precipitation patterns.**

Sensitivity

Local jobs and industries will face varying impacts from climate hazards, and outdoor or weather-dependent industries may be particularly impacted. For example, 10.7% of jobs in Putnam County are construction jobs,[cclxxxiv] meaning that workers could face high heat exposure or other climate risks.[cclxxxv] Farmers and farm workers could also be impacted by heat exposure, and climate hazards could exacerbate economic stressors.[cclxxxvi] (See "Agricultural Lands + Soils" section.) Furthermore, local businesses located near the Hudson River could experience vulnerability from sea level rise and flooding. Across many job sectors, extreme heat, changing precipitation, and sea level rise could pose potential hazards by disrupting commute patterns or the transport of goods (see "Travel and Transportation" section).[cclxxxvii]

Adaptive Capacity

Adaptive capacity for local jobs and businesses is generally **medium**, although adaptive capacity is variable depending on the impacted industry, the hazard of concern, and county-level capabilities. Examples of relevant functions at the County level include outreach, education, and planning-related responsibilities.

Vulnerable Communities

Asset Description

While the impacts of climate change are expected across Putnam County, some populations face disproportionate risks and impacts. Ensuring that all communities within the County—particularly those most vulnerable—have access to necessary resources and services can play a key role in building resilience.

Although Putnam County is not considered a disadvantaged community based on New York State criteria, a number of its communities are considered economically or employment distressed.[cclxxxviii] A community is in economic distress if its median annual household income is less than 80% of the national average, and a community is in employment distress if it has a 2-year unemployment rate at least 1% greater than the national average.[cclxxxix] Economic or employment distress can exacerbate the impacts of climate change because residents have less resources to spend on recovering from a disaster or to prepare for expected climate impacts. The below map highlights areas of employment, income, or combined distress in Putnam County.

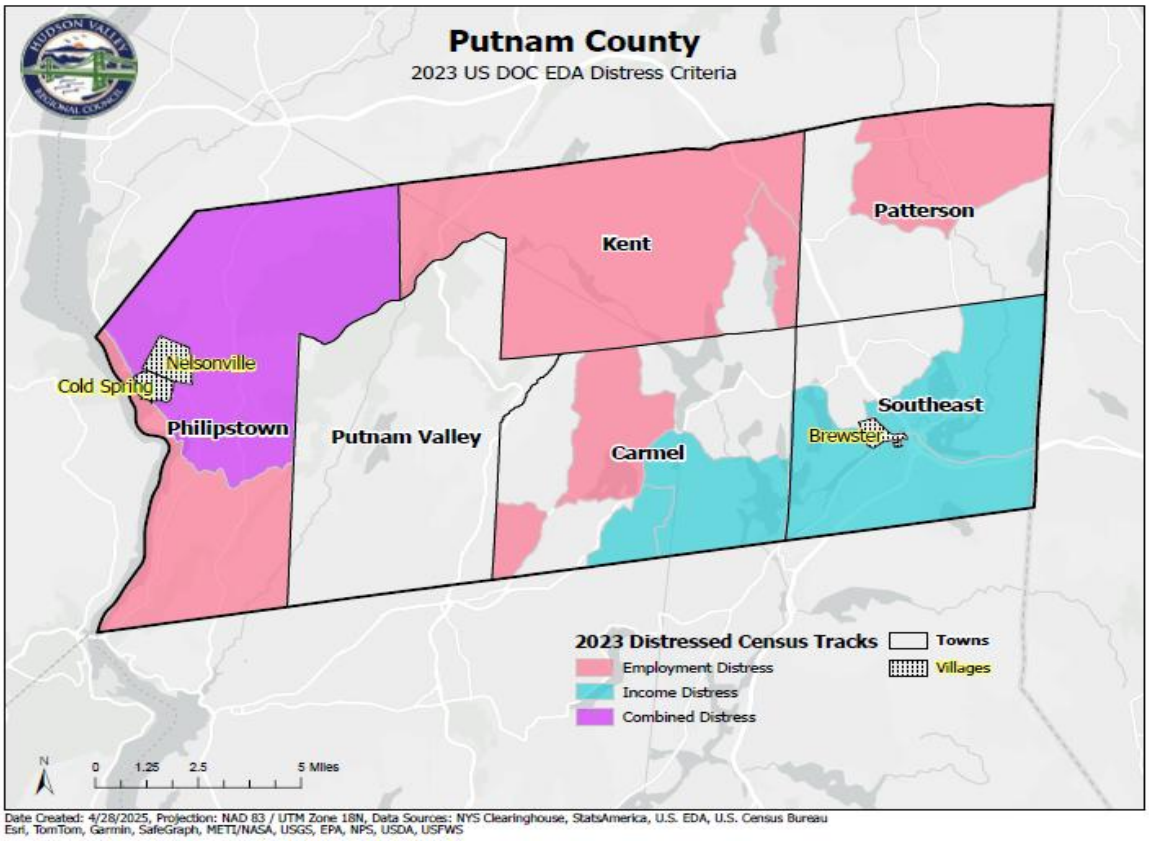


Figure 39: 2023 US DOC EDA Distress Criteria in Putnam County | Map created by HVRC

In addition, a variety of populations in Putnam County could face disproportionate impacts from climate hazards including: low-income populations, non-English speakers, older adults, youth, and people with disabilities. Maps of the distribution of vulnerable populations can be found below. Outdoor workers and emergency response staff may also face higher vulnerability to climate hazards.

Figure 4.4-5. Distribution of Vulnerable Populations in Putnam County

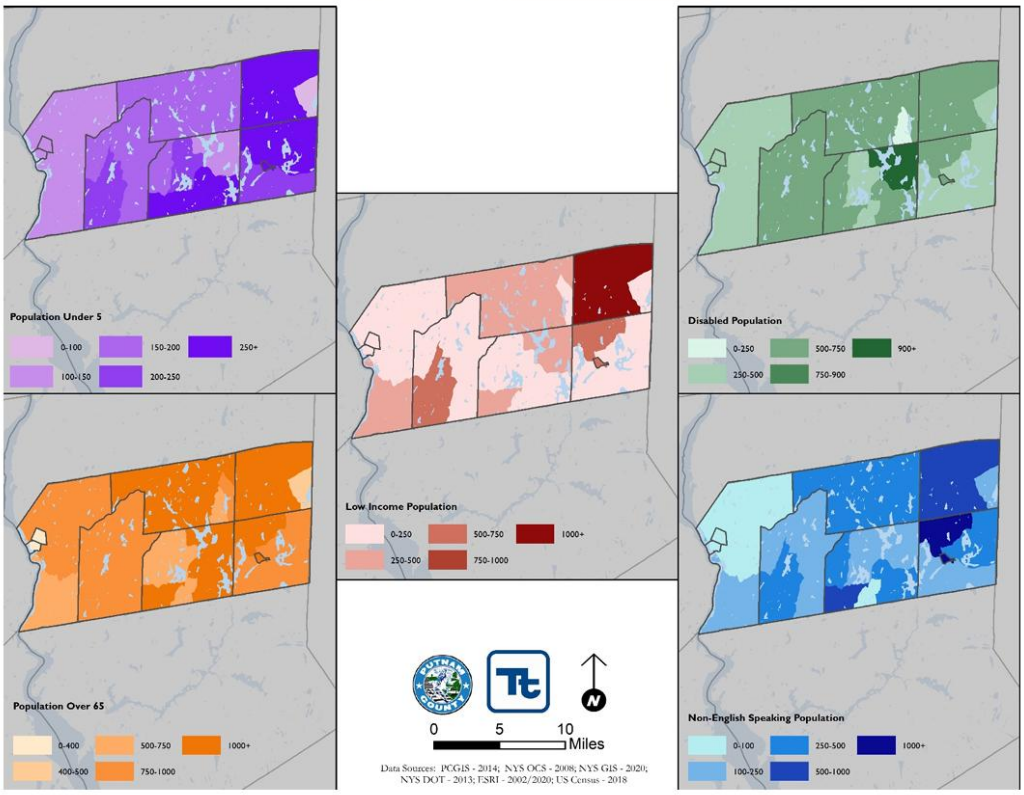


Figure 40: The distribution of vulnerable populations in Putnam County | Putnam County Hazard Mitigation Plan Section 4, p. 15.

Furthermore, while overall social vulnerability is low in the County, some locations have higher levels of vulnerability based on the CDC/ATSDR Social Vulnerability Index. These communities were considered during the development of this plan to ensure that vulnerable populations' needs were addressed.[ccxc]

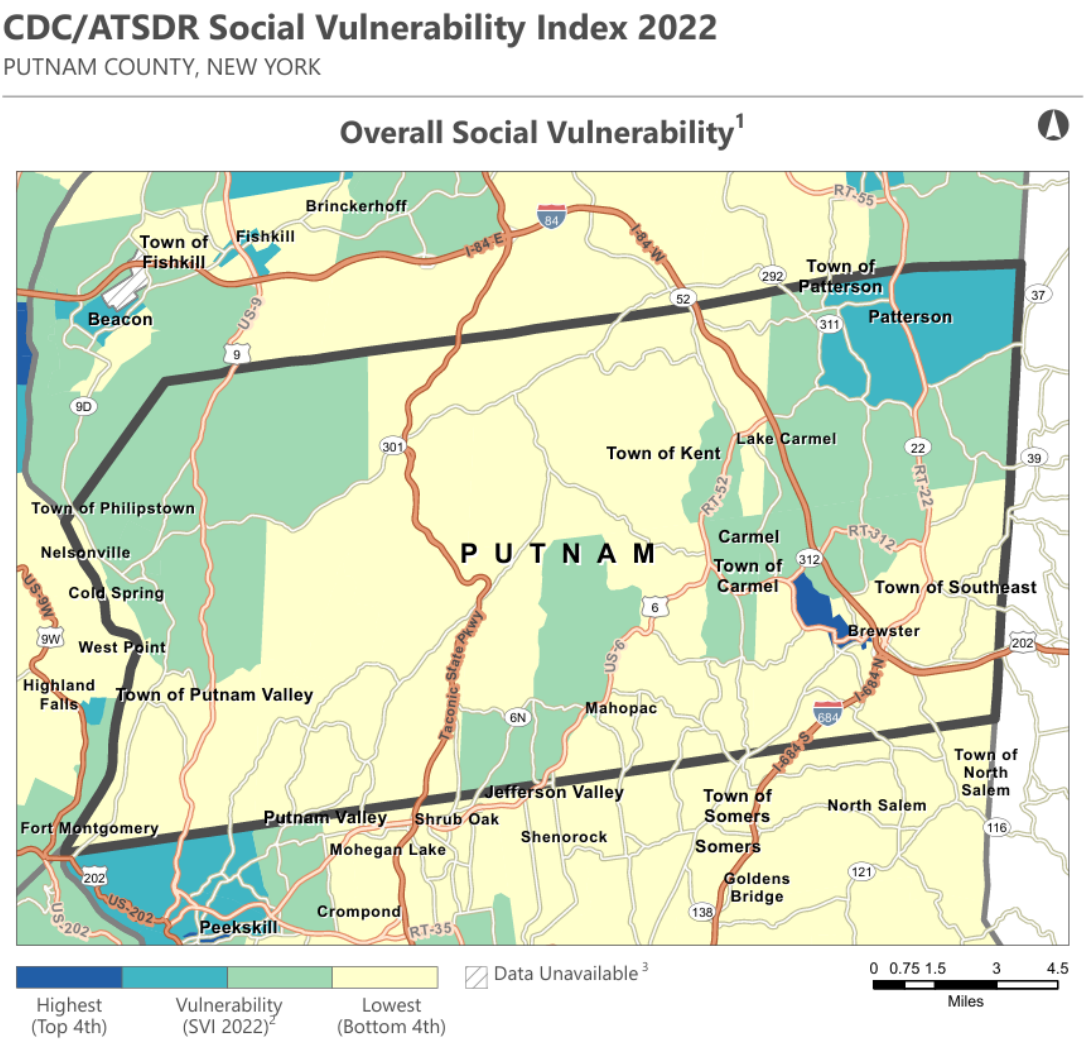


Figure 41: CDC/ATSDR Social Vulnerability Index in Putnam County. The index includes data on "socioeconomic status," "household characteristics," "racial and ethnic minority status," and "housing type/transportation." Areas most vulnerable in Putnam County include Brewster and Patterson. | CDC

Survey Results

Supporting vulnerable communities was generally ranked as a **medium-high priority** for County resiliency planning based on a stakeholder survey. A breakdown of participant prioritization levels can be found below for vulnerable communities.

	High	Medium	Low
Supporting vulnerable communities	67.8%	18.9%	13.3%

When asked about personal experiences with disruptions due to climate hazards, six respondents described experiences related to vulnerable communities. An example of the stories shared:

- *"I have young kids and when they were babies, I would check the air quality every day before taking them outside. This became more common for me to do after the wildfires in Canada happened when my daughter was born. I was shocked at how frequently (3+ days a week) the air quality was poor."*

Exposure
Vulnerable communities can be impacted by all climate hazards, including **rising temperatures, changing precipitation patterns,** and **rising sea levels.**
Sensitivity

Climate hazards can have numerous, cross-cutting impacts on vulnerable populations. As such, information about the susceptibility of vulnerable populations is included under many assets in the Climate Vulnerability Assessment. General trends are also summarized below, drawing heavily from the New York Climate Impacts Assessment.

Low- and moderate-income households may have fewer resources to prepare for and to respond to damage from climate hazards. As such, they may face more severe impacts from hazard events and/or take longer to recover from events. Climate change can also exacerbate existing economic challenges. For example, rising AC demand could increase energy costs, and power outages could spoil refrigerated foods, consequently worsening food insecurity (See "Energy + Power" and "Food Access + Food Security" sections).[ccxci] In Putnam County, ~6.8% of the population lives in poverty, based on 2024 data.[ccxcii]

Language barriers can also impact the ability to access and interpret warnings or communications about extreme heat, storms, or other hazards.[ccxciii] Emergency events often require complex coordination, and ensuring all residents can be reached is critical for safety. Language barriers can also limit access to outreach materials about expected climate impacts and how to proactively prepare. According to data from the 2024 American Community Survey 1-Year Estimate, approximately 8.1% of Putnam County residents speak English "less than very well."[ccxciv] While Putnam County does publish some information in Spanish, language accessibility was identified as an area for improvement.

Both youth and older adults can face increased sensitivity to climate change. Older adults may experience higher health impacts from climate hazards, like extreme heat, and may have greater levels of isolation, which can increase vulnerability. For example, within Putnam County, over 85% of older adults own their own home. For older adults with limited mobility, evacuation and power outages can pose particular challenges.[ccxcv] For example, access to personal transportation to evacuate may be limited, and power could impact medical equipment/medicine refrigeration. Approximately 27.6% of the population in Putnam County is over the age of 60.[ccxcvi]

For younger children, extreme temperatures (hot or cold) can pose health challenges, and, for older children, there can be associations between climate change and mental health outcomes. [ccxcvii] [ccxcviii] Availability of mental health resources, particularly for youth, has been identified as a challenge in the County. Approximately 19.1% of the population in Putnam County is under the age of 18 and 4.8% of the population is under the age of 5.[ccxcix] (See "Resources for Youth and Older Adults" section).

Populations with disabilities may also face increased vulnerability to climate hazards. In Putnam County, 9.6% of the population has a disability, 5.4% have ambulatory difficulty, 4.6% have independent living difficulty, 3.5% have cognitive difficulty, 2.8% have hearing difficulty, 2.4% have self-care difficulty, and 1.4% have vision difficulty.[ccc]

Outdoor workers, including "bike delivery workers, construction and utility service workers, and agricultural workers, as well as public service workers such as police, firefighters, and emergency responders" can face direct impacts from climate hazards while working outside.[ccci] This could particularly impact the agricultural, emergency response, and construction employees in Putnam County.

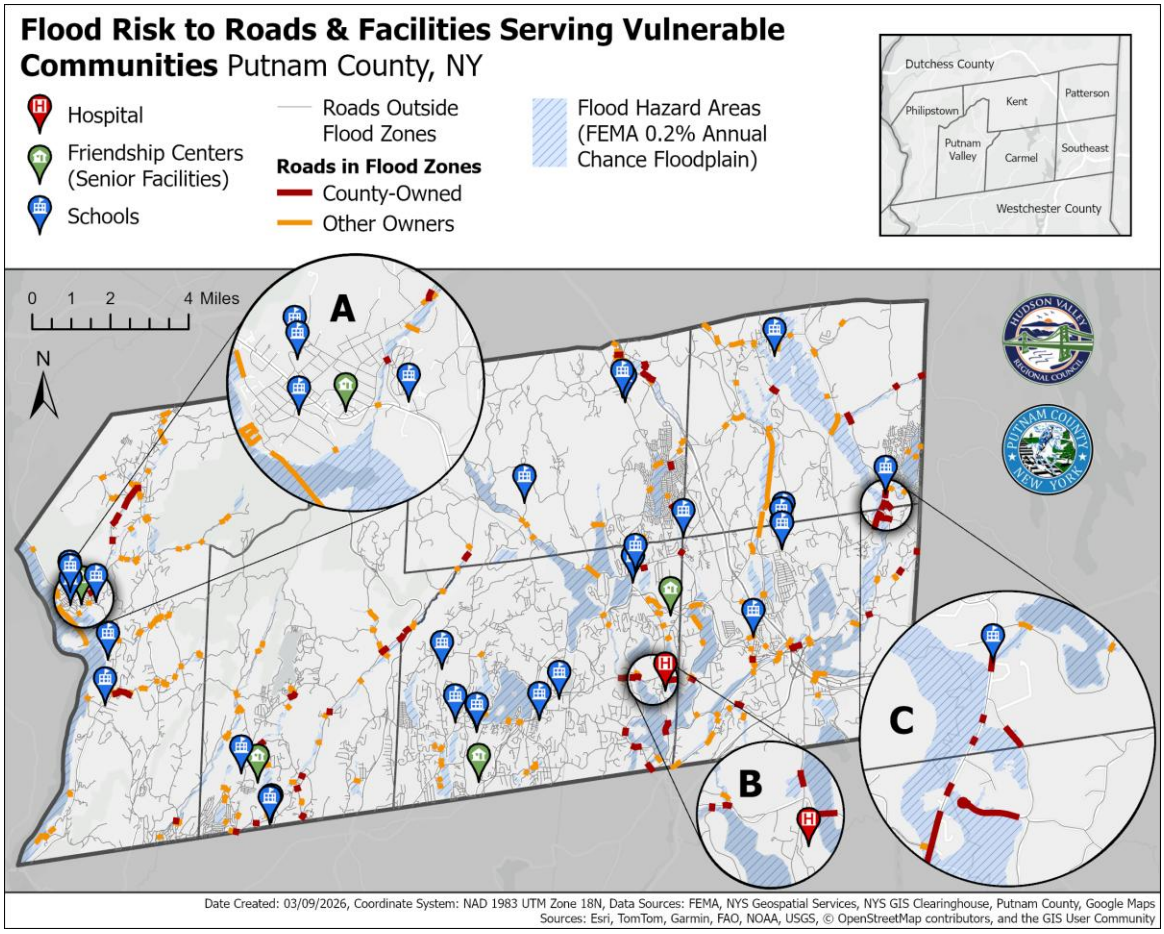


Figure 42: The map above highlights places where vulnerable populations may be located in relationship to flood zones. Specifically, schools, Friendship Centers, and the Putnam Hospital are mapped relative to the FEMA 0.2% Annual Chance Floodplain in Putnam County. Road networks (separated by County and non-County ownership) are also mapped to highlight where routes to and from these facilities fall within the floodplain. Flood zones were last updated in 2013 for Putnam County The age of the current FEMA mapping is a limitation when considering present-day flood risk, and other available, current information should also be considered when evaluating flood risk. cccii [cciii]

Callout A (left) enlarges a dense cluster of facilities in Cold Spring for clarity. Callout B (center) shows the Putnam Hospital. While the hospital is not in the floodplain, several nearby roads are at risk of flooding. Callout C (right) shows the Green Chimneys School, which is the only school in Putnam located within the FEMA 0.2% annual chance floodplain boundary. Map callouts do not obstruct floodplains or facilities.

Adaptive Capacity

Adaptive capacity for supporting vulnerable communities is **high** in Putnam County. The County has existing efforts to reach vulnerable populations through departments like the Office for Senior Resources, Department of Social Services, Mental Health, & Youth Bureau, and Department of Planning and Transportation. Supporting vulnerable populations through outreach, programs, and proactive emergency response planning can further build adaptive capacity.

Food Access & Food Security

Asset Description

Access to affordable and nutritious food is critical for maintaining health and wellbeing. **Within Putnam County, there are a variety of resources to support equitable access to food and nutrition. However, climate change can pose risks to both food systems and services.** These disruptions could be especially impactful for vulnerable communities. According to a 2025 Putnam County News Release, "there are approximately 2,900 SNAP-eligible individuals in Putnam County, including nearly 950 seniors." [ccciv] Cornell Cooperative Extension reports that ~28% of residents in the County "struggle to meet their basic daily needs."[cccv]

Food assistance is currently available through local organizations and churches, including at soup kitchens and food pantries.[cccvi] Cornell Cooperative Extension, in partnership with Second Chance foods, offers a "Bountiful Meals" programs that provides free meals with locally produced food, available in community freezers to fill the food access gaps in food security for older adults and those that do not qualify for food assistance.[cccvii] [cccviii]designated locations around Putnam County.[cccix] Some local farms and CSA programs in the County accept SNAP EBT. On a county level, the Department of Social Services manages the Supplemental Nutrition Assistance Program (SNAP) for the County. The Office of Senior Resources also provides free lunch through their congregate sites and runs a home-delivered meal program for homebound clients. Maintaining these programs requires access to reliable power for refrigeration, safe transportation routes to transport foods, and an adequate climate for growing food locally.

Survey Results

Stakeholders generally ranked ensuring food access and food security as a **high priority** for county resilience planning. A breakdown of participant prioritization levels can be found below for food access and security.

	High	Medium	Low
Ensuring food access and food security	72.7%	14.7%	12.6%

When asked about personal experiences with disruptions due to climate hazards, eight respondents described experiences related to food access and food security. Examples of stories shared include the following:

- *"Missed many celebrations due to stormy weather, ice, fear of wildfires. Unable to get food to food pantries (little free pantry in Brewster) etc.*
- *"Storms stopped trucks from getting to food bank centers [...]"*

Exposure

Changing precipitation patterns and **rising temperatures** hold the potential to impact food security and access.

Sensitivity

Food access and food security are susceptible to multiple, compounding climate impacts. Changing precipitation patterns and rising temperatures could negatively impact locally produced agriculture (See "Agricultural Lands + Soils" section). Power outages from brownouts from storms or extreme heat could disrupt food storage and refrigeration (see Power and Energy section). Following power outages, costs associated with replacing spoiled food could create an economic barrier for low-income residents (see "Vulnerable Populations" section). Flooding or damage on roadways could also prevent residents from reaching grocery stores or food assistance programs and/or disrupt the ability to transport goods to stores/food pantries.

Adaptive Capacity

Adaptive capacity for food access and food security in the County is generally **medium.** There are existing programs in the County that offer support relevant to food security through the Department of Social Services, Office of Senior Resources, and Cornell Cooperative Extension of Putnam County. Additionally, the Department of Health offers education about when to throw away food following a power outage event to reduce risks from spoiled foods. Furthermore, resilient transportation routes and options can support residents in reaching stores and food pantries. However, food security programs run by outside organizations are not under Putnam County's management—although partnerships and collaboration may be possible.

Historic Preservation

Asset Description

Historic buildings add to the sense of place and identity in Putnam County, yet their aging materials could be particularly vulnerable to climate impacts. The National Register of Historic Places Database compiles "historic places worthy of preservation" in the United States.[cccx] Putnam County has 49 locations currently included in the Register.[cccxi] Examples of listed sites include the old Putnam County Courthouse, Cold Spring Historic District, Garrison Landing Historic district, West Point Foundry Archeological Site, Castle Rock, and the Boscobel House and Gardens.[cccxii] Putnam County has also taken an active role in preserving and communicating about its history through programs like the "Old House Program" and through the County Historian records, archives, and library.[cccxiii] Building resilience while maintaining historic assets requires strategic planning and creative solutions.

Additionally, the Putnam County Historian manages historic governmental/judicial records through the County Archives, which includes records back to 1812, and nongovernmental records through the Historian's Collection, which includes important documents like letters, diaries, memoirs, and other artifacts preserving the history of Putnam County. The records in the County Archives and Historian's Collection are critical resources for informing future decision-making.

Survey Results

Supporting historic preservation received mixed support based on stakeholder survey feedback and was generally ranked as a **lower priority** for County resilience planning. Notably, survey responses commented only on historic preservation broadly and did not specifically address the County Archives and Historian's Collection. A breakdown of participant prioritization levels can be found below for historic preservation.

	High	Medium	Low
Supporting historic preservation	37.1%	49.7%	13.3%

Exposure

Climate hazards to Putnam County's historic preservation include **rising temperatures, increasing precipitation,** and **sea level rise**.

Sensitivity

Historic properties face variable sensitivity to climate change depending on their locations, building materials, and management. According to the New York Climate Impacts Assessment, heat can warp building materials, flooding and sea level rise can harm foundations, and changing moisture levels can impact building material longevity.[cccxiv] While relevant to all buildings, these climate impacts could impact historic properties in the County.

The County Archives and Historian Records are also vulnerable to changing precipitation, especially related to heavy rain events. These resources are stored on the ground floor of the Records Building in Brewster, which is located near the East Branch of the Croton River. There have already been instances of water seeping inside following significant rain events. Aging dams connected to the New York City reservoir system upstream of the center also pose significant risks should they fail (see "Dams" section). Only a small portion of the records and archives are digitized, photocopied, or otherwise preserved. As such, flooding from precipitation or dam failure could jeopardize the information and knowledge stored in these important resources.

Adaptive Capacity

Adaptive capacity for historic preservation is **variable** for the County. Specifically, the County has limited capacity to influence the preservation of individual buildings and historic properties. While Putnam County can provide relevant outreach and educational materials, management of individual properties is not a function of Putnam County, unless the property is specifically owned by the County. On the other hand, adaptive capacity for the County Archives and Historical Records is **high**, because they are assets managed by the County within a County-owned facility.

Resources for Youth and Older Adults

Asset Description

Youth and older adults are among Putnam County's most vulnerable residents, and climate hazards could pose a risk to the services that meet their transportation, caretaking, and medical needs. As of 2024, 4.7% of Putnam County residents were under the age of 5, 16.3% were between 5 and 19, and 27.6% were over the age of 60.[cccxv] The older adult population ages 70 and older is expected to increase, and the youth population is expected to decrease.[cccxvi]

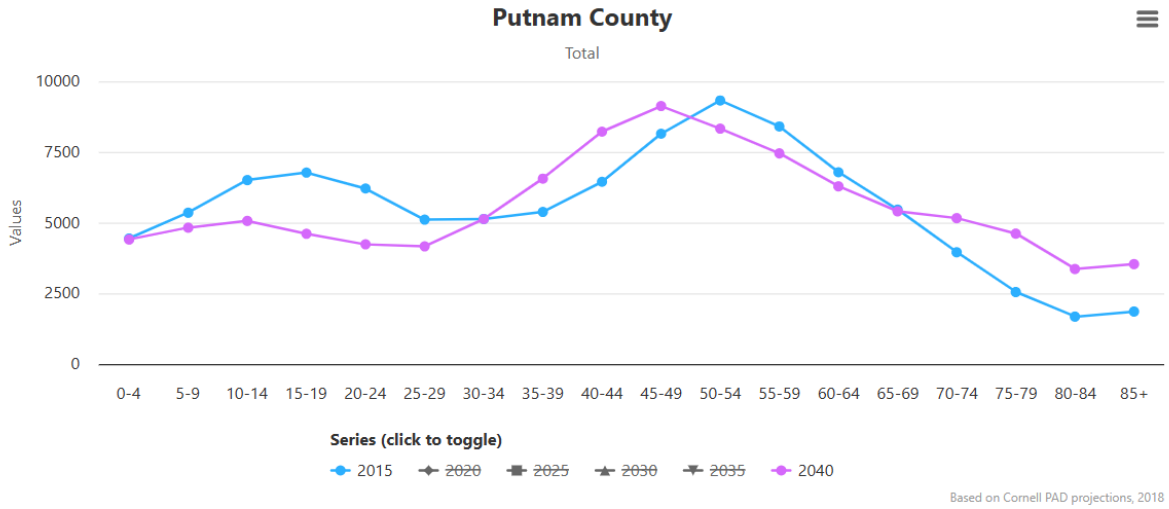


Figure 43 Putnam County age distributions in 2015 and 2040 (projected) | Cornell Program on Applied Demographics

Within Putnam County, there are a variety of programs and services available for youth and older adults. For example, Putnam County's Office of Senior Resources (OSR) oversees four Friendship Centers that offer congregate meals, wellness classes and activities, transportation, and additional services. In addition to the Centers, the Office of Senior Resources runs a variety of programs for older adults relevant to resiliency planning including: nutrition and food support, social model adult day services, caregiver support, legal services, transportation to medical appointments, and health insurance counseling. OSR also conducts outreach to isolated and frail individuals to provide information and referrals, and facilitates a volunteer program to further support community needs.[cccxvii]

The Putnam County Youth Bureau focuses on supporting youth "at risk of becoming involved or further involved in the juvenile justice or human services system." The Youth Bureau is located at Tilly Foster Farm in Brewster, NY. Programs include Pegasus, which provides educational programming for children with parents who have an alcohol or drug dependency; Youth Court, which provides a court of peers as an alternative to family court for first-time offenders; services for youth with mental health needs; shelter for runaway and homeless youth; and youth conference and awards events.[cccxviii] Continuing to provide and expand these services under expected climate impacts can be important for supporting youth in the County. Additional resources are also coordinated through partnerships with private organizations.[cccxix]

Many programs and opportunities are also available to older adults and youth that are not coordinated by the County, including schools, sports and recreational opportunities, and healthcare facilities.

Survey Results

Stakeholder survey respondents generally ranked providing services for older adults and youth as a **medium-high** priority for county-resilience planning. A breakdown of participant prioritization levels can be found below for resources for older adults and youth.

	High	Medium	Low
Providing resources and services for older adults	58%	35.7%	6.3%
Providing resources and services for youth	55.9%	33.6%	10.5%

When asked about personal experiences with disruptions due to climate hazards, four respondents described experiences related to resources for youth or older adults. One participant noted:

- *"Too many to list! But I'll say that the importance for both seniors and children to be able to access services during periods of extreme weather is essential."*

Exposure

Youth and older adults can be impacted directly and indirectly by all climate hazards, and the resources they access are vulnerable to **rising temperatures, changing precipitation patterns,** and **rising sea levels.**

Sensitivity

Climate hazards could disrupt resources for older adults and youth by directly impacting the services offered or by limiting access to resources. Youth and older adults share an increased need for mobility and care support, which may increase their sensitivity to climate impacts. For example, older adults with chronic health conditions may require oxygen supplies, regular medication, and access to healthcare providers that could be impacted by disruptions to power and energy or travel and transportation.[cccxx] None of Putnam County's four Friendship Centers are located within floodplains, although several are located relatively proximate to flood zones,[cccxxi] and road flooding could impact access to the facilities for staff, services, and visitors to reach the centers (See "Travel + Transportation" and "Healthcare Facilities + Services" sections).

Climate hazards could potentially disrupt access to transportation services dedicated to youth and older adults. In these cases, there may be reduced alternative transportation options in the event of cancellations or delays.[cccxxii] [cccxxiii] For example, Putnam County's volunteer medical transportation program for older adult-residents who lack other options to reach their medical appointments could be disrupted by road closures due to flooding or debris.

Many families rely on childcare providers and schools to care for youth. Childcare providers and teachers may not be able to get to work as travel becomes dangerous during severe weather events.[cccxxiv] Schools are managed at the district level, and school facilities experience varying exposure across Putnam County.

Youth and older adult community members' sensitivity to climate change may be compounded when they also belong to other vulnerable demographics. For example, school closures are particularly impactful for children from low-income families who rely on free or reduced-price school breakfast and lunch.[cccxxv]

Adaptive Capacity

Adaptive capacity for resources for youth and older adults is **medium** in Putnam County. The County may take advantage of its pre-existing offices dedicated to providing services for youth and older adults. Through the Office for Senior Resources, the County already works to provide transportation and targeted outreach and can build the resilience of these resources during severe weather events. However, the adaptive capacity of county-run services is tied to other assets, including those listed in the Travel and Transportation and Healthcare Facilities and Services sections.

Cultural Resources, Tourism, & Community Events

Asset Description

Beyond directly impacting physical assets and services, climate hazards have the potential to disrupt resources, experiences, and events that contribute to making Putnam County a unique place to live and visit. Disruptions to cultural resources, tourism, and community events can impact social experiences and economic outcomes in the area. For example, tourism contributes to Putnam County's local economy. According to the New York State Tourism Association, tourists and visitors spent over $88 million at businesses in Putnam County in 2024.[cccxxvi] Tourists are drawn to the region due to its outdoor recreation; local businesses; and historic, cultural, and artistic sites.

Putnam County contains ample cultural resources that serve locals and visitors alike, including:

- Eight libraries (Brewster Public Library, Julia L. Butterfield Memorial Library, Reed Memorial Library, Alice Curtis Desmond and Hamilton Fish Library, Kent Public Library, Mahopac Public Library, Patterson Library, and Putnam Valley Free Library),[cccxxvii]
- Spiritual centers like the Chuan Yang Monastery, Garrison Institute, and Graymoor.
- Museums/art centers like the Boscobel House & Garden, Manitoga, Magazzino Italian Art, and Hudson Valley Shakespeare.[cccxxviii]

Events, festivals, and farmers' markets are also present across the villages and towns in Putnam County, and a schedule of activities is maintained on the Tourism page of Putnam County's website.[cccxxix]

Survey Results

Overall, cultural resources, tourism, and community events were ranked as a **lower priority** than other social assets for county resiliency planning based on stakeholder feedback. Within this category, access to cultural centers like libraries and museums was a higher priority whereas supporting tourism and holding community events were lower priorities. A breakdown of participant prioritization levels can be found below for cultural resources, tourism, and community events.

	High	Medium	Low
Access to cultural centers and resources (libraries, museums, etc.)	42%	36.4%	21.7%
Supporting tourism and visitors to the County	14%	49.7%	36.4%
Holding community events or festivals	4.7%	54.4%	30.8%

When asked about personal experiences with disruptions due to climate hazards, 15 participants described experiences related to cultural resources, tourism, or events.

Exposure

Cultural resources, tourism and community events can be impacted by **rising temperatures, sea level rise,** and **increasing precipitation.**

Sensitivity

Cultural resources, events, and tourism can be impacted through compounding climate impacts and hazards. Potential impacts to tourism include, but are not limited to, the following:

- Flooding on roads or rail lines could impact travel to the area (see "Travel and Transportation" section).

- Visitors seeking Putnam County's recreational opportunities may be impacted by severe heat events (see "Recreation" section).
- Historic buildings can face additional risks from heat, sea level rise, and increasing precipitation (See "Historic Preservation").

Artistic and cultural resources can also be negatively impacted by hazards.

- Rising temperatures will require more air conditioning at museums, which can impact operating costs.[cccxxx]
- Furthermore, libraries are used as cooling shelters during extreme heat events, which may require more frequent use under rising temperatures (see "Cooling/Warming Centers").

Community events and festivals could also face cancellations or complications due to extreme heat and/or severe precipitation events.

Adaptive Capacity

Adaptive capacity for cultural resources, tourism, and community events is **medium**. While infrastructural upgrades to museums and cultural centers would likely be addressed at the facility level, there are actions the County could take to improve the adaptive capacity of these assets. For example, maintaining safe transportation options or conducting outreach related to hazards preparedness could build resilience for assets in this section.

Environmental Assets

Drinking Water

Asset Description

Safe and adequate drinking water is necessary for the health and wellbeing of Putnam County residents, and climate change poses risks for the County's drinking water supplies. Putnam County has a mixture of public and private water supplies for their potable water. These sources include some surface water, but most drinking water comes from underground aquifers accessed through wells.[cccxxxi] Aquifers can either be located in bedrock, which underlies all of Putnam County, or surficial sand and gravel formations, which exist in specific locations within the County.[cccxxxii] Most wells in Putnam County are deep, targeting bedrock.[cccxxxiii] [cccxxxiv]

Well depth in the County ranges from 10 to 1330 feet, with most between ~150 and ~800 feet.[cccxxxv]

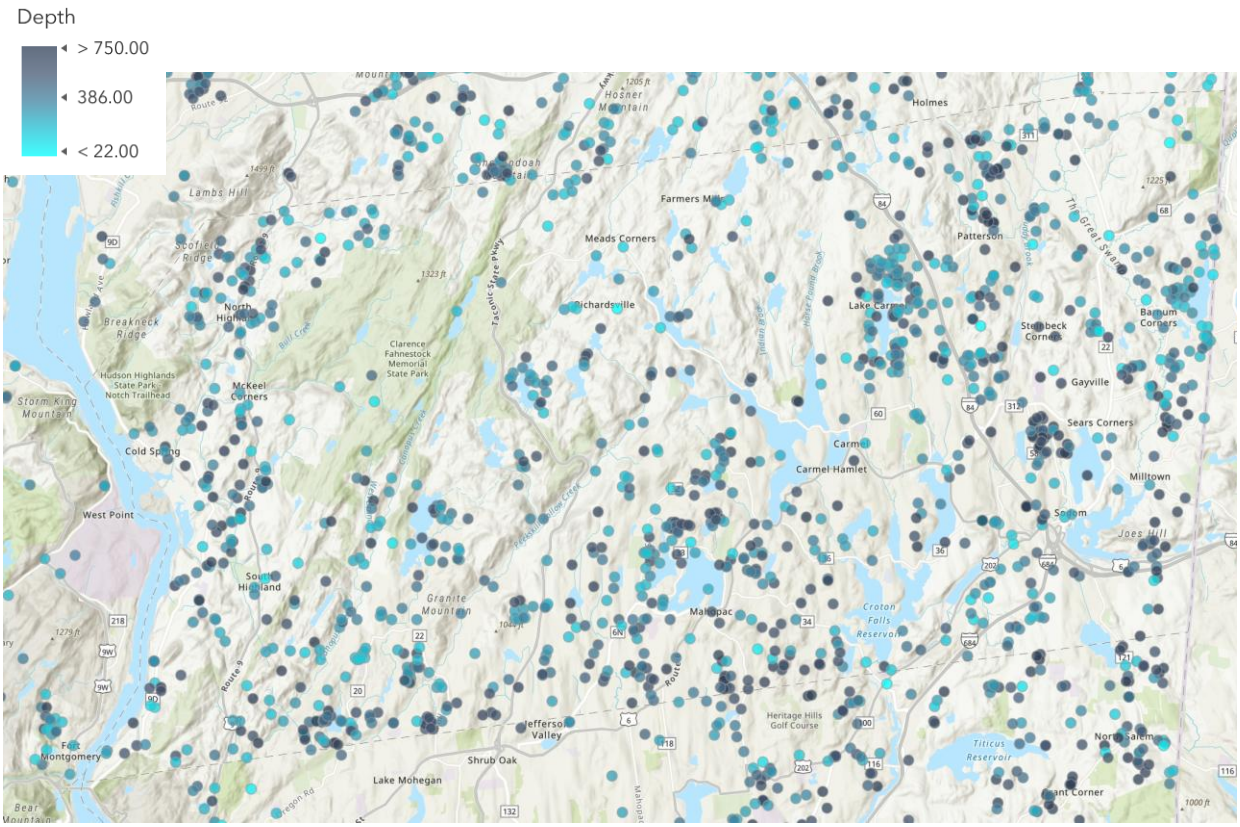


Figure 44: Wells in Putnam County, depth in feet | NYS DOS GIS

Under New York law, the Putnam County Department of Health is responsible for regulatory oversight of any system with at least 5 service connections or that services at least 25 people daily for at least 60 days a year. Even if privately or municipally owned, systems which meet these qualifications are considered public by definition. There are 129 community water systems for which the Department of Health "reviews and provides surveillance."[cccxxxvi] [cccxxxvii]

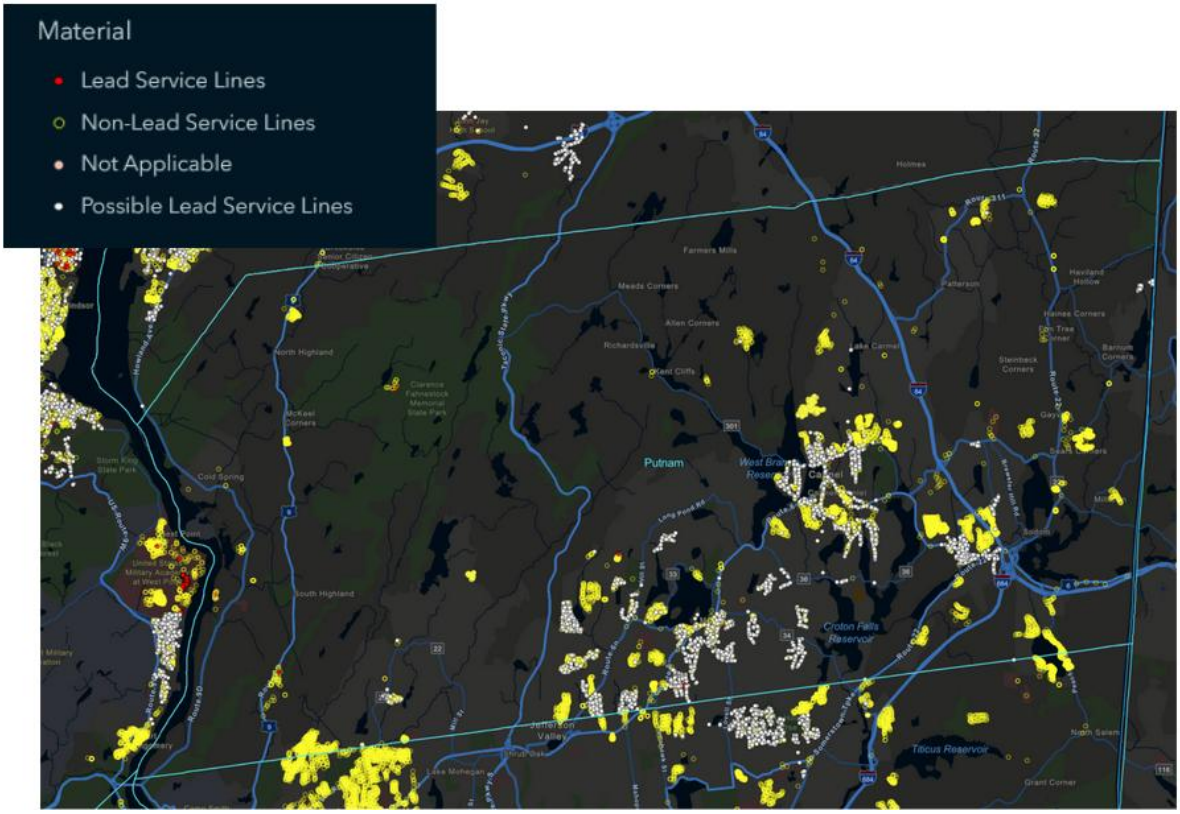


Figure 45: Water service lines in Putnam County | NYLCVEF

Many surface water bodies in the County are owned by New York City. Water from these reservoirs are channeled through the Delaware Aqueduct in Putnam County, or the Croton and Catskill Aqueducts downstream, to provide a portion of the city's drinking water.[cccxxxviii] More information can be found in the Place Narrative.

Survey Results

Generally, survey participants ranked protecting safe drinking water as a **high priority**. **Of all the environmental assets in the County, protecting safe drinking water was ranked as the highest priority for county resiliency planning based on a stakeholder survey.** A breakdown of participant prioritization levels can be found below for safe drinking water.

	High	Medium	Low
Protecting safe drinking water	90.2%	6.3%	3.5%

When asked about personal experiences with disruptions due to climate hazards, seven respondents described experiences related to water.

Exposure

Surface waters and wells have the potential to be impacted by climate hazards, including **changing precipitation** and **increasing temperatures.**

Sensitivity

Climate hazards could lead to lower groundwater levels and contamination of both well and surface water supplies. Groundwater is maintained by rainwater and snowmelt which seeps through the ground, and it can be depleted by overextraction or a lack of supply.[cccxxxix] Deep wells dug into bedrock are less vulnerable to contaminants and less sensitive to droughts than shallow wells targeting permeable surficial deposits. [cccxl] [cccxli] Although most of Putnam County's wells are in more resilient bedrock aquifers, if water is depleted without being restored during drought conditions, there may still be a drop in groundwater elevation. This can cause reduced yield in wells. Drought conditions may also lead to increasing sediment and contaminant concentrations if groundwater needs to be carried from farther distances to reach wells.[cccxlii] While not one of the top three climate hazards for Putnam County, the County's Hazard Mitigation Plan does note that New York State can anticipate an increase in drought frequency that may impact water supplies.[cccxliii]

Furthermore, flood water—including from flooded roads—can contaminate drinking water, and flooding from downpours can contaminate wells. As temperatures rise, and precipitation patterns alter, Putnam County can also anticipate an increase in harmful algal blooms.[cccxliv] Harmful algal blooms impact surface water bodies—although most of Putnam County sources its water from wells, some residents do retrieve their water from surface supplies.[cccxlv] Harmful algal blooms may also be more widely impactful for the network of reservoirs in Putnam County which are connected to New York City's water supply. Treatment may mitigate the impact of harmful algal blooms on drinking water, but this is dependent on choosing the correct process at each treatment stage, and some toxins may still escape after a full treatment process.[cccxlvi]

Figure 4.6-4. Potable Water Facilities in Putnam County

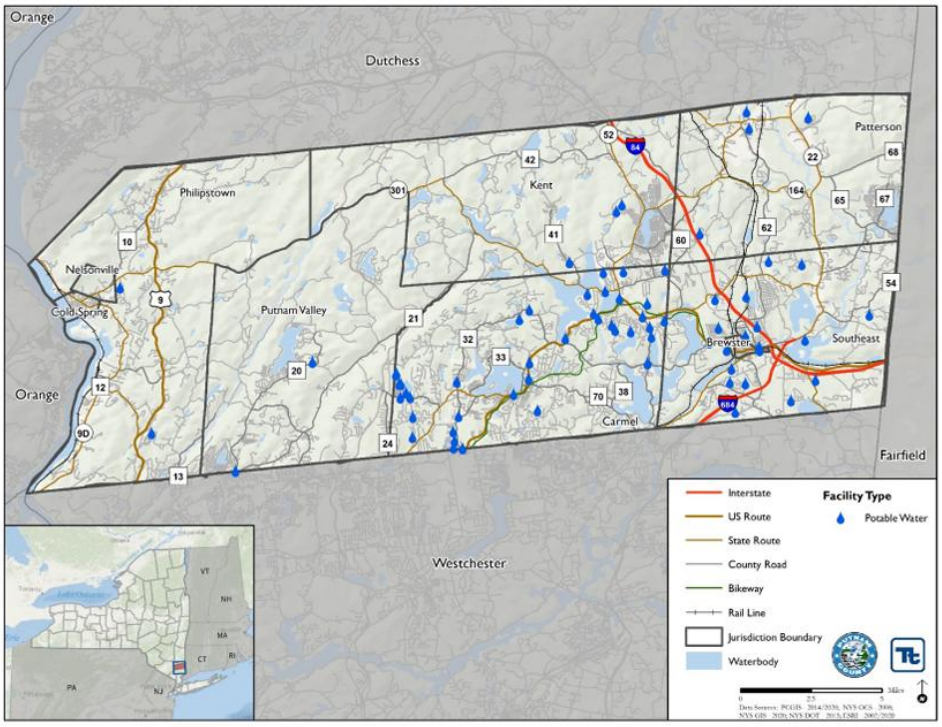


Figure 46: Potable Water Facilities in Putnam County | Putnam County Hazard Mitigation Plan Section 4 p. 44

Adaptive Capacity

Adaptive capacity for drinking water is **medium**. The Putnam County Department of Health, "reviews operations, provides surveillance…, responds to problems such as low pressure and outages, and performs special surveys to ensure compliance with New York State codes" for all public water systems. There are also preexisting programs to annually monitor the operation of community water supplies, monitor non-community water supplies every three years, and conduct required sampling for small non-community supplies.[cccxlvii] The County may take advantage of these systems to monitor and address water quality and water supply issues in the face of climate hazards. However, the County has more limited capacity to address drinking water issues for the 55% of the County's population that does not rely on public supplies.

The Department of Health offers two additional tools/programs that can support clean and safe water. Specifically, the Department offers assistance related to drinking water advising, inspections, and monitoring. It also has a webpage about harmful algal blooms with a phone number to report occurrences, which can aid in education and tracking. [cccxlviii]

Clean Air

Asset Description

Protecting clean air is a particularly complex resiliency challenge, because air quality can be impacted by hazard events both within and outside of the County. For example, smoke from wildfires can travel far distances and impede access to clean air. Nonetheless, identifying solutions to promote clean air is important for health and safety in the County, especially for vulnerability communities like youth, older adults, and people with pre-existing medical conditions.

Survey Results

Generally, stakeholder survey participants ranked protecting clean air has a **high priority** for County resilience planning. A breakdown of participant prioritization levels can be found below for safe clean air.

	High	Medium	Low
Protecting clean air	81.1%	12.6%	6.3%

When asked about personal experiences with disruptions due to climate hazards, 32 respondents described experiences related to clean air/air quality. Examples of stories shared include the following:

- *"In the past two summers we've had a notable increase in days with poor air quality related to high temps and wildfires (some of which originate far beyond Putnam County and are of course beyond control). As someone with limited cooling (air conditioning) in the home, this is a significant concern."*
- *"The growing frequency of days with poor air quality resulting from wildfires is a real concern for me […]*

Exposure

Increasing temperatures could impact air quality in Putnam County.

Sensitivity

Putnam County's susceptibility to wildfire and conditions that promote fires are increasing by ~10-30% due to rising temperatures.[cccxlix] Increases in wildfires in other locations have also impacted air quality in the past. For example, a press release from August 2025 indicates poor air quality in Putnam County due to Canadian wildfires.[cccl]

Adaptive Capacity

Adaptive capacity for clean air is generally **medium** in the County. Adaptive capacity is limited primarily to outreach and education, because the County has less control over air pollutants, particularly those originating from outside the County's borders.

Ecosystems, Habitats, and Biodiversity

Asset Description

Many of the ecosystems in Putnam County are vulnerable to climate impacts. Protecting the health of ecosystems, habitats, and biodiversity can mitigate these risks and also contribute to climate adaptation and mitigation. Putnam County is home to diverse ecosystems including forests, rivers, lakes, wetlands, and estuaries. Detailed information about the ecosystems in Putnam County is available in the Place Narrative. These ecosystems provide important habitat for numerous species of plants and animals, including a variety of rare species.[ccli] Some significant natural communities in Putnam County include chestnut oak forests, Appalachian oak hickory forests, oak-tulip tree forests, pitch pine-oak-heath rocky summits, and red maple-hardwood swamps.[cclii] The Great Swamp, in northeastern Putnam County, is particularly significant for the rare and diverse array of species that inhabit its varied habitats.

Survey Results

Protecting ecosystems, habitats, and biodiversity was generally deemed a **high priority** for county resilience planning by survey respondents. A breakdown of participant prioritization levels can be found below.

	High	Medium	Low
Protecting ecosystems and habitats	74.1%	21%	4.9%
Protecting biodiversity	67.8%	24.5%	4.9%

Survey respondents also indicated that pests, insects, and invasive species are a concern relevant to this section.

- 62.9% of survey respondents indicated that they have had experiences with pests, insects, and invasive species in the past 5-10 years.
- Looking 10-15 years into the future, 44.8% of survey respondents reported that they were highly concerned about pests, insects, and invasive species; 35.1% reported a medium level of concern; 22.4% reported a low level of concern; and 1.4% reported that they were unsure.

Throughout survey responses, participants identified a variety of invasive species, insects, and pests of concern, including ticks, spotted lantern flies, stink bugs, Japanese beetles, Japanese knot weed, spongy moths, jumping worms, and Beech Tree Disease.

When asked about personal experiences with disruptions due to climate hazards, 15 respondents described experiences related to ecosystems, habitats, and biodiversity. An example of a story shared includes the following:

- *"Diversity of wild flowers on the rail trail has dropped drastically due to invasive species."*

Exposure

Putnam County's ecosystems, habitats, and biodiversity, are susceptible to **sea level rise, increasing precipitation,** and **increasing temperatures.**

Sensitivity

Ecosystems, habitats, and biodiversity are vulnerable to many climate hazards affecting Putnam County. Potential impacts include, but are not limited to, the following:

- Rising temperatures are increasing susceptibility to invasive species in the state.[ccliii]
- Storms can damage wetlands through influxes of water, nutrients, sediment, or toxins, and can potentially bury/damage wetlands near rivers.[ccliv] Coastal flooding is projected to be more prevalent under climate change due to sea level rise in conjunction with potentially increasing storm severity.[cclv]
- Increasing temperatures can also increase susceptibility to harmful algal blooms in the County's lakes through deoxygenation.[cclvi]
- Shifting temperature patterns could impact phenology--"the seasonal timing of biological activities as they occur in ecosystems"--which can have wide-ranging impacts on ecosystems.[cclvii]
- Flooding and changing temperatures may cause species distributions to shift as species seek more favorable habitat, and as species experience die-off from physiological stress, disease, and increased competition.[cclviii]
- According to the County's HMP, potential increases in summer drought conditions could pose threats to water supplies and soil water, impacting wetlands, triggering wildfires, and further contributing to infestations and disease.[cclix]

Furthermore, Putnam County's riverfront location makes it particularly important due to its estuary habitat. The New York Climate Impact Assessment notes that the Hudson River's estuary environment is "one of the most biodiverse in the state" and hosts aquatic species that may be particularly vulnerable to sea level rise due to changing saltwater concentrations in the environment.[cclx]

Adaptive Capacity

Adaptive capacity for Putnam County's ecosystems, habitats, and biodiversity is **medium**. The County has existing strengths that impact adaptive capacity. For example, the 2021 HMP indicates that "The Department of Health has undertaken monitoring, warning, and education about harmful algal blooms in the County."[cclxi] The County is also working on projects that could benefit ecosystems in the County including:

- Dam hardening, which reduces flood risk from dam failure.
- Improving fire emergency preparedness capabilities, which enables better fire response.

- Undertaking storm sewer improvement projects, which can prevent flooding. [cccLxii] [cccLxiii]

Additionally, overall development pressure in the County is low, leaving significant room for natural areas.

However, adaptive capacity is potentially impacted by the availability of up-to-date data and plans. Multiple County departments currently use the NY DEC Natural Resource Mapper tool in their planning efforts, but more granular data is not always available. For example, while the County does not have a current Natural Resources Inventory (an inventory was created in the early 2000s), there are local-level NRIs available within towns and villages. The County also has planning-level capacities that could impact adaptive capacity in this section. For example, the County previously created an Open Space Management Plan, although it is no longer in use.

Management of land in the County is also complicated by ownership models. Much of the land in the County is owned by New York City and by nonprofits/land conservation organizations. In these locations, the County has less influence on the management of ecosystems and habitats for climate impacts.

Parks, Open Space + Recreational Sites

Asset Description

Putnam County is home to many parks, open spaces, and recreational sites **which provide locations for outdoor leisure activities, contribute to Putnam County's tourism industry, and serve as habitats for biodiversity. Climate hazards may both impact these lands and disrupt the services they provide.** Putnam County's parks, open spaces, and recreational sites include, but are not limited to, the Fred Dill Wildlife Sanctuary and Outdoor Education Center, the Hudson Highland State Park, Veterans Memorial Park, Michael Ciaiola Conservation Area.[cccLxiv] A more complete list of parks, open spaces, and recreational sites can be found within the Place Narrative. The Putnam Trailway and Maybrook Trailway also provide biking and recreational opportunities.[cccLxv] [cccLxvi]

County-owned parks, open spaces, and recreational sites are maintained by Putnam County's Department of Parks and Recreation, which employs staff at each park to patrol and maintain properties year-round.[cccLxvii]

Survey Results

Access to high-quality recreation sites and access to parks and open spaces received mixed support for prioritization in county resiliency planning, generally representing a **medium**

priority level. A breakdown of participant prioritization levels for parks, open spaces, and recreational sites can be found below.

	High	Medium	Low
Access to high-quality recreational sites	41.3%	39.9%	18.9%
Access to parks and open space	48.3%	38.5%	13.3%

When asked about personal experiences with disruptions due to climate hazards, 18 respondents described experiences related to parks, open space, and recreation. Examples of comments shared include the following:

- "Poor air quality from Canadian wildfires reducing outdoor recreational opportunities. Extreme heat as well."
- "Trail damage / limited access after storms."

Exposure

Putnam County's abundance of parks, open spaces, and recreational sites are vulnerable to **sea level rise, flooding,** and **rising temperatures**—which can impact the physical sites as well as their use.

Sensitivity

Climate hazards may impact the physical conditions of parks, open spaces, and recreational sites and impede their use. For example, heavy precipitation could wash out trails and flooding from sea level rise could impact riverfront parks in Cold Spring and Philipstown. Wildfires could also pose significant challenges for parks and recreational sites; if ignited, water would need to be trucked in to extinguish a wildfire.

Beyond physical impacts, rising temperatures could also impede the use of parks and recreational sites. Rising temperatures will lead to an increase in extreme heat days and heat waves in Putnam County. Heat exposure can lead to health-related illness or mortality.[cccLxviii] According to the CDC, populations particularly susceptible to heat illness and mortality include: "older adults, young children, and people with chronic medical conditions."[cccLxix]

Visitors may use parks, open space, and recreational sites in part for their biodiversity and ecosystem benefits, including photography, birding, fishing, and hunting, which could be impacted by the harms to ecosystems caused by climate change.[cccLxx] More information on the harms to ecosystems and biodiversity can be found in the Ecosystems and Habitats section.

Adaptive Capacity

Adaptive capacity for parks, open space, and recreational sites in Putnam County is generally **medium**. Within Putnam County, substantial open space and conservation land is owned by nonprofit and land conservation organizations, and each town within Putnam County has its own Parks and Recreation department. Additionally, due to its location in the New York City Watershed, some land is owned by New York City. This variety of ownership models impacts how and if the County can operate different portions of the land. Additional details on specific landowners in Putnam County can be found within the Place Narrative.

Agricultural Lands + Soils

Asset Description

Agricultural lands and soils can contribute to County resilience by supporting sustainable, local food systems; supporting local jobs; protecting open space; and buffering flood impacts. As of 2025, the County has 172 farm parcels in the Agricultural District, which, combined, represent 5,642.5 acres.[cccLxxi] The County owns farmland through its Tilly Foster Farm property, which serves as an asset both for community members and for tourists.[cccLxxii] Putnam County's Agriculture and Farmland Protection Plan (2004) identifies key farming functions in the area including: "equine and livestock operations, greenhouses, nurseries, orchards, maple syrup, hay and corn production."[cccLxxiii]

Agriculture contributes economic, social, and environmental benefits to Putnam County due to its economic impact, connection to agritourism, creation of scenic beauty and open space, provisioning of ecosystem services, and generation of food/food products.[cccLxxiv] However, agricultural lands, and the agricultural industry more generally, can face significant impacts from climate change. As such, building resilient agricultural lands and soils can benefit not only farmers, but also residents, local economies, and ecosystems.

Survey Results

Survey respondents primarily ranked protecting agricultural land and soils as a **high priority** for county resiliency planning. A breakdown of participant prioritization levels for agricultural land and soils can be found below.

	High	Medium	Low
Protecting agricultural land and soils	68.5%	26.6%	4.9%

When asked about personal experiences with disruptions due to climate hazards, three respondents described experiences related to agricultural lands/soils. An example of a comment shared includes the following:

- *"Extreme / unexpected weather conditions impact the crops we grow, the timing for planting & harvesting and overall production. Additionally, it's challenging to recruit ppl to work at the farm with the heat and air quality issues during the summer."*

Exposure

Changing precipitation and **increasing temperatures** have the potential to impact agriculture in the County in intersecting and compounding ways.

Sensitivity

Agricultural lands and soils are susceptible to multiple, compounding climate impacts. Changing precipitation patterns and rising temperatures can damage crops.[cccLxxv] Rising temperatures can lead to increased pest/invasive species concerns, impact the growing cycles of plants, and pose health concerns for farmers and farm animals.[cccLxxvi] As noted by one survey respondent, climate hazards could also impact farm hiring/recruitment due to poor climate conditions.

Adaptive Capacity

Adaptive capacity for agricultural lands and soils is **medium**. While most farmland is not owned or operated by the County, there are ways Putnam County can impact the adaptive capacity of agricultural lands and soils. The County currently does not conduct outreach to farms or farmers about resiliency planning, but it has implemented resilience measures at the County-owned Tilly Foster Farm including installing ponds, swales, and rain gardens. Putnam County has plans to update its 2004 Agricultural and Farmland Protection Plan, pending funding availability.

Identify Community Unknowns or Uncertainties

The above Climate Vulnerability Assessment employs a "moderate scope" approach. According to the Climate Smart Communities program, a moderate scope Climate Vulnerability assessment reviews "one to three climate hazards for the entire geographic area of the community."[cccclxxvii] To determine the primary hazards of concern to Putnam County, the CCARP Leadership Team focused on the top climate hazards identified by the New York State Climate Impact Assessment: changing precipitation, increasing temperatures, and rising sea levels.

An analysis of stakeholder survey feedback indicates that there are additional hazards of concern for residents/staff in Putnam County. Survey participants were asked to indicate if they have a high, medium, or low level of concern about each of the hazards listed in Table 3. Participants could also select that they were unsure.

Aggregate survey responses rank the following hazards in descending order of priority: heat waves; extreme heat; precipitation; drought; pests, insects, and invasive species; poor air quality; flooding; severe winter storms; wildfires; hurricanes; and tornadoes. This ranking is based on the percentage of survey respondents that indicated a high level of concern about each hazard 10-15 years into the future.

	High	Medium	Low	Unsure
Heat waves	51%	27.3%	20.3%	1.4%
Extreme heat	49.7%	27.3%	20.3%	2.8%
Severe Storm: Precipitation	49%	29.4%	20.3%	1.4%
Drought	46.2%	34.3%	18.9%	0.7%
Pests, insects, + invasive species	44.8%	31.5%	22.4%	1.4%
Poor air quality	44.1%	32.2%	22.4%	1.4%
Flooding	41.3%	32.9%	24.5%	1.4%
Severe winter storms	37.8%	38.5%	23.8%	0%
Wildfires	32.2%	38.5%	26.6%	2.8%

Severe Storm: Hurricanes	24.5%	36.4%	36.4%	2.8%
Severe Storm: Tornadoes	14.7%	29.4%	51%	4.9%
None of the Above	7%	2.1%	24.5%	66.4%

Table 3: Percentage of stakeholder survey respondents that reported high, medium, low, or unsure level of concerns about hazards 10-15 years into the future.

Many participants also noted prior experiences with relevant hazards in the past 5-10 years. The graph below illustrates the number of survey respondents (out of 143) that noted prior experience with relevant hazards.

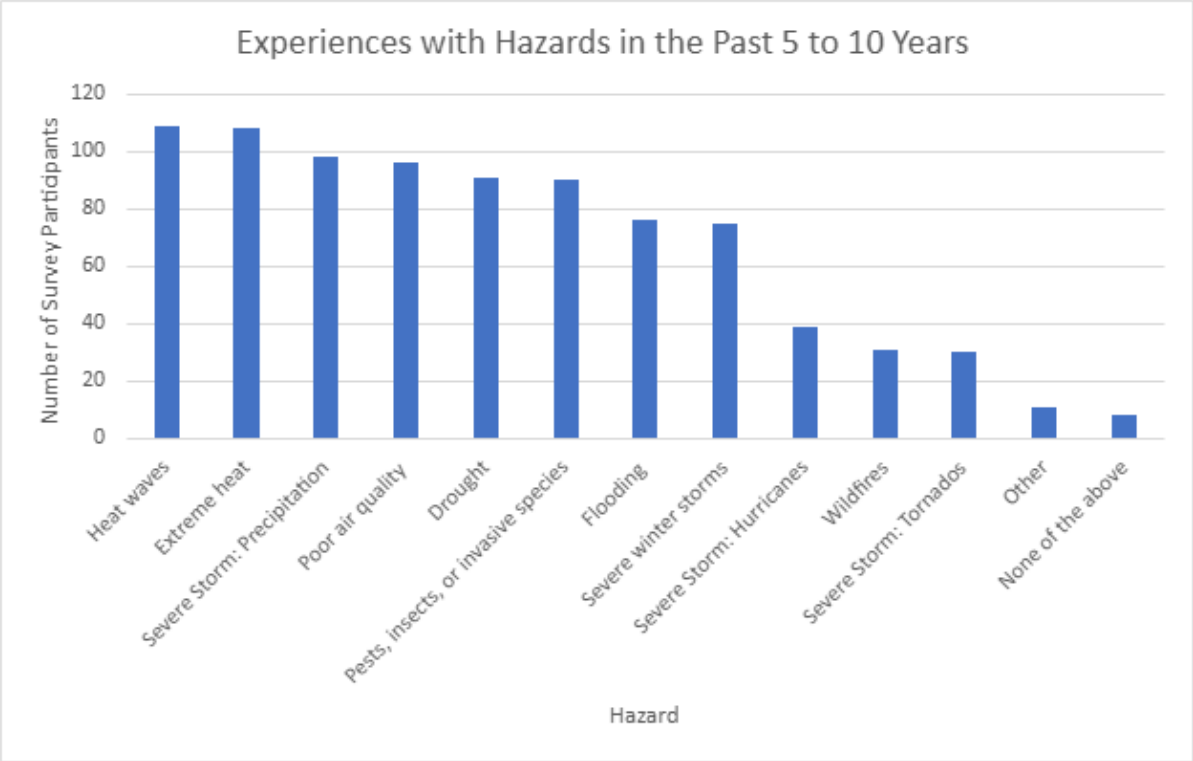


Figure 47: Number of survey participants who noted prior experience with relevant hazards out of 143 total survey participants.

Evaluating the potential impacts of additional hazards on county assets could be a possible area for future research.

Throughout the assessment process, data gaps and uncertainties were uncovered. For example,

- Within Putnam County, up-to-date information on dams was identified as a potential data gap and challenge.

- Putnam County does not have an up-to-date natural resources inventory or parks and open space plan. Additional assets related to ecosystems, biodiversity, or habitat may be present in the community, and not reflected in this assessment.

Additionally, some information was excluded from the Climate Vulnerability Assessment analysis because of the availability of public data, relevance to County-level planning and decision-making, or capacity/timeline constraints. For example:

- A complete analysis of all public buildings and their flood risk was not completed for this assessment due to limitations of publicly available data.
- This assessment focuses on the vulnerability of healthcare facilities within Putnam County due to the scale and scope of the assessment, although there are other facilities in neighboring communities that may be relevant to County residents.
- The planning team did not review data or plans for lands owned by nonprofits, conservation organizations, or other, non-County entities due to lack of County-level control over these areas.
- A resilience assessment was not completed as part of the climate vulnerability assessment process due to capacity/timeline constraints but could be a meaningful next step in future updates. Guidance on conducting a resilience assessment is available in the CCARP template.

Furthermore, this assessment recognizes the uncertainty related to specific climate outcomes for the County. High and low climate projections were included within the "Observed and Projected Physical Effects of Climate Change in New York State and Putnam County" section. The vulnerability of assets in the community will ultimately be impacted by the experienced trajectory of climate effects.

Vulnerability Assessment Matrix

The below table summarizes the relevant climate hazards; level of exposure, sensitivity, and adaptative capacity; and level of stakeholder prioritization for each asset explored in this assessment.

Asset	Sea Level Rise	Changing Precipitation	Rising Temperatures	Exposure	Sensitivity	Adaptive Capacity	Stakeholder Survey Prioritization
Infrastructural Assets							
Energy + Power		x	x	High	High	High	High
Travel + Transportation	x	x	x	High	High	High	Medium-High
Cooling + Warming Shelters		x	x	Medium	Medium	High	Medium

Storm Shelters	x	x	x	Medium	Low	Medium	Medium-High
Stormwater Infrastructure		x		High	High	High	High
Dams		x		High	High	Medium	High
Septic Infrastructure	x	x		Medium	High	Medium	High
Homes + Residential Properties	x	x	x	Medium	Medium	Medium	High
Public Buildings	x	x	x	Medium	Low	High	Low
Waste		x	x	Low	Low	Low	Medium-High
Social Assets							
Healthcare Facilities + Services	x	x	x	Medium	High	Medium	High
Local Jobs + Businesses	x	x	x	Medium	Medium	Medium	High
Vulnerable Communities	x	x	x	High	High	High	Medium-High
Food Access + Food Security		x	x	Medium	High	Medium	High
Historic Preservation	x	x	x	Medium	High	Variable	Low
Resources for Youth and Older Adults	x	x	x	Low	Medium	Medium	Medium-High
Cultural Resources, Tourism, and Community Events	x	x	x	Medium	Medium	Medium	Low
Environmental Assets							
Drinking Water		x	x	Medium	Medium	Medium	High
Clean Air			x	High	High	Medium	High
Ecosystems, Habitats, and Biodiversity	x	x	x	High	High	Medium	High
Parks, Open Space, and Recreational Sites	x	x	x	High	High	Medium	Medium
Agricultural Lands + Soils		x	x	High	High	Medium	High

Table 4: Exposure, sensitivity, and adaptive capacity summary table for Putnam County's Climate Vulnerability Assessment

Climate Impact Chains

Although the above Climate Vulnerability Assessment addresses infrastructure, social, and environmental assets separately, disruptions due to climate hazards often have compounding impacts on multiple, interconnected assets. In order to map the relationship between hazards and multiple assets, Climate Impact Chains were created as part of the Climate Vulnerability Assessment process. Climate Impact Chains are a visualization tool used to demonstrate the cascading impacts of climate hazards, directly and indirectly. The Climate Impact Chains created for this plan drew heavily from the research in the "Exposure, Sensitivity, and Adaptive Capacity" section of this Climate Vulnerability Assessment. They map impacts resulting from rising temperatures, changing precipitation, and sea level rise. The visualizations highlight that addressing vulnerabilities in Putnam County will require a holistic approach that considers the multiple, downstream effects of climate hazards. See Appendix L for copies of the Climate Impact Chains created.

Community Plans Consistency Assessment

Climate vulnerabilities and adaptive capacity are impacted by existing plans, policies, and procedures in Putnam County. As a first step in the Climate Vulnerability Assessment process, the CCARP Leadership Team elected to complete a Climate Smart Resilience Planning (CSRP) process to assess existing resilience and opportunities for growth in the County, aligning with guidance from the CSC PE7 Action: Evaluate Policies for Climate Resilience. The CSRP process involved compiling all relevant policies and plans in the County and inventorying their resiliency measures using the CSRP Tool—a spreadsheet-based inventory with over 300 metrics to systematically assess policies for potential climate resilience measures. The inventory is organized across five categories: Vulnerability and Risk Assessment, Public Outreach, Plans Integration, Preparedness and Recovery, and Hazard Mitigation.

The CSRP process was completed from September 2025-January 2026 through a combination of research, and a review process. As part of the process, the following plans and documents were reviewed, and additional plans were discussed:

- Putnam County Hazard Mitigation Plan (2021)
- Hurricane Emergency/Tropical Storm Action Plan (2024)
- Putnam County Comprehensive Emergency Management Plan Revision 2 (2023)
- Putnam County Six Year (FY 2025-FY 2030) (FY 2025-FY 2030) and One Year Capital Plans (FY 2025)

- Disaster Debris Management and Removal Plan
- Public Health Emergency Preparedness and Response Plan (Revised 2024)
- Putnam County Department of Health Integrated Preparedness Plan (2025)
- Comprehensive Economic Development Plan for the Mid-Hudson Region (2025-2030)
- Moving Forward 2055: New York Metropolitan Transportation Council Regional Transportation Plan (2026-2055)
- 2004 Agriculture and Farmland Protection Plan (2004)
- Draft Local Solid Waste Management Plan (2025-2034)
- Lower Hudson Coalition of Conservation District's Flood Preparedness and Response Guide (2014).

A Summary Report outlining the process, contributors, existing strengths, and opportunities for growth as well as the completed CSRP Tool can be found in Appendix B. The process and findings helped inform the Climate Vulnerability Assessment and were used in subsequent planning efforts to identify potential adaptation strategies.

Community Future Scenarios

Exploratory Future Scenario Planning

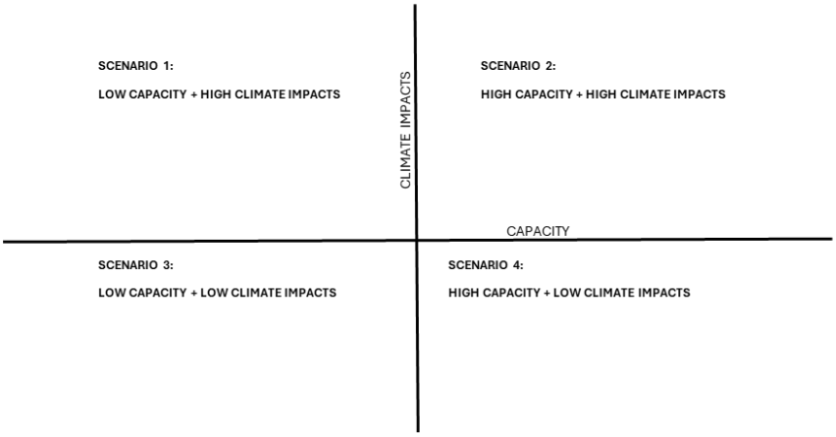
As part of its CCARP process, Putnam County and HVRC hosted two exploratory scenario planning workshops on February 9, 2026, and March 9, 2026. Exploratory scenario planning is a stakeholder engagement strategy used to support planning in light of uncertainties into the future. The workshops served three purposes:

- To convene stakeholders in discussions about potential future conditions,
- To prioritize and brainstorm adaptation strategies, and
- To inform a Resilience and Adaptation Vision Statement for the County.

Summaries of each workshop and outcomes can be found below:

Scenario Planning Workshop Part 1:		
Date/Time: February 9, 2026: 2:00-3:00 pm	**Location:** Planning Dept. Conference Room - 841 Fair St., Carmel, NY 10512	**Participants:** 12, including facilitators (See Appendix E for list of participants)
Summary: During the first workshop, members of the CCARP Working Group met to discuss four possible futures (scenarios) for Putnam County. To guide this exercise, participants imagined the County under varying degrees of climate impacts and County capacity. In this context:		

- **Climate impacts** referred to whether increasing temperatures, changing precipitation, and rising sea levels follow high or low climate projections.
- **County capacity** referred to the availability of funding, staff time, community buy-in, competing priorities, and volunteer support (see Scenario Planning Matrix below).



The workshop included a short presentation, an activity with two discussion groups, and time to discuss next steps. During the small group activities, each group discussed what life in Putnam County would look like in 2035 under two of the above scenarios.

Throughout these conversations, participants were encouraged to imagine the future from three possible perspectives. Specifically, they were prompted to consider how various combinations of climate impacts and capacity would impact their work/offices; their day-to-day lives; and/or stakeholders in the community (i.e. local businesses, other residents, community organizations etc.). This step drew inspiration from the CCARP guidance to incorporate participatory simulations.[10]

Goals: The goals of this first workshop were:

- To generate meaningful conversations amongst different stakeholders,
- To consider how potential uncertainties could affect climate adaptation planning in Putnam County, and
- To encourage future adaptation planning efforts to anticipate and plan for multiple potential outcomes.

Outcomes: Following the first workshop, stakeholder feedback was synthesized to create four narrative scenarios. The narratives outlined descriptions of possible future conditions under each of the four scenarios discussed. These narratives were not intended to be

[10] CCARP Template p. 43.

predictive but rather inform conversations about adaptation strategies and community visioning during the second scenario planning workshop.

Scenario Planning Workshop Part 2:		
Date/Time March 9, 2026: 2:00-4:00 pm	**Location:** Donald B Smith Campus, 110 Old Route 6, Carmel, Bureau of Emergency Services Classroom #1	**Participants:** 14, including facilitators (See Appendix E)

Summary: During the second scenario planning workshop, participants completed activities to inform the CCARP's adaptation strategies and vision statement. The workshop included a short presentation to provide an update on the CCARP process, define resilience and adaptation, review climate projections for Putnam County, summarize the previous workshop, and introduce this workshop's activities and goals.

Following the presentation, participants broke into four groups to complete two small group activities. Each group was assigned one scenario to discuss.

- During the first activity, participants used their assigned scenarios to prioritize and provide feedback on a list of adaptation strategies generated/identified throughout the CCARP process. These include recommendations from the CSRP process and relevant goals from the County's Hazard Mitigation Plan, as well as additional ideas that emerged during the planning process.
- During the second activity, participants used their assigned scenarios to brainstorm additional adaptation strategies to recommend for inclusion in the CCARP.

At the conclusion of the workshop, participants reconvened to provide feedback on the County's resilience and adaptation vision through two, word cloud exercises.

Goals: The goals of the second workshop were to:

- Prioritize and generate adaptation planning strategies that are cognizant of potential uncertainties in the future.
- To provide input on Putnam County's Resilience & Adaptation Vision Statement.

Outcomes: Following the workshop, an updated list of adaptation strategies was created that removed, modified, and/or added adaptation strategies and actions. The new list of adaptation strategies was circulated for further feedback via a stakeholder survey.

Additionally, themes from the word cloud exercise were analyzed to help update/inform Putnam County's Adaptation & Resilience Vision Statement.

A Shared Community Vision

Putnam County is committed to leading by example in preparing for and adapting to current and projected climate trends. We strive to strengthen our resilience while planning for future conditions through thoughtful innovation and collaboration. Using data-driven solutions and public outreach, we will work to protect and support the communities, livelihoods, infrastructure, ecosystems, and natural resources that we value today. We recognize that this vision requires us to work together and provide the necessary resources for all of our community members, particularly those most vulnerable. By leveraging support at the local, state, and federal levels and fostering strong community partnerships, Putnam County will maintain a healthy, safe, and resilient future for generations to come.

Recommendations for Action

The following section compiles a list of adaptation strategies and recommended actions to further Putnam County's resilience and adaptive capacity. These strategies and recommendations were developed through a participatory process. (See the "CCARP Leadership Team, Participatory Engagement Process, and Framework" section for more information.)

The Climate Vulnerability Assessment identifies portions of Brewster and Patterson as having higher social vulnerability relative to other areas of the County (see the "Vulnerable Communities" section). Recommended actions that are particularly applicable to these communities include Strategy 5(d), Strategy 7(a) through (d), Strategy 12(a) and (b), Strategy 22(c), and Strategy 25(a) and (e). Strategy 9(a), Strategy 9(h), and Strategy 19(a) may also support these communities. Brewster and Patterson should be considered when prioritizing and implementing these actions.

Strategies and recommended actions are accompanied by information about potential co-benefits, costs, and relevant assets.[11] A lead entity and recommended timeline is also proposed for each action.

[11] Co-benefits and icons are modeled from the co-benefits icons within HVRC's CVAAP Template.

Symbol	Co-Benefit
	High potential to save money
	High potential to enhance resource security
	High potential to create jobs
	High potential to improve public health
	High potential to deliver benefits to vulnerable communities
	High potential to lower greenhouse gas (GHG) emissions and/or sequester carbon

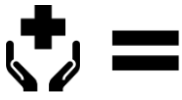
Table 5: Co-benefits icons for adaptation strategies. Derived from HVRC's Climate Vulnerability Assessment & Adaptation Plan Template (CVAAP).

Category	Timeframe
Near-term	1-2 year timeline
Medium-term	2-7 year timeline
Long-term	7-10 year timeline

Table 6 Proposed timelines are included for each recommended action, using the above categories

Infrastructure

Strategy 1: Secure and incentivize backup power at critical facilities to address potential power outages.

Co-Benefits: 

Relevant Assets: Power & Energy; Cooling Centers

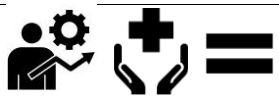
	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Work with all cooling centers to ensure backup power is available.	$-$$	Department of Public Works	Near/Medium-term
b.	Identify critical facilities that would benefit from additional solar/backup power to protect against power outages.	$-$$$	Bureau of Emergency Services	Medium/Long-term

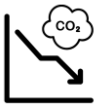
Strategy 2: Reduce flood risks by assessing the stormwater infrastructure in the County and right-sizing infrastructure when needed.

Co-Benefits: 	**Relevant Assets:** Stormwater Infrastructure		
Description & Recommended Actions	**Costs**	**Lead Entity/ies**	**Timeline**
a. Continue assessing all culverts for potential flood risks.	$-$$	Department of Public Works	Ongoing
b. Continue exploring FHWA, Bridge NY, and other funding opportunities for stormwater projects.	$	Department of Public Works	Ongoing
c. Encourage any new County infrastructure projects to incorporate green infrastructure to reduce flooding, when relevant.	$$-$$$	Department of Public Works	Medium/Long-term

Strategy 3: Assess and address risks related to dams, such as dam failure and flooding.			
Co-Benefits: 	**Relevant Assets:** Dams		
Description & Recommended Actions	**Costs**	**Lead Entity/ies**	**Timeline**
a. Seek out State funding for dam improvements, repairs, or removals.	$-$$$	Department of Planning, Development, & Public Transportation	Medium/Long-term
b. Map potential flood impacts for all dams in the County, separating out which dams are owned by County and by non-County entities.	$	GIS/IT	Near-term
c. Increase information about dam-related risks by continuing communications with non-County landowners about the condition and maintenance of their dams.	$	Department of Public Works	Long-term
d. Assess and prioritize dams for potential dam removal and decommissioning projects.	$$-$$$	Department of Public Works	Ongoing/Long-term
e. Encourage dams, culverts, and bridges to be built to accommodate 200- or 500-year storms, higher than the State requirement for designing to accommodate 100-year storms.	$$-$$$	Department of Public Works	Ongoing

Strategy 4: Expand public transportation to increase connectivity and mobility options for Putnam County residents.

Co-Benefits: 

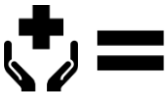


Relevant Assets: Travel and Transportation

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Increase public transportation options to increase connectivity to trains, healthcare, and food resources, and to increase transportation options during emergencies.	$$$	Department of Planning, Development & Public Transportation	Long-term

Strategy 5: Assess and protect buildings in Putnam County from potential flood and water damage.

Co-Benefits: 

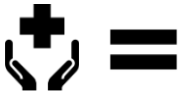


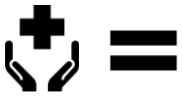
Relevant Assets: Homes and Residential Properties; Public Buildings; Ecosystems, Habitat, and Biodiversity

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Assess options for the County Records Building, which currently floods frequently.	$-$$	Department of Public Works	Medium-term
b.	Repair or upgrade County buildings susceptible to water damage (i.e. Health Department Building).	$$	Department of Public Works	Medium-term
c.	Map public buildings and lands in relationship to flood risks to identify priority areas.	$	GIS/IT	Near-term
d.	Continue County-level land conservation strategies for properties in vulnerable areas.	$-$$$	Parks Department	Ongoing
e.	Encourage local municipalities to identify and assess areas suitable for relocating or building housing outside of the floodplain.	$	Bureau of Emergency Services; Department of Planning, Development & Public Transportation	Long-term

Strategy 6: Expand outreach, education, and programs for Putnam County communities to support proper septic system maintenance.

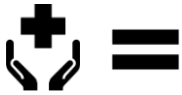
Co-Benefits: 	**Relevant Assets:** Septic Infrastructure; Homes and Residential Properties; Drinking Water; Ecosystems, Habitats, and Biodiversity		
Description & Recommended Actions	**Costs**	**Lead Entity/ies**	**Timeline**
a. Continue and expand community outreach/education about septic maintenance.	$	Department of Health	Near-term
b. Establish a program to support funding or incentives for septic replacement projects.	$-$$$	Department of Health	Long-term

Strategy 7: Increase cooling center program awareness and accessibility.			
Co-Benefits: 	**Relevant Assets:** Cooling Centers; Vulnerable Communities		
Description & Recommended Actions	**Costs**	**Lead Entity/ies**	**Timeline**
a. Continue to publicize information about cooling centers and advertise transportation options for accessing centers.	$	Department of Health, Department of Planning, Development & Public Transportation	Ongoing
b. Prioritize high-need census tracts for future cooling center projects and outreach	$	Department of Health	Medium-term
c. Coordinate with Putnam Lake to establish a cooling center.[12]	$	Department of Health	Near-term
d. Publicize information about criteria for opening cooling centers to increase public awareness.	$	Department of Health	Near-term

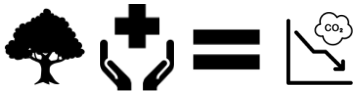
Strategy 8: Expand storm and emergency shelters for pets and animals to increase the accessibility of cooling centers.			
Co-Benefits: 	**Relevant Assets:** Storm Shelters; Vulnerable Communities		
Description & Recommended Actions	**Costs**	**Lead Entity/ies**	**Timeline**
a. Identify at least one location in the eastern and western portions of the County for people with pets, service animals, and/or farm animals to shelter during a disaster.	$-$$	Bureau of Emergency Services	Medium-term

[12] Putnam Lake currently does not have a cooling center.

b. Explore collaborations with veterinary networks to identify existing facilities that can be used to shelter pets and animals.	$	Bureau of Emergency Services	Medium-term

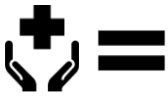
Strategy 9: Expand evacuation planning to address potential increases in severe weather events and flood risks to road infrastructure.			
Co-Benefits: 	**Relevant Assets:** Travel & Transportation; Vulnerable Communities; Healthcare Facilities & Services		
	Description & Recommended Actions	**Costs**	**Lead Entity/ies**	**Timeline**
a.	Plan evacuation strategies for vulnerable communities that may need assistance while evacuating.	$-$$	Bureau of Emergency Services	Medium-term
b.	Map evacuation routes in relationship to flood risks to assess potential challenges.	$	GIS/IT	Near-term
c.	Expand existing evacuation planning efforts by creating an Emergency Transportation Plan.	$$	All	Medium-term
d.	Increase outreach and education about evacuation routes.	$	Bureau of Emergency Services	Near-term
e.	Update evacuation planning for the County, drawing from the insights in the Indian Point Emergency Guide.	$-$$	Bureau of Emergency Services	Medium-term
f.	Collaborate with neighboring counties to ensure evacuation routes have appropriate capacity for all counties.	$-$$$	Bureau of Emergency Services	Medium-term
g.	Collaborate with health facilities and emergency services on evacuation planning.	$	Bureau of Emergency Services & Department of Health	Medium-term
h.	Provide evacuation options for residents reliant on public transportation.	$-$$$	Department of Planning, Development & Public Transportation	Long-term

Social

Strategy 10: Further a resilient food system that supports local food production and food security.	
Co-Benefits: 	**Relevant Assets:** Vulnerable Communities; Food Access and Food Security

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Expand/encourage dialogue between County departments, local organizations, and food pantries to identify and address resiliency gaps.	$	Agriculture & Farmland Protection Board, Department of Health, Cornell Cooperative Extension of Putnam County	Medium-term
b.	Collaborate with local organizations on preserving the network of farms in the County.	$	Agriculture & Farmland Protection Board	Ongoing

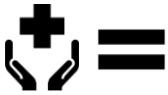
Strategy 11: Collaborate with schools, daycares, preschools, and summer camps on resiliency and emergency preparedness planning.

Co-Benefits: 

Relevant Assets: Resources for Seniors and Youth

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Increase coordination with daycares, camps, and preschools.	$	Department of Health, Youth Bureau	Medium-term

Strategy 12: Expand outreach and programs related to resiliency for County residents, including those who may be particularly vulnerable to the impacts of a changing climate.

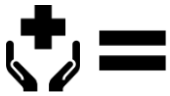
Co-Benefits: 

Relevant Assets: Vulnerable Communities; Resources for Seniors and Youth

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Expand effective outreach efforts to vulnerable communities, including older adult populations.	$	Office of Senior Resources	Ongoing
b.	Improve accessibility of outreach materials by offering all resilience-related outreach in multiple languages.	$	All	Ongoing
c.	Encourage participation in the County's existing "Are You Okay" program through campaigns, outreach, giveaways, or additional strategies.	$	Office of Senior Resources	Ongoing/Near-term
d.	Encourage community-led "Are You OK" programs, in addition to the County program, that provide support for older adults in neighborhoods or apartment complexes.	$	Office of Senior Resources	Medium-term

e. Explore resiliency outreach and emergency alert options for residents without access to the internet. Potential options include creating booklets/print materials, conducting outreach by phone, etc.	$-$$	Bureau of Emergency Services, Information Technology (IT) Department	Medium-term

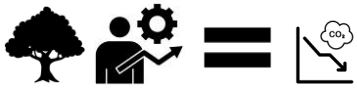
Strategy 13: Coordinate with healthcare facilities on resilience and emergency preparedness planning.

Co-Benefits: 

Relevant Assets: Healthcare Facilities and Services; Vulnerable Communities

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Collaborate with Putnam Hospital, Danbury Hospital, urgent care, medical offices, and pharmacies to support emergency planning, particularly for people with at-home medical equipment, modular equipment, or injuries.	$-$$$	Department of Health	Medium-term

Strategy 14: Coordinate with local employers and businesses to promote a resilient economy.

Co-Benefits: 

Relevant Assets: Local Jobs and Businesses

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Expand conversations with land developers in Putnam County to promote future job growth and resiliency.	$	Department of Planning, Development & Public Transportation	Medium-term

Strategy 15: Protect County Archives and Historical Records from flood risks.

Co-Benefits: 

Relevant Assets: Historic Preservation; Public Buildings

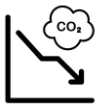
	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Identify a location to relocate the County Archives and Historical Records to reduce flood risk/exposure	$-$$	County Historian & Department of Public Works	Near/Medium-term
b.	Seek resources to support digitizing the County Archives & Records to ensure long-term preservation of historical memory.	$-$$	County Historian, Information	Near-term

		Technology (IT) Department	

Environmental

Strategy 16: Reduce risks from wildfires and wildfire smoke exposure.

Co-Benefits: 



Relevant Assets: Parks, Open Space, and Recreational Sites; Ecosystems, Habitats, and Biodiversity; Clean Air

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Work with land trusts, nonprofit organizations, DEC, DEP, and other partners on forest management for fire resilience and continue forest management practices on county-owned property.	$$-$$$	Bureau of Emergency Services; Department of Public Works; Department of Parks and Recreation	Near/Medium-term
b.	Create an inventory of equipment available in the County, region, and state to fight forest fires in order to identify potential gaps.	$-$$	Bureau of Emergency Services	Near/Medium-term
c.	Coordinate with New York State, villages, and towns to assess wildfire risks and vulnerabilities. Work to identify roles and responsibilities prior to emergency events, drawing from lessons learned from the Sedgewood fire.	$-$$	Bureau of Emergency Services	Near/ Medium-term

Strategy 17: Support resilient agriculture in Putnam County through outreach and planning.

Co-Benefits: 

Relevant Assets: Agricultural Lands and Soils; Local Jobs and Businesses

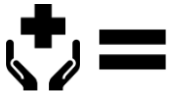
	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Collaborate with partners and local organizations on outreach to farmers about climate resilience and to understand farmers' existing concerns and challenges.	$	Agriculture & Farmland Protection Board	Near-term

b. Explore including climate resilience considerations in the anticipated update of the Putnam County Farmland Protection Plan.	$	Agriculture & Farmland Protection Board	Near-term

Strategy 18: Increase ecosystem management & data collection for climate resilience.			
Co-Benefits: 	**Relevant Assets:** Parks, Open Space, and Recreational Sites; Ecosystems, Habitats, and Biodiversity		
Description & Recommended Actions	**Costs**	**Lead Entity/ies**	**Timeline**
a. Update the Comprehensive Park and Open Space Plan and/or the County-level Natural Resources Inventory.	$$	Department of Planning, Development & Public Transportation	Near/Long-term
b. Increase public-facing educational materials about nature-based solutions to flooding, potentially leveraging existing resources from the NY DEC.	$	Bureau of Emergency Services	Near-term
c. Increase community outreach about identifying and responsibly removing invasive species.	$	Department of Parks and Recreation	Near-term

Cross-Cutting

Strategy 19: Expand partnerships for climate resilience.			
Co-Benefits: 	**Relevant Assets:** Cross-cutting		
Description & Recommended Actions	**Costs**	**Lead Entity/ies**	**Timeline**
a. Connect with local organizations to align and coordinate adaptation/resilience services and programs.	$	All	Medium-term
b. Inventory resources at community centers across the County and support resource sharing across communities	$	Bureau of Emergency Services	Medium-term

Strategy 20: Increase storm & emergency preparedness education.			
Co-Benefits: 	**Relevant Assets:** Cross-cutting		
Description & Recommended Actions	**Costs**	**Lead Entity/ies**	**Timeline**

a. Continue and expand existing, proactive outreach efforts about storm/emergency preparedness through website, social media, mailings, newsletters, and/or TV ads.	$	Bureau of Emergency Services & Department of Health, Office of County Executive	Ongoing
b. Implement an early flood warning system, potentially using Kingston as an example.	$$$	Bureau of Emergency Services	Medium-term
c. Tailor existing storm/emergency preparedness outreach materials to reflect the particular challenges and opportunities in Putnam County.	$	Bureau of Emergency Services & Department of Health	Near-term
d. Install high-water mark signs to illustrate flood risks. Assess locations like Peekskill Hollow, Cold Spring, and, if relevant, local camps as potential options.	$	Department of Public Works	Medium-term
e. Assess flash flood risks and need for a flash flood warning system.	$$	Bureau of Emergency Services	Medium-term
f. Increase outreach & educational programming for County residents and businesses about resilience, flood/erosion risks, climate trends, and emergency preparedness.	$	Bureau of Emergency Services	Near-term
g. Offer NY DHS Citizen Preparedness Corps Trainings in Putnam County to increase community outreach and education.[13]	$	Bureau of Emergency Services	Near-term

Strategy 21: Increase volunteer capacity.

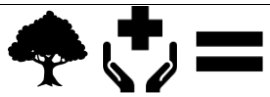
Co-Benefits: 

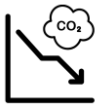
Relevant Assets: Cross-cutting

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Include volunteers in advancing County-level resilience by working with existing volunteer networks and relationships with non-County organizations.	$	All	Near-term
b.	Collaborate with school districts to recruit volunteers and/or expand community outreach and education.	$	All	Near-term

Strategy 22: Align internal processes and plans.

[13] The trainings are free and taught by the NY National Guard.

Co-Benefits: 

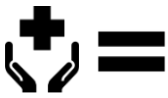


Relevant Assets: Cross-cutting

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Collaborate across departments and partner organizations to continuously review potential grant funding opportunities for hazard mitigation and/or resilience-related projects.	$	All	Ongoing
b.	Expand succession planning procedures for retiring or departing staff to reduce loss of institutional knowledge.	$	All	Near-term
c.	Continue dialogue with towns and villages on comprehensive planning, zoning, and land use related to climate risks, including by sharing the adopted CCARP and, when applicable, providing relevant climate vulnerability, flood mapping, and precipitation information through existing municipal land use and SEQRA review processes	$	Department of Planning, Development & Public Transportation	Ongoing
d.	Consider County-level comprehensive planning, inclusive of climate considerations.	$$-$$$	Department of Planning, Development & Public Transportation	Long-term
e.	Formalize a procedure for sharing climate-related vulnerability and risk assessment projects with relevant stakeholders, including the Department of Planning and Transportation and Department of Public Works.	$	Bureau of Emergency Services; Department of Planning, Development & Public Transportation; & Department of Public Works	Near-term
f.	Explore the feasibility and need for new plans relevant to resiliency planning, such as a Local Waterfront Revitalization Plan, Climate Action Plan, Floodplain Management Plan, Short- and Long-Term Recovery Plan, and Natural Resources Inventory. Prioritize planning efforts	$$-$$$	Department of Planning, Development & Public Transportation	Near-Long-term

	based on the availability of implementation funding opportunities. Complete the development and adoption of a County Stormwater Management Plan.			
g.	Create a Government Operations GHG Inventory	$$	Department of Planning	Near-term
h.	Continue encouraging Continuity of Operations Plans across County departments.	$$	Bureau of Emergency Services	Near-term

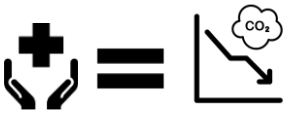
Strategy 23: Expand timely outreach & education capacity.

Co-Benefits: 

Relevant Assets: Cross-cutting

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Across relevant departments, develop outreach materials/press releases about emergency preparedness, climate resilience, or related topics that are preapproved and can be distributed as needed.	$	Department of Health; Bureau of Emergency Services; & Department of Planning, Development & Public Transportation	Near-term
b.	Create department-specific social media pages, as needed, where information about climate resilience can be shared.	$	Bureau of Emergency Services; Department of Planning, Development & Public Transportation; Department of Health	Ongoing

Strategy 24: Increase staff capacity for adaptation & resilience planning.

Co-Benefits: 


Relevant Assets: Cross-cutting

	Description & Recommended Actions	Costs	Lead Entity/ies	Timeline
a.	Fund a dedicated engineer to assess county infrastructure and support towns.	$$	Department of Public Works	Long-term

b. Explore hiring a dedicated grant writer or working with a grant firm to increase capacity and funding opportunities.	$$	Department of Planning, Development, and Public Transportation	Long-term

Strategy 25: Expand data & data collection related to county resilience planning.			
Co-Benefits: 	**Relevant Assets:** Cross-cutting		
Description & Recommended Actions	**Costs**	**Lead Entity/ies**	**Timeline**
a. Map County infrastructure, vulnerable populations, buildings, cultural resources, and natural resources in relationship to the County's top climate hazards.	$	GIS/IT	Near-term
b. Incorporate climate projections into County Planning, including emergency response plans, capital plans, and infrastructure planning, when relevant.	$	All	Ongoing
c. Expand open-source GIS mapping resources related to climate resiliency.	$	GIS/IT	Ongoing
d. Compile local zoning maps along the Hudson River for a County-wide view of land uses near a high flood-risk area.	$	Department of Planning, Development & Public Transportation; Information Technology (IT) Department	Near-term
e. Share relevant data and maps with town councils to increase climate resilience education and awareness.	$	All	Near-term
f. Incorporate NY DEC's sea level rise projections into planning efforts, when relevant.	$	All	Ongoing

Summary of Community Priorities

The following table summarizes Putnam County community priorities related to adaptation strategies based on 16 survey responses to the Putnam County Lunch & Learn: Public Engagement Survey (See Appendix I).

Infrastructure	High	Medium	Low
Secure backup power at critical facilities to address potential power outages.	75%	25%	0%
Reduce flood risks by assessing the stormwater infrastructure in the County and right-sizing infrastructure when needed.	68.75%	31.25%	0%
Assess and address risks related to dams, such as dam failure and flooding.	68.75%	18.75%	12.5%
Expand public transportation to increase connectivity and mobility options for Putnam County residents.	62.5%	18.75%	18.75%
Assess and protect buildings in Putnam County from potential flood and water damage.	43.75%	50%	6.25%
Expand septic outreach, education, and programs for Putnam County community members to support proper maintenance.	43.75%	18.75%	12.5%
Increase cooling center program awareness and accessibility to increase use during high heat events.	37.5%	43.75%	18.75%
Expand storm and emergency shelters for pets and animals to increase the accessibility of shelters.	37.5%	18.75%	43.75%
Expand evacuation planning to address potential increases in severe weather events and flood risks to road infrastructure.	31.25%	50%	18.75%
Social	**High**	**Medium**	**Low**
Further a resilient food system that supports local food production and food security.	68.75%	31.25%	0%
Collaborate with schools, daycares, preschools, and summer camps on resiliency and emergency preparedness planning.	62.5%	37.5%	0%
Expand outreach and programs related to resiliency for County residents, including those particularly vulnerable to the impacts of a changing climate.	56.25%	37.5%	6.25%
Coordinate with healthcare facilities on resilience and emergency preparedness planning.	56.25%	37.5%	6.25%
Coordinate with local employers and businesses to promote a resilient economy.	43.75%	37.5%	18.75%
Protect the County Archives and Historical Records from flood risks to preserve local history.	18.75%	68.75%	12.5%
Environmental	**High**	**Medium**	**Low**
Reduce risks from wildfires and wildfire smoke exposure.	68.75%	31.25%	0%
Support resilient agriculture in Putnam County through outreach and planning.	62.5%	31.25%	6.25%
Increase ecosystem management and data collection for climate resilience.	37.5%	56.25%	6.25%
Cross-Cutting	**High**	**Medium**	**Low**

Expand partnerships for climate resilience.	68.75%	25%	6.25%
Increase storm and emergency preparedness education within the County.	62.5%	25%	12.5%
Increase volunteer capacity for resilience and adaptation projects.	56.25%	37.5%	6.25%
Align internal processes within Putnam County to support climate resilience and planning.	56.25%	31.25%	12.5%
Increase staff capacity for adaptation and resilience planning.	43.75%	50%	6.25%
Expand data and data collection related to County resiliency planning.	25%	62.5%	12.5%

Assessment of Potential Maladaptations

While climate adaptation strategies have the potential to create many co-benefits, careful planning is required to avoid the possibility of maladaptation. Maladaptation occurs when adaptation strategies lead to unintended consequences. Specifically, this report uses the IPCC 2022 definition of maladaptation, included in the "Key Terms" section of this report:

Maladaptation: "Actions that may lead to increased risk of adverse climate-related outcomes, including via increased greenhouse gas (GHG) emissions, increased or shifted vulnerability to climate change, inequitable outcomes, or diminished welfare, now or in the future. Most often, maladaptation is an unintended consequence" (IPCC 2022).[cccIxxviii]

With this definition in mind, this report includes a maladaptation analysis for each of the strategies proposed in the CCARP. The maladaptation analysis seeks to identify potential avenues for maladaptation so that the implementation of the CCARP can proactively avoid unintended consequences and maximize positive outcomes into the future. To complete the maladaptation analysis, each strategy was evaluated using six questions, closely adapted from the CCARP Template's sample maladaptation matrix:

Could the proposed strategy:

1. Increase emissions?
2. Redirect vulnerabilities to other communities or transfer vulnerabilities to future generations?
3. Impact vulnerable communities?
4. Encourage path dependency or reduce long-term adaptive capacity?
5. Degrade ecosystems, biodiversity, or ecosystem services?

6. Become ineffective due to uncertainties about the future?[14]

A matrix evaluating each strategy for maladaptive potential is included in Appendix N. It is important to note that although maladaptation is possible, it is not a guaranteed outcome. Planning enables the likelihood and risks of maladaptation to be reduced in order to successfully adapt to climate change.

Monitoring & Evaluation Approach & Plan

Indicators and Metrics

The strategies outlined in this plan are intended to be actionable and reduce Putnam County's vulnerabilities to potential climate impacts. Assessing progress will require clear goals and mechanisms for tracking progress. The following section includes a list of indicators and metrics that Putnam County could track to evaluate progress on increasing county-level resilience and adaptive capacity.

According to definitions from Resilience Metrics, cited in the CCARP template:

- "An **indicator** is a quality, trait, or state of a system that suggests ("indicates") or hints at something one is interested in. More specifically, an indicator is a sign that a particular set of adaptation actions are yielding the desired result and/or making progress in the right direction."
- "A **metric** is a variable that can be measured (if quantitative) or otherwise tracked (if qualitative) that represents the indicator."[cccclxxix]

The following indicators and metrics aim to support the County in assessing progress toward building its resilience and adaptive capacity. While providing a general guideline, some data may require collaboration with non-County organizations, which could impact data accessibility.

Infrastructure		
Indicator	**Metrics**	**Relevant Data Sources**
Reduce vulnerable dams, culverts, and bridges.	Number of high hazard dams with unsound or deficient condition ratings.	• NYSGIS Clearinghouse: NYS DEC Inventory of Dams • NYS GIS Clearinghouse: NYSDOT Large Culverts
	Percent of dams with condition ratings less that "no deficiencies noted."	

[14] CCARP Template p. 52.

	Number of culverts replaced.	• NYS GIS Clearinghouse: NTSDOT Bridges • DPW Records/Internal tracking • Collaborations with NYS
Expand transportation options to increase access to storm shelters, evacuation routes, etc.	Percent of roads vulnerable to flooding, including evacuation routes.	• FEMA's National Flood Hazard Area • NYS GIS Clearinghouse: NYS Streets
	Number of public transportation routes available outside of areas vulnerable to flooding.	• Data.NY.Gov MTA Rail Branches Map • Putnam County Public Transit
Increase access to cooling during high heat days.	Number of cooling centers with backup power.	• Department of Health
	Number of visits to cooling centers.	• Coordinate with local libraries
	Number of visits to Putnam Hospital for heat-related illness.	• Coordinate with Putnam Hospital
Improve accessibility and awareness of storm shelters.	Number of "clicks" or views for online outreach about storm shelter locations.	• Internal tracking
Reduce flood vulnerability in homes/residential properties.	Number of homes in the floodplain.	• Putnam County Tax Parcels • NYS Building Footprints • FEMA's National Flood Hazard Layer • FEMA Flood Map Service Center
	Number of people living in the floodplain.	• Data previously reported in the County's Hazard Mitigation Plan
	Number of public buildings located in the floodplain.	• FEMA's National Flood Hazard Layer • FEMA Flood Map Service Center
Improve access to reliable power and energy.	Annual number of power outages.	• Real-time tracking/collaboration with power companies
	Percent of critical facilities with backup power.	• Internal tracking

Social		
Indicator	**Metric**	**Relevant Data Sources**
Outreach to vulnerable communities.	Percentage of older adults that the County can reach.	• Tracked by OSR
	Participation rates in County "Are You Okay" program.	• OSR and "Are You Ok?" Registration Data
Support food systems resiliency.	Number of farms/acres of farmland in Putnam County.	• Agriculture & Farmland Protection Board / Internal tracking
Continuous access to healthcare and services.	Wait times at Putnam Hospital.	• Putnam Hospital
Continuity of tourism/cultural events.	Annual tourism spending.	• Empire State Development

Maintain local jobs and businesses.	Lost workdays or closures due to storms/natural disasters.	• Internal tracking

Environmental		
Indicator	**Metric**	**Relevant Data Sources**
Improve water quality.	Annual number of harmful algal blooms.	• NYS DEC • Explore potential data options for private lakes
Enhance forest/ecosystem management and response.	Explore available data sources related to wildfire containment in Putnam County.	
Support resiliency of parks and open space.	Explore available data sources related to damage from natural hazards within County-owned trails and parks.	

Plan Implementation Strategy

Governance and Management Structure

This plan will be considered before actions are made by the Putnam County Capital Planning Committee. Specific strategies and actions will be the responsibility of the department designated as the "Lead Entity" under the "Recommended Actions" section of this plan.

When relevant, outside stakeholders will be engaged in the implementation of specific strategies and actions by leveraging new and existing partnerships with local organizations. Putnam County will also explore opportunities to bridge the CCARP with the County's P.I.L.O.T. (Putnam Invests in Leaders of Tomorrow) program to work with local high school and college students. To support adequate resources to enact the plan, the County will continue to pursue funding opportunities from state, federal, and additional, external funding sources.

Implementation Methods

The implementation of the CCARP will include a mixture of public outreach and internal collaboration to ensure progress on the plan over time.

Public Outreach: The CCCARP webpage will continue to serve as a central place for storing and sharing information about the CCARP. As progress is made on the plan's implementation, the County may explore creating a dashboard to visualize progress on the CCARP's Recommended Actions. The County will also continue to share information about the CCARP

through strategies like adapting existing flyers and outreach materials to share information about the CCARP.

Internal Collaboration: Updates about the CCARP may be shared in a variety of settings to promote progress on the Plan including at Capital Committee Meetings, Safety Committee Meetings, Department Head Meetings, and Climate Smart Task Force Meetings. On an as needed basis, the Climate Smart Coordinator will also coordinate with departments about the CCARP Strategies and Recommended Actions.

Budget and Funding Options

The anticipated budget for this CCARP may vary based on specific implementation decisions. Initial costs estimates are included in the Recommended Actions portion of the CCARP using a high ($$$), medium ($$), and low ($) scale. For the purpose of this analysis:

- **Low-cost actions** are those that may be able to be accomplished with existing funding or that will likely require minimal costs. Relevant costs could include printing outreach materials, leveraging staff time, or continuing existing programs/projects. Low-cost actions also include those where the County could partner or encourage non-County entities to take on projects, but where the County would not be the lead implementor (i.e. Recommended Action 22(c)).
- **Medium-cost actions** are those that may require more substantial investments in terms of time and/or financial resources. Relevant costs could include more significant staff time, hiring consultants, purchasing equipment, implementing modest scope repairs/upgrades, etc.
- **High-cost actions** are those that may require significant external funding and staff time. Relevant costs could include, but are not limited to, large-scale infrastructure upgrades or investing in new infrastructure projects.

All costs are preliminary estimates and will require more in-depth budgetary considerations prior to implementation. In order to implement these projects, Putnam County can consider a variety of funding sources at the state and federal level. Examples of past and current funding opportunities can be found below:

NYS DEC: Climate Smart Communities Grants program: The Climate Smart Communities Grants Program can support climate mitigation and adaptation projects, with awards spanning $50,000-$2,000,000. Eligible projects related to this CCARP could include:

- Addressing flooding through nature-based solutions,
- Relocating or retrofitting infrastructure,
- Addressing heat exposure,

- Preparing feasibility studies, and
- Furthering emergency preparedness.

NYS: Clean Water, Clean Air and Green Jobs Environmental Bond Act of 2022: Funding opportunities through the Bond Act, and additional sources, can be easily searched using the "Fund My Project" tool. Specific funding opportunities will vary based on project timelines. For example, the NYS EFC: Green Resiliency Grants Program had funding opportunities related to stormwater infrastructure with a close date of June 12, 2026. Similarly, the NYS EFC and NYS DEC: Resilient Watersheds Grant (RWG) Program Round 2 provided grant funding opportunities spanning $150,000-$10,000,000 to support communities implementing flood mitigation actions. Projects funded by this program must have been recommended within a Resilient NY flood study or DEC-approved flood study. This opportunity had an application deadline of June 26, 2026.

NYS DOT: BRIDGE NY Program: The NYS DOT: BRIDGE NY Program has provided funding opportunities for bridge and culvert replacements, with a total of $200 million available per funding year.

US DOT: Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT): The US DOT: PROTECT grant program was previously offered through the Bipartisan Infrastructure Law to support climate resilient transportation projects related to "planning, resilience improvements, community resilience and evacuation routes, or at-risk coastal infrastructure."

Hudson River Estuary Program (HREP) Local Stewardship Planning Grants: The entirety of Putnam County falls within the "Hudson River Estuary Grants Program Boundary." HREP has previously funded relevant projects like Natural Resources Inventories and Open Space Plans through Local Stewardship Planning Grants.

U.S. Department of Transportation FHWA: Investment Program (BIP): The BIP grant program, created through the Infrastructure Investments and Jobs Act (IIJA), has offered competitive funding for improving the "safety, efficiency, and reliability" of bridges. A portion of the overall, annual BIP funding (5%) can be used for projects dedicated to "culvert replacement or rehabilitation of bridge-sized culverts."

USDA: National Resources Conservation Service (NRCS): The NRCS hosts several programs which provide money to eligible local governments to help protect agricultural land and watersheds. For example, the Watershed Protection and Flood Prevention Operations (WFPO)

Program provides financial and technical assistance to local public sponsors for projects that help protect and restore watersheds. Other programs support recovery from natural disasters, as well as dam rehabilitation and water supply construction. These programs can be searched using the NRCS Programs and Initiatives page.

FEMA: Building Resilient Infrastructure and Communities (BRIC) and the Flood Mitigation Assistance Grant Program: BRIC is a selective program that offers funds to government entities for hazard mitigation activities, e.g., "school safe rooms, utility hardening, relocating critical facilities out of flood areas, and securing pump stations." The Flood Mitigation Assistance program provides funds for projects which "reduce or eliminate the risk of repetitive flood damage" to buildings covered by the National Flood Insurance Program, focusing on Severe Repetitive Loss and Repetitive Loss properties.

The Nature Conservancy (TNC) in New York: Climate Resilience Grant Program (CRGP): TNC in New York offers the CRGP, which provides up to $50,000 for land acquisition projects, and $25,000 for planning and capacity projects which help conserve resilient lands and/or waters. In the 2025 fiscal year, TNC awarded funds to the Hudson River Watershed Alliance for flood resilience planning.

NYS DEC: Water Quality Improvement Program (WQIP): The WQIP program offers reimbursement grants for construction or implementation projects. The grant supports projects that "directly improve water quality or habitat, promote flood risk reduction, restoration, and enhanced flood and climate resilience, or protect a drinking water source." Potentially relevant funding opportunities include dam safety repair, rehabilitation, and removal. Local match of 25% is required for this program.

Conclusion

The completion of this CCARP represents a significant milestone in Putnam County's ongoing commitment to climate resilience. The Climate Vulnerability Assessment establishes a clear understanding of how climate hazards affect the County's infrastructure, social, and environmental assets, while the Climate Adaptation Plan sets forth a structured framework of strategies and recommended actions to reduce those vulnerabilities and strengthen adaptive capacity. Together, these components provide a foundation for informed, coordinated, and proactive decision-making.

With this foundation in place, the County now transitions from planning to implementation. Putnam County plans to begin advancing recommended actions in partnership with designated lead entities, County departments, and community stakeholders, guided by the priorities and timelines established herein and supported by state, federal, and external funding opportunities. Implementation will be accompanied by continued monitoring and periodic review, as detailed in the preceding sections, ensuring that the Plan remains responsive to advances in climate science and the evolving needs of the community. Through this sustained and collaborative effort, Putnam County reaffirms its commitment to safeguarding the health, safety, and well-being of its residents and to foster a resilient future for generations to come.

Process for Updating the CCARP

The CCARP will be updated on a routine basis to reflect advances in scientific data and climate projections. Putnam County intends to update the CCARP, including the Climate Vulnerability Assessment and Adaptation Plan, every 10 years. Plan updates will be completed in alignment with CSC Guidelines.

Reference

New York State Climate Smart Communities, *Inclusive Community Engagement Primer* (New York State Climate Smart Communities, 2022), 2, https://climatesmart.ny.gov/fileadmin/csc/documents/InclusiveEngagement-Primer-CSC-Cert-2022-09-01.pdf.

[ii] Jeremy Stapleton, *Exploratory Scenario Planning: How to Explore an Uncertain Future* (Lincoln Institute of Land Policy, 2020), 1-2, https://go.lincolninst.edu/l/153411/2022-11-02/pqbyrq/153411/1667398979cfdTtMLz/exploratory_scenario_planning_policy_brief.pdf.

[iii] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 2, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[iv] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 2, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[v] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 1, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[vi] United States Census Bureau, *2020 Census Urban Areas FAQs* (United States Census Bureau, February 2023), 2, https://www2.census.gov/geo/pdfs/reference/ua/Census_UA_2020FAQs_Feb2023.pdf.

[vii] "QuickFacts: Putnam County, New York," United States Census Bureau, accessed March 6, 2026, https://www.census.gov/quickfacts/fact/table/putnamcountynewyork/AGE775224#AGE775224.

[viii] "NYPAD View," New York Protected Areas Database (NYPAD), accessed March 6, 2026, https://nysdec.maps.arcgis.com/home/item.html?id=efc27f4a465f40ecbb78233a15f285ba.

[ix] New York State GIS Clearinghouse Data, "Civil Boundaries," New York State, accessed March 6, 2026, https://gis.ny.gov/civil-boundaries.

[x] "New England Archeological Time Periods," National Park Service (NPS), accessed May 11, 2026, https://www.nps.gov/articles/000/archeological-time-periods.htm.

[xi] *Encyclopaedia Britannica*, s.v. "Wappinger," accessed May 11, 2026, https://www.britannica.com/topic/Wappinger.

[xii] "The Wappinger People," Mount Gulian Historic Site, accessed May 11, 2026, https://mountgulian.org/history/the-wappinger-people/.

[xiii] *Encyclopaedia Britannica*, s.v. "Wappinger," accessed May 11, 2026, https://www.britannica.com/topic/Wappinger.

[xiv] Conor Walsh, "How the Wappingers People Shaped the Hudson Valley, New York," WRRV, August 12, 2024, https://wrrv.com/wappinger-new-york-tribes/.

[xv] John R. Swanton, *The Indian Tribes of North* America, (U. S. Government Printing Office, 1952), 45.

[xvi] *Encyclopaedia Britannica*, s.v. "Wappinger," accessed May 11, 2026, https://www.britannica.com/topic/Wappinger.

[xvii] *Encyclopaedia Britannica*, s.v. "Wappinger," accessed May 11, 2026, https://www.britannica.com/topic/Wappinger.

[xix] *Encyclopaedia Britannica*, s.v. "Wappinger," accessed May 11, 2026, https://www.britannica.com/topic/Wappinger.

[xx] "County Historian," Putnam County Historian, accessed September 4, 2025, https://www.putnamcountyny.gov/county-historian; Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 1, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[xxi] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 1, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[xxii] "County Historian," Putnam County, accessed September 4, 2025, https://www.putnamcountyny.gov/county-historian?highlight=WyJhdmVudWUiLCJvbmUiXQ==#Memorial-to-Chief-Nimham-at-County-Park.

[xxiii] "County Historian," Putnam County, accessed September 4, 2025, https://www.putnamcountyny.gov/county-historian?highlight=WyJhdmVudWUiLCJvbmUiXQ==#Memorial-to-Chief-Nimham-at-County-Park.

[xxiv] Discover Putnam New York, *Stay. Play. Explore.* Putnam County, NY (Discover Putnam New York, n.d.), accessed September 12, 2025, https://www.putnamcountyny.gov/images/Departments/Tourism/PDF_Documents/Putnam%20County%20Digital%20Itinineray.

[xxv] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 22, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[xxvi] "Putnam County, New York," United States Census Bureau, accessed February 20, 2026, http://data.census.gov/profile/Putnam_County,_New_York?g=050XX00US36079.

[xxvii] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 2, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[xxviii] "Putnam County, New York," United States Census Bureau, accessed February 20, 2026, http://data.census.gov/profile/Putnam_County,_New_York?g=050XX00US36079.

[xxix] "Putnam County, New York," United States Census Bureau, accessed February 20, 2026, http://data.census.gov/profile/Putnam_County,_New_York?g=050XX00US36079.

[xxx] "Age and Sex: American Community Survey, 2024 ACS 5-Year Estimates Subject Tables, Table S0101," United States Census Bureau, accessed May 26, 2026, https://data.census.gov/table/ACSST5Y2024.S0101?q=Putnam+County+New+York.

[xxxi] "ACS Demographic and Housing Estimates: 2024 ACS 5-Year Estimates Data Profiles, Table DP05," United States Census Bureau, accessed May 26, 2026, https://data.census.gov/table/ACSDP5Y2024.DP05?q=New+York.

[xxxii] "Age and Sex: American Community Survey, 2024 ACS 5-Year Estimates Subject Tables, Table S0101," United States Census Bureau, accessed May 26, 2026, https://data.census.gov/table/ACSST5Y2024.S0101?q=Putnam+County+New+York

[xxxiii] "Age and Sex: American Community Survey, 2010 ACS 5-Year Estimates Subject Tables, Table S0101," United States Census Bureau, accessed May 26, 2026, https://data.census.gov/table/ACSST5Y2010.S0101?q=Putnam+County+New+York.

[xxxiv] "ACS Demographic and Housing Estimates: 2024 ACS 5-Year Estimates Data Profiles, Table DP05." United States Census Bureau, accessed May 26, 2026, https://data.census.gov/table?g=050XX00US36079&d=ACS+5-Year+Estimates+Data+Profiles.

[xxxv] Federal Emergency Management Agency (FEMA), *National Risk Index Data: Technical Documentation* (Federal Emergency Management Agency, December 2025), 4-1, https://www.fema.gov/sites/default/files/documents/fema_national-risk-index_technical-documentation.pdf.

[xxxvi] United States Census Bureau, *2024 Community Resilience Estimates Quick Guide* (United States Census Bureau, January 29, 2026), 3, https://www2.census.gov/programs-surveys/demo/technical-documentation/community-resilience/2024/cre_quick_guide_2024.pdf.

[xxxvii] "Counties - NRI Social Vulnerability Rating," *Resilience Analysis and Planning Tool (RAPT)*, Federal Emergency Management Agency (FEMA), accessed February 20, 2026, https://experience.arcgis.com/experience/0a317e8998534c30a9b2d3861c814d42/.

[xxxviii] "Counties - NRI Social Vulnerability Rating," *Resilience Analysis and Planning Tool (RAPT)*, Federal Emergency Management Agency (FEMA), accessed February 20, 2026, https://experience.arcgis.com/experience/0a317e8998534c30a9b2d3861c814d42/.

[xxxix] Federal Emergency Management Agency (FEMA), *National Risk Index Data: Technical Documentation* (Federal Emergency Management Agency, December 2025), 4-2, https://www.fema.gov/sites/default/files/documents/fema_national-risk-index_technical-documentation.pdf.

[xl] United States Census Bureau, *2023 Community Resilience Estimates: Quick Guide* (United States Census Bureau, Department of Commerce, January 2025), https://www2.census.gov/programs-surveys/demo/technical-documentation/community-resilience/2023/cre_quick_guide_2023.pdf.

[xli] "Disadvantaged Communities," New York State Energy Research and Development Authority (NYSERDA), accessed September 5, 2025, https://www.nyserda.ny.gov/ny/Disadvantaged-Communities.

[xlii] United States Census Bureau, American Community Survey 5-Year Estimates: Subject Tables (Table S1701, "Poverty Status in the Past 12 Months," 2023), accessed December 22, 2025, https://data.census.gov/table?q=Table+S1701&y=2023&d=ACS+5-Year+Estimates+Subject+Tables, included in "County Summary, New York, Putnam County," *Resilience Analysis and Planning Tool (RAPT),* Federal Emergency Management Agency (FEMA), https://experience.arcgis.com/experience/0a317e8998534c30a9b2d3861c814d42/.

[xliii] United States Census Bureau, American Community Survey 5-Year Estimates: Subject Tables (Table S1602, "Limited English Speaking Households," 2023), accessed December 22, 2025, https://data.census.gov/table?q=Table+S1602&y=2023&d=ACS+5-Year+Estimates+Subject+Tables, included in "County Summary, New York, Putnam County," *Resilience Analysis and Planning Tool (RAPT),* Federal Emergency Management Agency (FEMA), https://experience.arcgis.com/experience/0a317e8998534c30a9b2d3861c814d42/.

[xliv] United States Census Bureau, American Community Survey 5-Year Estimates: Subject Tables (Table S1810, "Disability Characteristics," 2023), accessed December 22, 2025, https://data.census.gov/table?q=Table+S1810&y=2023&d=ACS+5-Year+Estimates+Subject+Tables, included in "County Summary, New York, Putnam County," *Resilience Analysis and Planning Tool (RAPT),* Federal Emergency Management Agency (FEMA), https://experience.arcgis.com/experience/0a317e8998534c30a9b2d3861c814d42/.

[xlvi] Federal Emergency Management Agency (FEMA), *FEMA Community Resilience Challenges Index Annual Update of Indicator Tables* (Federal Emergency Management Agency, May 2025), https://www.fema.gov/sites/default/files/documents/fema_crci-annual-update-indicator-tables_2025.pdf.

[xlvii] "Putnam County, New York," United States Census Bureau, accessed February 20, 2026, http://data.census.gov/profile/Putnam_County,_New_York?g=050XX00US36079.

[xlviii] Putnam County Records.

[xlix] Putnam County Agricultural & Farmland Protection Board, *An Agricultural and Farmland Protection Plan for Putnam County: Agricultural Opportunities Challenges in Putnam County* (Putnam County, 2004), 3, https://www.putnamcountyny.gov/images/Departments/Soil_Water_Conservation/Keep%20Putnam%20Farming/PDF_Documents/Final-Plan-08-04.pdf.

[l] Hudson Valley Regional Council (HVRC), *2025-2030 Comprehensive Economic Development Strategy* (Hudson Valley Regional Council, July 2025), 24, https://hudsonvalleyregionalcouncil.org/wp-content/uploads/2025/10/2025-2030HVRC-CEDS-Adopted20250917.pdf.

[li] "Putnam County Bureau of Emergency Services," Putnam County Bureau of Emergency Services, accessed September 8, 2025, https://www.putnamcountyny.gov/pcbes.

[lii] "Putnam County Planning, Development & Public Transportation," Putnam County Planning, Development & Public Transportation, accessed January 26, 2026, https://www.putnamcountyny.gov/planning-department.

[liii] "Putnam County Department of Public Works (DPW)," Putnam County Department of Public Works (DPW), accessed February 20, 2026, https://www.putnamcountyny.gov/public-works.

[liv] "Putnam County Parks & Recreation," Putnam County Parks & Recreation, accessed September 17, 2025, https://www.putnamcountyny.gov/parks-recreation.

[lv] "Putnam County Soil & Water Conservation District," Putnam County Soil & Water Conservation District, accessed March 9, 2026, https://www.putnamcountyny.gov/soil-water-conservation-district.

[lvi] "Putnam County Agriculture and Farmland Protection Board," Putnam County Agriculture and Farmland Protection Board (PCAFPB), accessed March 9, 2026, https://www.putnamcountyny.gov/keepputnamfarming.

[lvii] "Putnam County Department of Health," Putnam County Department of Health, accessed February 20, 2026, https://www.putnamcountyny.gov/health.

[lviii] "Putnam County Office for Senior Resources," Putnam County Office for Senior Resources, accessed December 3, 2025, https://putnamcountyny.gov/osr/.

[lix] "Putnam County Department of Social Services & Mental Health," Putnam County Department of Social Services & Mental Health, accessed February 20, 2026, https://www.putnamcountyny.gov/department-of-social-services.

[lxi] Putnam County Department of Parks & Recreation, https://putnamcountyny.gov/parks-recreationhttps://climatesmart.ny.gov/actions-certification/participating-communities/certification-report?tx_sjcert_certification%5Baction%5D=show&tx_sjcert_certification%5Bcertification%5D%5B__identity%5D=224&tx_sjcert_certification%5Bcontroller%5D=Certification&cHash=93be005da56b692b8c9b782ed0a15b63

[lxii] Tetra Tech, "Section 9.1: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 2-3, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-9.1-Putnam-County-122320_dfs1.pdf.

[lxiii] "Local Government Home Rule Power," New York State, accessed February 5, 2026, https://video.dos.ny.gov/lg/handbook/html/local_government_home_rule_power.html.

[lxiv] Hudson Valley Regional Council, *Putnam County Communitywide Greenhouse Gas Emissions Inventory* (Putnam County Department of Planning, Development, and Public Transportation, 2024), 8, https://putnamcountyny.gov/images/Departments/Planning_Dev_Transport/PDF_Documents/Climate%20Smart/HVRC%20-%20Community-GHG-Report%20-%20Putnam%20County%202.24.pdf.

[lxv] Tetra Tech, "Section 9.1: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 9, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-9.1-Putnam-County-122320_dfs1.pdf.

[lxvi] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[lxvii] R. D. Dallmeyer, "Tectonic Setting of the Northeastern Reading Prong," *Geological Society of America Bulletin* 85, no. 1 (1974): 131-134, https://pubs.geoscienceworld.org/gsa/gsabulletin/article-abstract/85/1/131/201478/Tectonic-Setting-of-the-Northeastern-Reading-Prong?redirectedFrom=PDF.

[lxviii] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[lxix] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[lxx] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 6, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[lxxi] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 4-6, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[lxxii] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[lxxiii] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[lxxiv] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 5, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[lxxv] Tetra Tech, "Section 5.4.2: Drought," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 2, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.2-Drought_121520_Dfs.pdf.

[lxxvi] The National Academies of Sciences, Engineering, and Medicine, "1 Introduction," in *Review of the New York City Department of Environmental Protection Operations Support Tool for Water Supply*, (Washington, DC: The National Academies Press, 2018), doi: 10.17226/25218.

[lxxvii] The National Academies of Sciences, Engineering, and Medicine, "1 Introduction," in *Review of the New York City Department of Environmental Protection Operations Support Tool for Water Supply*, (Washington, DC: The National Academies Press, 2018), doi: 10.17226/25218.

[lxxviii] Tetra Tech, "Section 5.4.6: Harmful Algal Bloom," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 1-2, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.6-HAB-121520_dfs.pdf.

[lxxix] Tetra Tech, "Section 5.4.6: Harmful Algal Bloom," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.6-HAB-121520_df.

[lxxx] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 6, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[lxxxi] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 6, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[lxxxii] "Map of the Great Swamp Watershed," Friends of the Great Swamp (FrOGS), accessed January 7, 2026, https://frogs-ny.org/about-map/.

[lxxxiii] WSP, "Appendix B, Environmental," in *New York Nature Explorer: Southeast to Danbury* (Putnam County, July 2022), https://www.putnamcountyny.gov/images/Departments/Planning_Dev_Transport/PDF_Documents/SE2D%20APPENDIX%20B.pdf.

[lxxxiv] "Animals of the Great Swamp," Friends of the Great Swamp (FrOGS), accessed January 7, 2026, https://frogs-ny.org/animals-of-the-great-swamp/.

[lxxxv] "Animals of the Great Swamp," Friends of the Great Swamp (FrOGS), accessed January 7, 2026, https://frogs-ny.org/animals-of-the-great-swamp/.

[lxxxvi] "Birds of the Great Swamp," Friends of the Great Swamp (FrOGS), accessed January 7, 2026, https://frogs-ny.org/birds-of-the-great-swamp/.

[lxxxvii] "Plants of the Great Swamp," Friends of the Great Swamp (FrOGS), accessed January 7, 2026, https://frogs-ny.org/plants-of-the-great-swamp/.

[lxxxviii] "Hudson Highlands State Park Preserve," New York State Parks, Recreation, and Historic Preservation, accessed January 8, 2026 https://parks.ny.gov/visit/state-parks/hudson-highlands-state-park-preserve.

[lxxxix] Putnam County, DRAFT Putnam County, NY: Local Solid Waste Manage Plan 2025-2034 (Putnam County, 2025), 14-17, https://www.putnamcountyny.gov/images/Departments/Department_of_Health/recycle/PC_LSWMP_DRAFT_11-2025.pdf.

[xc] "Maybrook Trailway," New York State Empire State Trail, https://empiretrail.ny.gov/new-york-city-poughkeepsie/brewster-pawling.

[xci] "Cranberry Mountain Wildlife Management Area," New York State Department of Environmental Conservation (NYSDEC), https://dec.ny.gov/places/cranberry-mountain-wildlife-management-area.

[xcii] "Hudson Highlands State Park Preserve," New York State Parks, Recreation, and Historic Preservation, accessed January 8, 2026, https://parks.ny.gov/visit/state-parks/hudson-highlands-state-park-preserve.

"Hudson Highlands State Park Preserve," New York State Parks, Recreation, and Historic Preservation, accessed January 8, 2026, https://parks.ny.gov/visit/state-parks/hudson-highlands-state-park-preserve.

[xciv] Putnam County, DRAFT Putnam County, NY: Local Solid Waste Manage Plan 2025-2034 (Putnam County, 2025), 16, https://www.putnamcountyny.gov/images/Departments/Department_of_Health/recycle/PC_LSWMP_DRAFT_11-2025.pdf.

[xcv] Schneider Geospatial, Beacon (Property & Parcel Search) (Putnam County; accessed March 3, 2026), https://beacon.schneidercorp.com/Application.aspx?App=PutnamCountyNY&PageType=Search.

[xcvi] "DEP is Top Taxpayer in Ulster, Putnam, Delaware, and Schoharie Counties," New York City Department of Environmental Protection (NYCDEP), December 29, 2023, https://www.nyc.gov/site/dep/news/23-049/dep-top-taxpayer-ulster-putnam-delaware-schoharie-counties.

[xcvii] "Putnam County Tax Parcels," Putnam County GIS, https://data-pcny.opendata.arcgis.com/maps/87ae151efbec46d196e4c66d08a4a33c/about.

[xcviii] "Putnam County Tax Parcels," Putnam County GIS, https://data-pcny.opendata.arcgis.com/maps/87ae151efbec46d196e4c66d08a4a33c/about.

[xcix] Governor Kathy Hochul, "Governor Hochul Announces 763 Acres Added to Clarence Fahnestock Memorial State Park in the Hudson Valley," New York State, October 3, 2024, https://www.governor.ny.gov/news/governor-hochul-announces-763-acres-added-clarence-fahnestock-memorial-state-park-hudson.

[c] "Michael Ciaiola Conservation Area," Putnam County, https://www.putnamcountyny.gov/component/jbusinessdirectory/companies/michael-ciaiola-conservation-area?Itemid=101.

[ci] Tetra Tech, "Section 5.4.3: Flood," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 3, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_dfs.pdf.

[cii] Sheila S. Hess et al., "New York State Climate Impacts Assessment Chapter 05: Ecosystems," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 253–340, https://doi.org/10.1111/nyas.15203.

[ciii] New York State GIS Clearinghouse Data, "Dams," New York State Department of Environmental Conservation (NYSDEC), last modified December 9, 2025, accessed January 23, 2026, https://data.gis.ny.gov/datasets/5a7d83359cc842e0871121540 8f5b55c_29/explore.

[civ] Alon Dominitz, *DOW TOGS 3.1.5 – Guidance for Dam Hazard Classification (*New York State Department of Environmental Conservation, n.d.), https://extapps.dec.ny.gov/docs/water_pdf/togs315.pdf.

[cv] "NYMTC Moving Forward 2055 Interactive Map Appendix A: Recommended Projects, Programs, and Studies," New York Metropolitan Transportation Council (NYMTC), https://experience.arcgis.com/experience/5a13b6ab6f534cebbaf5f684e6df33fb/page/Appendix-A.

[cvi] "NYMTC Moving Forward 2055 Interactive Map Appendix A: Recommended Projects, Programs, and Studies," New York Metropolitan Transportation Council (NYMTC), https://experience.arcgis.com/experience/5a13b6ab6f534cebbaf5f684e6df33fb/page/Appendix-A.

[cvii] "NYMTC Moving Forward 2055 Interactive Map Appendix A: Recommended Projects, Programs, and Studies," New York Metropolitan Transportation Council (NYMTC), https://experience.arcgis.com/experience/5a13b6ab6f534cebbaf5f684e6df33fb/page/Appendix-A.

[cviii] "NYMTC Moving Forward 2055 Interactive Map Appendix F: Environmental Mitigation and New Consultation," New York Metropolitan Transportation Council (NYMTC), https://experience.arcgis.com/experience/5a13b6ab6f534cebbaf5f684e6df33fb/page/Appendix-F.

[cix] "NYMTC Moving Forward 2055 Interactive Map Appendix A: Recommended Projects, Programs, and Studies," New York Metropolitan Transportation Council (NYMTC), https://experience.arcgis.com/experience/5a13b6ab6f534cebbaf5f684e6df33fb/page/Appendix-A.

[cx] "NYMTC Moving Forward 2055 Interactive Map Appendix F: Environmental Mitigation and New Consultation," New York Metropolitan Transportation Council (NYMTC), https://experience.arcgis.com/experience/5a13b6ab6f534cebbaf5f684e6df33fb/page/Appendix-F.

[cxi] "NYMTC Moving Forward 2055 Interactive Map Appendix A: Recommended Projects, Programs, and Studies," New York Metropolitan Transportation Council (NYMTC), https://experience.arcgis.com/experience/5a13b6ab6f534cebbaf5f684e6df33fb/page/Appendix-A.

[cxii] "NYMTC Moving Forward 2055 Interactive Map Appendix F: Environmental Mitigation and New Consultation," New York Metropolitan Transportation Council (NYMTC), https://experience.arcgis.com/experience/5a13b6ab6f534cebbaf5f684e6df33fb/page/Appendix-F.

[cxiii] Gretchen Stevens and Chris Graham, *Town of Kent New York: Natural Resources Inventory 2023* (Town of Kent, 2023), xiii, https://www.townofkentny.gov/sites/g/files/vyhlif4576/f/uploads/town_of_kent_natural_resources_inventory_accessible.pdf.

[cxiv] Putnam Valley Commission for the Conservation of the Environment, *Town of Putnam Valley Natural Resources Inventory* (Town of Putnam Valley, 2018), 42-43, 47, 51,56, 71, 75-77, 113, https://www.putnamvalley.com/wp-content/uploads/2019/02/PutnamValley_NRI_Final_for_posting.pdf.

[cxv] Tetra Tech, "Section 4: County Profile" in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 6, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[cxvi] Tetra Tech, "Section 5.4.2: Drought," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.2-Drought_121520_Dfs.pdf.

[cxvii] Tetra Tech, "Section 5.4.4: Extreme Temperature," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 6, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.4-Extreme-Temps-121520.pdf.

[cxviii] Tetra Tech, "Section 5.4.5: Flood," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 14-15, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_dfs.pdf.

[cxix] Tetra Tech, "Section 5.4.4: Extreme Temperature," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 6, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.4-Extreme-Temps-121520.pdf.

[cxx] Tetra Tech, "Section 5.4.7: Severe Storms," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 15, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.7-Severe-Storm-121520_dfs.pdf.

[cxxi] Luis Aguirre-Torres et al., "New York State Climate Impacts Assessment Chapter 08: Society and Economy," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 446–500, https://doi.org/10.1111/nyas.15199.

[cxxii] Tetra Tech, "Section 5.4.7: Severe Storms," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 1-2, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.7-Severe-Storm-121520_dfs.pdf.

[cxxiii] Tetra Tech, "Section 5.4.7: Severe Storms," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 10, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.7-Severe-Storm-121520_dfs.pdf.

[cxxiv] "Storm Events Database," National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), https://www.ncei.noaa.gov/stormevents/details.jsp.

[cxxv] Christopher Lamie et al., "New York State Climate Impacts Assessment Chapter 02: New York State's Changing Climate" *Annals of the New York Academy of Sciences* 1542, no. 1 (2024), 91–145, https://doi.org/10.1111/nyas.15240.

[cxxvi] National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), Storm Events Database (SED) (accessed March 3, 2026), https://www.ncei.noaa.gov/stormevents/details.jsp.

[cxxvii] National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), Storm Events Database (SED) (accessed March 3, 2026), https://www.ncei.noaa.gov/stormevents/details.jsp.

[cxxviii] "OpenFEMA Dataset: FEMA Web Declaration Areas – v1," Federal Emergency Management Agency (FEMA), https://www.fema.gov/openfema-data-page/fema-web-declaration-areas-v1.

[cxxix] "OpenFEMA Dataset: Disaster Declarations Summaries - v2," Federal Emergency Management Agency (FEMA), https://www.fema.gov/openfema-data-page/disaster-declarations-summaries-v2.

[cxxx] Tetra Tech, "Section 5.4.8: Severe Winter Storm," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 1, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.8-Severe-Winter-Storms-121520bk.pdf.

[cxxxi] Tetra Tech, "Section 5.4.8: Severe Winter Storm," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 3, 5, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.8-Severe-Winter-Storms-121520bk.pdf.

[cxxxii] Tetra Tech, "Section 5.4.8: Severe Winter Storm," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 7-8, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.8-Severe-Winter-Storms-121520bk.pdf.

[cxxxiii] Tetra Tech, "Section 5.4.8: Severe Winter Storm," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 5-6, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.8-Severe-Winter-Storms-121520bk.pdf.

[cxxxiv] National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), Storm Events Database (SED) (accessed March 3, 2026), https://www.ncei.noaa.gov/stormevents/details.jsp.

[cxxxv] Tetra Tech, "Section 5.4.5: Flood," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 1-4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_dfs.pdf.

[cxxxvi] Tetra Tech, "Section 5.4.5: Flood," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 1-4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_dfs.pdf.

[cxxxvii] Christopher Lamie et al., "New York State Climate Impacts Assessment Chapter 02: New York State's Changing Climate," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 91-145, https://doi.org/10.1111/nyas.15240.

[cxxxviii] Tetra Tech, "Section 5.4.5: Flood," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 1-4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_dfs.pdf.

[cxxxix] National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), Storm Events Database (SED) (accessed March 3, 2026), https://www.ncei.noaa.gov/stormevents/details.jsp.

[cxl] "OpenFEMA Dataset: FEMA Web Declaration Areas – v1," Federal Emergency Management Agency (FEMA), https://www.fema.gov/openfema-data-page/fema-web-declaration-areas-v1.

[cxli] "OpenFEMA Dataset: Disaster Declarations Summaries - v2," Federal Emergency Management Agency (FEMA), https://www.fema.gov/openfema-data-page/disaster-declarations-summaries-v2.

[cxlii] Tetra Tech, "Section 5.4.2: Drought," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 1-2, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.2-Drought_121520_Dfs.pdf.

[cxliii] Tetra Tech, "Section 5.4.2: Drought," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.2-Drought_121520_Dfs.pdf.

[cxliv] "How are Drought Conditions Classified?," Northeast Regional Climate Center, June 8, 2018, https://www.nrcc.cornell.edu/services/blog/2018/06/28/index.html.

[cxlv] "Time Series," United States Drought Monitor (USDM), https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx, included in "Drought Conditions for Putnam County," National Oceanic and Atmospheric Administration (NOAA) National Integrated Drought Information System (NIDIS), https://www.drought.gov/states/new-york/county/Putnam.

[cxlvi] Tetra Tech, "Section 5.4.4: Extreme Temperature," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 3-4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.4-Extreme-Temps-121520.pdf.

[cxlvii] Christopher Lamie et al., "New York State Climate Impacts Assessment Chapter 02: New York State's Changing Climate," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024), 91-145, https://doi.org/10.1111/nyas.15240.
[cxlviii] Tetra Tech, "Section 5.4.4: Extreme Temperature," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 6, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.4-Extreme-Temps-121520.pdf.

[cxlix] National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), Storm Events Database (SED) (accessed March 3, 2026), https://www.ncei.noaa.gov/stormevents/details.jsp.

[cl] Tetra Tech, "Section 5.4.10: Wildfire," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 3-5, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.10-Wildfire-121520dfs.pdf.

[cli] Volker C. Radeloff et al.,"Rapid growth of the US wildland-urban interface raises wildfire risk," *Proceedings of the National Academy of Sciences* 115, no. 13 (2018): 3314-3319, https://doi.org/10.1073/pnas.1718850115.

[clii] Tetra Tech, "Section 5.4.10: Wildfire," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 7, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.10-Wildfire-121520dfs.pdf.

[cliii] Tetra Tech, "Section 5.4.10: Wildfire," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 9, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.10-Wildfire-121520dfs.pdf.

[cliv] Christopher Lamie et al., "New York State Climate Impacts Assessment Chapter 02: New York State's Changing Climate," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 91-145, https://doi.org/10.1111/nyas.15240.

[clv] Kimberley Thomas et al., "Explaining Differential Vulnerability to Climate Change: A Social Science Review," *Wiley Interdisciplinary Reviews Climate Change* 10, no. 2 (2019): e565, https://doi.org/10.1002/wcc.565.

[clvi] "The importance of community networks to disaster resilience," United States National Science Foundation (NSF), September 22, 2018, https://www.nsf.gov/news/importance-community-networks-disaster-resilience.

[clvii] "New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate," New York State *Climate Impacts Assessment, https://nysclimateimpacts.org/.*

[clviii] *"State Climate Summaries 2022 New York," National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), 2022, https://statesummaries.ncics.org/chapter/ny/.*

[clix] *"State Climate Summaries 2022 New York," National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), 2022, https://statesummaries.ncics.org/chapter/ny/.*

[clx] *"State Climate Summaries 2022 New York," National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), 2022, https://statesummaries.ncics.org/chapter/ny/.*

[clxi] *"New York State Climate Impacts Assessment," New York State Climate Impacts Assessment, https://nysclimateimpacts.org/.*

[clxii] *"QuickFacts: Putnam County, NY," United States Census Bureau, accessed January 28, 2026, https://www.census.gov/quickfacts/fact/table/putnamcountynewyork/AGE775224#AGE775224.*

[clxiii] *The average percentage of seniors was calculated using 2024 data for Putnam, Orange, Rockland, Westchester, Sullivan,* Dutchess, and Ulster Counties.

[clxiv] "QuickFacts," United States Census Bureau, https://www.census.gov/quickfacts/.

[clxv] "Climate Impact Spotlight: The South Hudson Region," New York State Climate Impacts Assessment, https://nysclimateimpacts.org/explore-by-region/the-south-hudson-region/.

[clxvi] "Climate Impact Spotlight: The South Hudson Region," New York State Climate Impacts Assessment, https://nysclimateimpacts.org/explore-by-region/the-south-hudson-region/.

[clxvii] "What will climate feel like in 60 years?," University of Maryland Center for Environmental Science, accessed 2025, https://fitzlab.shinyapps.io/cityapp/.

[clxviii] "New York State Urban Heat Islands Extreme Heat Maps: Putnam County, NY," Davey Institute, i-Tree, New York State Department of Environmental Conservation (NYSDEC), and State University of New York College of Environmental Science and Forestry (SUNY ESF), accessed February 19, 2026, https://nys-heat.daveyinstitute.com/hottest-hour/region-county.html?id=36079.

[clxix] Christopher Lamie et al., "New York State Climate Impacts Assessment Chapter 02: New York State's Changing Climate," *Annals of the New York Academy of Sciences* 1542, no.1 (2024): 91-145, https://doi.org/10.1111/nyas.15240.

[clxx] Christopher Lamie et al., "New York State Climate Impacts Assessment Chapter 02: New York State's Changing Climate," *Annals of the New York Academy of Sciences* 1542, no.1 (2024): 91-145, https://doi.org/10.1111/nyas.15240.

[clxxi] Christopher Lamie et al., "New York State Climate Impacts Assessment Chapter 02: New York State's Changing Climate," *Annals of the New York Academy of Sciences* 1542, no.1 (2024): 91-145, https://doi.org/10.1111/nyas.15240.

[clxxii] These statistics use 49.9 inches per year as New York City's baseline, drawing from 1981-2010 data.
[clxxiii] Christopher Lamie et al., "New York State Climate Impacts Assessment Chapter 02: New York State's Changing Climate," *Annals of the New York Academy of Sciences* 1542, no.1 (2024): 108-109, https://doi.org/10.1111/nyas.15240.

[clxxiv] "Precipitation," New York State Climate Impacts Assessment, https://nysclimateimpacts.org/explore-the-assessment/new-york-states-changing-climate/nysc-precip.

[clxxv] "Lakes and Streams," Cornell Cooperative Extension Putnam County, accessed February 2, 2026, https://cceputnamcounty.org/environment/lakes-and-streams.

[clxxvi] Tetra Tech, "Section 5.4.5: Flood," in Putnam County Hazard Mitigation Plan (Putnam County, 2021), 12, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_dfs.pdf.

[clxxvii] Tetra Tech, "Appendix D: Public and Stakeholder Outreach," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 17, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Appendix-D-Public-and-Stakeholder-Outreach-1216.

[clxxviii] "State Climate Summaries 2022 New York," National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), 2022, https://statesummaries.ncics.org/chapter/ny/.

[clxxix] "State Climate Summaries 2022 New York," National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), 2022, https://statesummaries.ncics.org/chapter/ny/.

[clxxxi] "State Climate Summaries 2022 New York," National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), 2022, https://statesummaries.ncics.org/chapter/ny/.

[clxxxii] "Local Scenarios: PSMSL ID: 1004902860," *Sea Level Rise Viewer,* National Oceanic and Atmospheric Administration (NOAA), accessed March 11, 2026, https://coast.noaa.gov/slr/.

[clxxxiii] Note: Flooding to date can mostly be attributed to extreme weather events.

[clxxxiv] Environmental Defense Fund, Texas A&M University, and Darkhorse Visualization, "Extreme Events in Putnam County," The U.S. Climate Vulnerability Index, accessed July 30, 2025, https://map.climatevulnerabilityindex.org/report/cc_extreme_events/putnam-county-new-york?mapBoundaries=County&mapFilter=0&reportBoundaries=County&geoContext=State.

[clxxxv] American Public Health Association (APHA) and U.S Department of Health and Human Services Centers for Disease Control and Prevention (CDC), *Extreme Rainfall and Drought* (American Public Health Association, n.d.), https://www.apha.org/getcontentasset/8d564f75-adee-4e1b-b139-055a904c39f8/7caodc9d-611d-46e2-9fd3-26a4c03ddcbb/precipitation.pdf?language=en.

[clxxxvi] The Lancet Countdown on Health and Climate Change, *Policy Brief for the United States of America* (The Lancet, 2023), https://www.lancetcountdownus.org/wp-content/uploads/2023/11/2023-Lancet-Countdown-U.S.-Brief_v1.

[clxxxvii] "U.S. Gridded Standardized Precipitation Index (SPI) from nClimGrid-Monthly," National Oceanic and Atmospheric Administration National Centers for Environmental Information (NOAA NCEI), accessed 2025, https://www.drought.gov/data-maps-tools/us-gridded-standardized-precipitation-index-spi-nclimgrid-monthly, included in "Drought Conditions for Putnam County," National Integrated Drought Information System (NIDIS), https://www.drought.gov/states/new-york/county/Putnam.

[clxxxviii] "Fires in 10 New York state counties burn more than 37 acres—Adirondack Explorer," Adirondack Explorer, April 22, 2025, https://www.adirondackexplorer.org/stories/rangers-fight-fires-10-counties-new-york-state.

[clxxxix] Governor Kathy Hochul, "Governor Hochul Announces Full Containment of Jennings Creek Wildfire at Sterling Forest State Park," New York State, November 22, 2024, https://www.governor.ny.gov/news/governor-hochul-announces-full-containment-jennings-creek-wildfire-sterling-forest-state-park.

[cxc] "Temporary Burn Ban in Putnam County, Kent Brush Fire Extinguished," Putnam County, October 30, 2024, https://www.putnamcountyny.gov/county-executive-articles/item/temporary-burn-ban-in-putnam-county-kent-brush-fire-extinguished.

[cxci] "Putnam County, NY Wildfire Map and Climate Risk Report," First Street, accessed July 30, 2025, https://firststreet.org/county/putnam-county-ny/36079_fsid/fire.

[cxcii] "Wildfires may fuel heart health hazards: Smoke exposure increases cardiovascular risks," American Heart Association, June 7, 2023, https://newsroom.heart.org/news/wildfires-may-fuel-heart-health-hazards-smoke-exposure-increases-cardiovascular-risks.

[cxciii] How Wildfire Smoke Impacts Your Health," Cleveland Clinic, February 3, 2025, https://health.clevelandclinic.org/wildfire-smoke-health-effects.

[cxciv] "Hurricane: Risk Profile," New York State MitigateNY, accessed 2025, https://mitigateny.org/assess_risk/natural_hazards/hurricane/risk_profile.

[cxcv] "Hurricane: Risk Profile," New York State MitigateNY, accessed 2025, https://mitigateny.org/assess_risk/natural_hazards/hurricane/risk_profile.

[cxcvi] Tetra Tech, "Section 5.4.7: Severe Storms," in *Putnam County Hazard Mitigation Plan*, (Putnam County, 2021), 10, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.7-Severe-Storm-121520_dfs.pdf.

[cxcvii] "PE7 Action: Climate Vulnerability Assessment," New York State Climate Smart Communities, accessed December 23, 2025, climatesmart.ny.gov/actions-certification/actions/#open/action/85.

[cxcviii] Tetra Tech, "Section 5.4.7: Severe Storms," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 23, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.7-Severe-Storm-121520_dfs.pdf.
[cxcix] Tetra Tech, "Section 5.4.4: Extreme Temperature," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 9, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.4-Extreme-Temps-121520.pdf.

[cc] "Low-Income Energy Affordability Data (LEAD) Tool," United States Department of Energy, accessed December 18, 2025, https://www.energy.gov/scep/low-income-energy-affordability-data-lead-tool.

[cci] "LEAD Tool," United States Department of Energy, accessed December 18, 2025, https://www.energy.gov/scep/slsc/lead-tool
[ccii] "Low-Income Energy Affordability Data (LEAD) Tool," United States Department of Energy, accessed December 18, 2025, https://www.energy.gov/scep/low-income-energy-affordability-data-lead-tool.

[cciii] Tetra Tech, "Section 9.1: Putnam County," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 23, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-9.1-Putnam-County-122320_dfs1.pdf.

[cciv] Tetra Tech, "Section 9.1: Putnam County," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 23, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-9.1-Putnam-County-122320_dfs1.pdf.

[ccv] Tetra Tech, "Section 9.1: Putnam County," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 23, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-9.1-Putnam-County-122320_dfs1.pdf.

[ccvi] "Putnam County Department of Public Works (DPW)," Putnam County Department of Public Works (DPW), accessed December 16, 2025, https://www.putnamcountyny.gov/public-works.

[ccvii] "Putnam County Public Transportation," Putnam County Department of Planning, Development, and Public Transportation, accessed December 11, 2025, https://www.putnamcountyny.gov/transportation.

[ccviii] Putnam Area Rapid Transit, *Cold Spring Trolley* (Putnam County Department of Planning, Development, and Public Transportation, revised September 2025), https://www.putnamcountyny.gov/images/Departments/Planning_Dev_Transport/PDF_Documents/2025%20Cold%20Spring%20Trolley%20Schedule%20Rev%20SEP%202025.pdf.

[ccix] "Putnam County Public Transportation," Putnam County Department of Planning, Development and Public Transportation, accessed January 6, 2025, https://www.putnamcountyny.gov/transportation.

[ccx] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 52, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[ccxi] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 52, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[ccxii] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 59, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[ccxiii] Tetra Tech, "Section 5.4.5: Flood," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 23, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_dfs.pdf.

[ccxiv] Metro-North Railroad, "MTA to Protect Metro-North Hudson Line Against Effects of Climate Change," Metropolitan Transportation Authority, last modified April 9, 2025, https://www.mta.info/press-release/mta-protect-metro-north-hudson-line-against-effects-of-climate-change.

[ccxv] Amy Macdonald et al., "New York State Climate Impacts Assessment Chapter 09: Transportation," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 511, https://doi.org/10.1111%2Fnyas.15198.

[ccxvi] Jeff Edwards, "Building Collapse, Closed Roads In Wake Of Torrential Rains, Violent Thunderstorms," Patch, last modified July 15, 2025, https://patch.com/new-york/southeast/building-collapse-closed-roads-wake-torrential-rains-violent-thunderstorms.

[ccxvii] Rockland/Westchester Journal News, "Major rainfall impacts life in Hudson Valley," LoHud, July 9, 2023, https://www.lohud.com/picture-gallery/marketplace/real-estate/new-city/2023/07/10/stony-point-neighborhood-flooded-during-torrential-storms-sunday/12230235002/.

[ccxviii] Amy Macdonald et al., "New York State Climate Impacts Assessment Chapter 09: Transportation," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 510-511, https://doi.org/10.1111%2Fnyas.15198.

[ccxix] "Climate Smart Communities Certification Report," New York State Climate Smart Communities, accessed February 20, 2026, https://climatesmart.ny.gov/actions-certification/participating-communities/certification-report?tx_sjcert_certification%5Baction%5D=show&tx_sjcert_certification%5Bcertification%5D%5B__identity%5D=224&tx_sjcert_certification%5Bcontroller%5D=Certification&cHash=93be005da56b692b8c9b782ed0a15b63.

[ccxx] Tetra Tech, "Section 9.1: Putnam County," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 27, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-9.1-Putnam-County-122320_dfs1.pdf.

[ccxxi] Tetra Tech, "Section 5.4.4: Extreme Temperature," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 1, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.4-Extreme-Temps-121520.

[ccxxii] New York State Department of Health, *Heat Vulnerability Index Putnam County, NY* (New York State Department of Health, accessed February 20, 2026), 3, https://www.health.ny.gov/environmental/weather/vulnerability_index/docs/putnam.pdf.

[ccxxiii] "FEMA Flood Map Service Center," Federal Emergency Management Agency (FEMA), accessed January 5, 2026, https://msc.fema.gov/portal/search?AddressQuery=668%20Route%20Six%20Mahopac%2C%20NY%2010541.

[ccxxiv] "Get Ready…. Hot Weather Will Soon Be Here," Putnam County Department of Health, May 9, 2023, https://www.putnamcountyny.gov/component/zoo/item/get-ready-hot-weather-will-soon-be-here?Itemid=101.

[ccxxv] "Climate Smart Communities Certification Report," New York State Climate Smart Communities, June 21, 2024, https://climatesmart.ny.gov/actions-certification/participating-communities/certification-report?tx_sjcert_certification%5Baction%5D=show&tx_sjcert_certification%5Bcertification%5D%5B__identity%5D=224&tx_sjcert_certification%5Bcontroller%5D=Certification&cHash=93be005da56b692b8c9b782ed0a15b63.

[ccxxvi] Tetra Tech, "Section 9.1: Putnam County," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 26, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-9.1-Putnam-County-122320_dfs1.pdf.

[ccxxvii] "Stormwater," New York State Department of Environmental Conservation (NYSDEC), accessed January 27, 2026, https://dec.ny.gov/environmental-protection/water/water-quality/stormwater.

[ccxxviii] Tetra Tech, "Section 5.4.5: Flood," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 10, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_dfs.pdf.

[ccxxix] Jeff Edwards, "Building Collapse, Closed Roads In Wake Of Torrential Rains, Violent Thunderstorms," Patch, last modified July 15, 2025, https://patch.com/new-york/southeast/building-collapse-closed-roads-wake-torrential-rains-violent-thunderstorms.

[ccxxx] "Putnam County Declares State of Emergency Due to Flooding," Putnam County, July 10, 2023, https://www.putnamcountyny.gov/county-executive-articles/item/putnam-county-declares-state-of-emergency-due-to-flooding.

[ccxxxi] "Climate Smart Communities Certification Report," New York State Climate Smart Communities, June 21, 2024, https://climatesmart.ny.gov/actions-certification/participating-communities/certification-report?tx_sjcert_certification%5Baction%5D=show&tx_sjcert_certification%5Bcertification%5D%5B__identity%5D=224&tx_sjcert_certification%5Bcontroller%5D=Certification&cHash=93be005da56b692b8c9b782ed0a15b63.

[ccxxxii] "Dam Safety," New York State Department of Environmental Conservation (NYSDEC), accessed February 3, 2026, https://dec.ny.gov/environmental-protection/water/dam-safety-coastal-flood-protection/dam-safety.

[ccxxxiii] New York State GIS Clearinghouse Data, "Dams," New York State Department of Environmental Conservation (NYSDEC), accessed December 16, 2025, https://data.gis.ny.gov/datasets/5a7d83359cc842e0871121540 8f5b55c_29/.

[ccxxxiv] Kelsey Leonard et al., "New York State Climate Impacts Assessment Chapter 10: Water Resources," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 585, https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15197.

[ccxxxv] New York State GIS Clearinghouse Data, "Dams," New York State Department of Environmental Conservation (NYSDEC), accessed February 24, 2026, https://data.gis.ny.gov/datasets/5a7d83359cc842e0871121540 8f5b55c_29/.

[ccxxxvi] New York State GIS Clearinghouse Data, "Dams," New York State Department of Environmental Conservation (NYSDEC), accessed February 24, 2026, https://data.gis.ny.gov/datasets/5a7d83359cc842e0871121540 8f5b55c_29/.

[ccxxxvii] New York State GIS Clearinghouse Data, "Dams," New York State Department of Environmental Conservation (NYSDEC), accessed February 24, 2026, https://data.gis.ny.gov/datasets/5a7d83359cc842e0871121540 8f5b55c_29/.

[ccxxxviii] "About Septic Systems," United States Environmental Protection Agency (EPA), accessed February 3, 2026, https://www.epa.gov/septic/about-septic-systems.

[ccxxxix] "How Septic Systems Work," United States Environmental Protection Agency (EPA), accessed February 3, 2026, https://www.epa.gov/septic/how-septic-systems-work.

[ccxl] "About Septic Systems," United States Environmental Protection Agency (EPA), accessed February 3, 2026, https://www.epa.gov/septic/about-septic-systems.

[ccxli] "Health Department To Residents…Resolve to Protect Your Septic," Putnam County Department of Health, January 2, 2024, https://www.putnamcountyny.gov/component/zoo/item/health-department-to-residents-resolve-to-protect-your-septic.

[ccxlii] Rebecca Mann, Cassidy Pearson, and Jenny Schuetz, "Sea level rise from climate change is threatening home septic systems and public health," Brookings, June 29, 2022, https://www.brookings.edu/articles/sea-level-rise-from-climate-change-is-threatening-home-septic-systems-and-public-health/.

[ccxliii] Kelsey Leonard et al., " New York State Climate Impacts Assessment Chapter 10: Water Resources," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 590, https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15197.

[ccxliv] "Health Department To Residents…Resolve to Protect Your Septic," Putnam County Department of Health, January 2, 2024, https://www.putnamcountyny.gov/component/zoo/item/health-department-to-residents-resolve-to-protect-your-septic.

[ccxlv] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 6, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[ccxlvi] "QuickFacts: Putnam County, New York," United States Census Bureau, accessed February 3, 2026, https://www.census.gov/quickfacts/fact/table/putnamcountynewyork/PST045224.

[ccxlvii] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 26, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.

[ccxlviii] Nicholas B. Rajkovich et al., "New York State Climate Impacts Assessment Chapter 04: Buildings," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 224, https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15200.

[ccxlix] Nicholas B. Rajkovich et al., "New York State Climate Impacts Assessment Chapter 04: Buildings," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024), 224, https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15200.

[ccl] Nicholas B. Rajkovich et al., "New York State Climate Impacts Assessment Chapter 04: Buildings," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024), 226, https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15200.

[ccli] Tetra Tech, "Section 5.4.5: Flood," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 18, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_dfs.pdf.

[cclii] Tetra Tech, "Section 5.4.5: Flood," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 16, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_dfs.pdf.

[ccliii] Tetra Tech, "Section 5.4.5: Flood," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 29, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_dfs.pdf.

[ccliv] Tetra Tech, "Section 5.4.5: Flood," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 29, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.5-Flood-121720_df.

[cclv] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 58, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[cclvi] Tetra Tech, "Section 9.1: Putnam County," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 18, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-9.1-Putnam-County-122320_dfs1.pdf.

[cclvii] "Putnam County Bureau of Emergency Services," Putnam County Bureau of Emergency Services, accessed February 6, 2026, https://www.putnamcountyny.gov/pcbes.

[cclviii] "Climate Smart Communities Certification Report," New York State Climate Smart Communities, 2024, https://climatesmart.ny.gov/actions-certification/participating-communities/certification-report?tx_sjcert_certification%5Baction%5D=show&tx_sjcert_certification%5Bcertification%5D%5B__identity%5D=224&tx_sjcert_certification%5Bcontroller%5D=Certification&cHash=93be005da56b692b8c9b782ed0a15b63.

[cclix] "Putnam County Department of Public Works (DPW)," Putnam County Department of Public Works (DPW), accessed February 20, 2026, https://www.putnamcountyny.gov/public-works.

[cclx] Nicholas B. Rajkovich et al., "New York State Climate Impacts Assessment Chapter 04: Buildings," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 224-226, https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15200.

[cclxi] "FEMA Flood Map Service Center," Federal Emergency Management Agency (FEMA), accessed December 22, 2025, https://msc.fema.gov/portal/search.

[cclxii] "Flood Zones," Federal Emergency Management Agency (FEMA), accessed January 5, 2026, https://www.fema.gov/about/glossary/flood-zones.

[cclxiii] "DECinfo Locator," New York Department of Environmental Conservation (NYSDEC), accessed January 8, 2026, https://gisservices.dec.ny.gov/gis/dil/.

[cclxiv] "Putnam County Local Solid Waste Management Plan," Putnam County Department of Health, accessed January 7, 2026, https://www.putnamcountyny.gov/health/recycle/.

[cclxv] Putnam County "Putnam Recycles" webpage https://putnamcountyny.gov/health/recycle?highlight=WyJzb2xpZCIsIndhc3RlIlo=

[cclxvi] "Putnam County Local Solid Waste Management Plan," Putnam County Department of Health, accessed January 7, 2026, https://www.putnamcountyny.gov/health/recycle/.

[cclxvii] "FEMA Flood Map Service Center," Federal Emergency Management Agency (FEMA), accessed March 9, 2026, https://msc.fema.gov/portal/search.

[cclxviii] Evan Bush, "Under Water: How FEMA's Outdated Flood Maps Incentivize Property Owners to Take Risks," NBC News, August 12, 2025, https://www.nbcnews.com/science/environment/water-femas-outdated-flood-maps-incentivize-system-risk-negotiable-rcna220529.

[cclxix] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 48, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[cclxx] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 48, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[cclxxi] "Putnam County Medical Reserve Corps," Putnam County, accessed February 20, 2026, https://www.putnamcountyny.gov/mrc.

[cclxxii] "Putnam County Bureau of Emergency Services," Putnam County Bureau of Emergency Services, accessed January 7, 2026, https://www.putnamcountyny.gov/pcbes.

[cclxxiii] Janice Barnes et al., "New York State Climate Impacts Assessment Chapter 07: Human Health and Safety," *Annals of the New York Academy of Sciences,* 1542 no. 1 (2024): 388, 399, https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15244.

[cclxxiv] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 48, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.

[cclxxv] "FEMA Flood Map Service Center," Federal Emergency Management Agency (FEMA), accessed December 23, 2025, https://msc.fema.gov/portal/search?AddressQuery=670%20Stoneleigh%20Ave%2C%20Lake%20Carmel%2C%20NY%2010512.

[cclxxvi] "FEMA Flood Map Service Center," Federal Emergency Management Agency (FEMA), accessed January 7, 2026, https://msc.fema.gov/portal/search?AddressQuery=670%20Stoneleigh%20Ave%2C%20Lake%20Carmel%2C%20NY%2010512.

[cclxxvii] "Climate change," World Health Organization (WHO), October 12, 2023, https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health.

[cclxxviii] Janice Barnes et al., "New York State Climate Impacts Assessment Chapter 07: Human Health and Safety," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 385-445, https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15244.

[cclxxix] "Putnam County Health Indicators by Race and Ethnicity, 2020-2022," New York State Department of Health, last modified November 2024, https://www.health.ny.gov/community/health_equity/reports/county/putnam.htm.

[cclxxx] New York State Department of Health, *Prevalence of Obesity Among New York State Adults by County, BRFSS 2021*, (New York State, 2023), https://www.health.ny.gov/statistics/prevention/injury_prevention/information_for_action/docs/2023-03_ifa_report.pdf.

[cclxxxi] Janice Barnes et al., "New York State Climate Impacts Assessment Chapter 07:Human Health and Safety," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 399, https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15244.

[cclxxxii] "Putnam County Medical Reserve Corps," Putnam County, accessed January 7, 2026, https://www.putnamcountyny.gov/mrc.

[cclxxxiii] "Putnam County, New York," United States Census Bureau, accessed February 20, 2026, https://data.census.gov/profile/Putnam_County,_New_York?g=050XX00US36079#employment.

[cclxxxiv] Hudson Valley Regional Council (HVRC), *2025-2030 Comprehensive Economic Development Strategy* (Hudson Valley Regional Council, 2025), 28, https://hudsonvalleyregionalcouncil.org/wp-content/uploads/2025/10/2025-2030HVRC-CEDS-Adopted20250917.pdf.

[cclxxxv] "Climate Change Impacts, Vulnerability, and Equity," New York State Climate Impacts Assessment, accessed February 23, 2026, https://nysclimateimpacts.org/explore-the-assessment/new-yorks-land-and-people/climate-change-impacts-vulnerability-and-equity/.

[cclxxxvi] Deborah Aller et al., "New York State Climate Impacts Assessment Chapter 03: Agriculture," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 149, 175, https://doi.org/10.1111%2Fnyas.15192.

[cclxxxvii] "Climate Change Impacts, Vulnerability, and Equity," New York State Climate Impacts Assessment, accessed February 23, 2026, https://nysclimateimpacts.org/explore-the-assessment/new-yorks-land-and-people/climate-change-impacts-vulnerability-and-equity/.

[cclxxxviii] "Disadvantaged Communities," New York State Energy Research and Development Authority (NYSERDA), accessed February 11, 2026, https://www.nyserda.ny.gov/ny/Disadvantaged-Communities.

[cclxxxix] Julie M. Lawhorn, *Areas of Economic Distress for EDA Activities and Programs*, CRS Report No. IF12074 (Congressional Research Service, 2024), https://www.congress.gov/crs-product/IF12074.

[ccxc] Agency for Toxic Substances and Disease Registry (ATSDR), *CDC/ATSDR Social Vulnerability Index 2022: Putnam County, NY* (United States Centers for Disease Control and Prevention (CDC), 2024), accessed January 9, 2026, https://svi.cdc.gov/Documents/CountyMaps/2022/New%20York/NewYork2022_Putnam%20County.pdf.

[ccxci] Luis Aguirre-Torres et al., "New York State Climate Impacts Assessment Chapter 08: Society and Economy," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 472-473, https://doi.org/10.1111%2Fnyas.15199.

[ccxcii] "QuickFacts: Putnam County, New York," United States Census Bureau, accessed January 28, 2026, https://www.census.gov/quickfacts/fact/table/putnamcountynewyork.

[ccxciii] Luis Aguirre-Torres et al., "New York State Climate Impacts Assessment Chapter 08: Society and Economy," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 475, https://doi.org/10.1111%2Fnyas.15199.

[ccxciv] United States Census Bureau, American Community Survey 1-Year Estimates: Data Profiles (Table DP02, "Select Social Characteristics in the United States," 2024), accessed December 23, 2025, https://data.census.gov/table/ACSDP1Y2024.DP02?q=DP02&g=050XX00US36079.

[ccxcv] Luis Aguirre-Torres et al., "New York State Climate Impacts Assessment Chapter 08: Society and Economy," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 473-474, https://doi.org/10.1111%2Fnyas.15199.

[ccxcvi] United States Census Bureau, American Community Survey 1-Year Estimates: Subject Tables (Table S0101, "Age and Sex," 2024), accessed January 12, 2026, https://data.census.gov/table/ACSST1Y2024.S0101?q=age+and+sex+of+population+of+putnam+county+ny.

[ccxcvii] Luis Aguirre-Torres et al., "New York State Climate Impacts Assessment Chapter 08: Society and Economy," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024), 474-475, https://doi.org/10.1111%2Fnyas.15199.

[ccxcviii] "Climate Change Impacts, Vulnerability, and Equity," New York State Climate Impacts Assessment, accessed February 23, 2026, https://nysclimateimpacts.org/explore-the-assessment/new-yorks-land-and-people/climate-change-impacts-vulnerability-and-equity/.

[ccxcix] "QuickFacts: Putnam County, NY," US Census Bureau, accessed February 23, 2026, https://www.census.gov/quickfacts/fact/table/putnamcountynewyork.

[ccc] Departments of Health of Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, and Westchester Counties, and Partners, *Mid-Hudson Region Community Health Assessment 2025*, (Putnam County, 2025), 33, https://www.putnamcountyny.gov/images/Departments/Department_of_Health/PDF_Documents/CHA.chip/2025-Regional-CHA-1223202.

[ccci] Luis Aguirre-Torres et al., "New York State Climate Impacts Assessment Chapter 08: Society and Economy," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 480, https://doi.org/10.1111%2Fnyas.15199.

[cccii] "FEMA Flood Map Service Center," Federal Emergency Management Agency (FEMA), accessed March 9, 2026, https://msc.fema.gov/portal/search.

[ccciii] Evan Bush, "Under Water: How FEMA's Outdated Flood Maps Incentivize Property Owners to Take Risks," NBC News, August 12, 2025, https://www.nbcnews.com/science/environment/water-femas-outdated-flood-maps-incentivize-system-risk-negotiable-rcna220529.

[ccciv] "Putnam County Funds Food Insecurity Initiatives," Putnam County, November 7, 2025, https://www.putnamcountyny.gov/county--articles/itemexecutive/putnam-county-funds-food-insecurity-initiatives?highlight=WyJjYXAiXQ==.

[cccv] "The Putnam County Food System Coalition," Cornell Cooperative Extension: Putnam County, accessed February 23, 2026, https://cceputnamcounty.org/food-nutrition/the-putnam-county-food-system-coalition.

[cccvi] "Putnam County Food Access Map," Cornell Cooperative Extension: Putnam County, November 3, 2025, accessed February 23, 2026, https://www.google.com/maps/d/viewer?mid=17vLcgxxvzcHmIWI8RP_slE2DsjHV2pU&ll=41.466310927070346%2C-73.76911424506443&z=11.

[cccvii] " Bountiful Meals," Cornell Cooperative Extension: Putnam County, accessed February 23, 2026, https://cceputnamcounty.org/food-nutrition/bountiful-meals.

[cccviii] "Mobile Food Pantry Trucks", Meals on Main St., accessed March 30, 2026, https://www.mealsonmainst.org/services#mobile-food-pantry-trucks.

[cccix] "Putnam County Food Access Map," Cornell Cooperative Extension: Putnam County, November 3, 2025, accessed February 23, 2026,

https://www.google.com/maps/d/viewer?mid=17vLcgxxvzcHmIWI8RP_sIE2DsjHV2pU&ll=41.466310927070346%2C-73.76911424506443&z=11.

[cccx] "National Register Database and Research," National Park Service (NPS), National Register of Historic Places, https://www.nps.gov/subjects/nationalregister/database-research.htm#table.

[cccxi] "National Register Database and Research," National Park Service (NPS), National Register of Historic Places, https://www.nps.gov/subjects/nationalregister/database-research.htm#table.

[cccxii] "National Register Database and Research," National Park Service (NPS), National Register of Historic Places, https://www.nps.gov/subjects/nationalregister/database-research.htm#table.

[cccxiii] "Putnam County Historian," Putnam County Historian, https://www.putnamcountyny.gov/county-historian#Learn-More-About-This-Program.

[cccxiv] Nicholas B. Rajkovich et al., "New York State Climate Impacts Assessment Chapter 04: Buildings," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024), 231, https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15200.

[cccxv] United States Census Bureau, American Community Survey 1-Year Estimates: Subject Tables (Table S0101, "Age and Sex," 2024), accessed April 3, 2026, https://data.census.gov/table/ACSST1Y2024.S0101?q=age+and+sex+of+population+of+putnam+county+ny.

[cccxvi] "County Projections Explorer," Cornell Program on Applied Demographics, accessed February 23, 2026, https://pad.human.cornell.edu/counties/projections.cfm.

[cccxvii] "Putnam County Office of Senior Resources," Putnam County Office of Senior Resources, accessed February 23, 2026, https://putnamcountyny.gov/osr/#service.

[cccxviii] "Putnam County Youth Bureau," Putnam County Youth Bureau, accessed February 23, 2026, https://www.putnamcountyny.gov/youth-bureau#Coordinated-Youth-and-Family-Services-Project.

[cccxix] "Putnam County Youth Bureau," Putnam County Youth Bureau, accessed February 23, 2026, https://www.putnamcountyny.gov/youth-bureau#Coordinated-Youth-and-Family-Services-Project.

[cccxx] Amy Macdonald et al., "New York State Climate Impacts Assessment Chapter 09: Transportation." *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 501–560, https://doi.org/10.1111/nyas.15198.

[cccxxi] "FEMA Flood Map Service Center," Federal Emergency Management Agency, accessed January 13, 2026, https://msc.fema.gov/portal/search?AddressQuery=%20Putnam%20Hospital%20Center.

[cccxxii] Amy Macdonald et al., "New York State Climate Impacts Assessment Chapter 09: Transportation," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 501–560, https://doi.org/10.1111/nyas.15198.

[cccxxiii] Janice Barnes et al., "New York State Climate Impacts Assessment Chapter 07: Human Health and Safety," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 385–445, https://doi.org/10.1111/nyas.15244.

[cccxxiv] Amy Macdonald et al., "New York State Climate Impacts Assessment Chapter 09: Transportation," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 501–560, https://doi.org/10.1111/nyas.15198.

[cccxxv] Luis Aguirre-Torres et al., "New York State Climate Impacts Assessment Chapter 08: Society and Economy," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 446–500, https://doi.org/10.1111/nyas.15199.

[cccxxvi] "What Does Tourism Mean to Putnam County?," New York State Tourism Industry Association, accessed February 23, 2026, https://www.nystia.org/about/advocacy/nys-economic-impact/putnam.

[cccxxvii] "Find My Library," Putnam County Libraries, accessed February 23, 2026, https://putnamcountylibraries.org/find-my-library/.

[cccxxviii] Discover Putnam New York, *Stay. Play. Explore. Putnam County, NY* (Discover Putnam New York, n.d.), accessed February 23, 2026, https://www.putnamcountyny.gov/images/Departments/Tourism/PDF_Documents/Putnam%20County%20Digital%20Itinineray.

[cccxxix] "Tourism," Putnam County, accessed February 23, 2026, https://www.putnamcountyny.gov/tourism.

[cccxxx] " Explore by Hazard," New York State Climate Impacts Assessment, accessed February 23, 2026, https://nysclimateimpacts.org/explore-the-assessment/explore-by-hazard/.

[cccxxxi] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 40, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.

[cccxxxii] The Chazen Companies, *Putnam County Groundwater Protection and Utilization Plan* (Putnam County, 2004), 35, https://www.putnamcountyny.gov/images/Departments/Soil_Water_Conservation/PDF_Documents/Putnam-GW-Report_Full-Copy.pdf.

[cccxxxiii] Tetra Tech, "Section 4: County Profile," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 40, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-4-County-Profile-121520bk.pdf.

[cccxxxiv] The Chazen Companies, *Putnam County Groundwater Protection and Utilization Plan* (Putnam County, 2004), 29, https://www.putnamcountyny.gov/images/Departments/Soil_Water_Conservation/PDF_Documents/Putnam-GW-Report_Full-Copy.pdf.

[cccxxxv] "New York State Department of Environmental Conservation Water Well Data Search Tool," New York State Department of Environmental Conservation (NYSDEC), https://appfactory.dec.ny.gov/WaterWell/WaterWellData.

[cccxxxvi] "Environmental Health Services," Putnam County Department of Health, https://putnamcountyny.gov/health/environmental.

[cccxxxvii] Putnam County Department of Health

[cccxxxviii] The National Academies of Sciences, Engineering, and Medicine, "1 Introduction," in *Review of the New York City Department of Environmental Protection Operations Support Tool for Water Supply*, (Washington, DC: The National Academies Press, 2018), doi: 10.17226/25218.

[cccxxxix] Gretchen Stevens and Chris Graham, *Town of Kent New York: Natural Resources Inventory 2023* (Town of Kent, 2023), 20, https://www.townofkentny.gov/sites/g/files/vyhlif4576/f/uploads/town_of_kent_natural_resources_inventory_accessible.pdf.

[cccxl] Gretchen Stevens and Chris Graham, *Town of Kent New York: Natural Resources Inventory 2023* (Town of Kent, 2023), 21, https://www.townofkentny.gov/sites/g/files/vyhlif4576/f/uploads/town_of_kent_natural_resources_inventory_accessible.pdf.

[cccxli] "Drought and Your Well," Vermont Department of Health, https://www.healthvermont.gov/environment/drinking-water/drought-and-your-well.

[cccxlii] "Information for Private Well Owners During a Drought," Commonwealth of Massachusetts, https://www.mass.gov/info-details/information-for-private-well-owners-during-a-drought#faq-private-well-problems-experienced-during-droughts.

[cccxliii] Tetra Tech, "Section 5.4.2: Drought," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 7-8, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.2-Drought_121520_Dfs.pdf.

[cccxliv] Tetra Tech, "Section 5.4.6: Harmful Algal Bloom," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 9, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.6-HAB-121520_dfs.pdf.

[cccxlv] Tetra Tech, "Section 5.4.6: Harmful Algal Bloom," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 4, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.6-HAB-121520_dfs.pdf.

[cccxlvi] Tetra Tech, "Section 5.4.6: Harmful Algal Bloom," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 2, 10, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.6-HAB-121520_dfs.pdf.

[cccxlvii] "Environmental Health Services," Putnam County Department of Health, https://putnamcountyny.gov/health/environmental.

[cccxlviii] "Harmful Algal Blooms," Putnam County Department of Health, accessed March 3, 2026, https://putnamcountyny.gov/health/beaches.

[cccxlix] Tetra Tech, "Section 5.4.10: Wildfire," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 18, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.10-Wildfire-121520dfs.pdf.

[cccl] "Air Quality Health Advisory Issued for New York City Metro, Lower Hudson Valley, Upper Hudson Valley, Adirondacks, Eastern Lake Ontario, and Central and Western New York Regions," New York State Department of Environmental Conservation (NYSDEC), August 4, 2025, https://dec.ny.gov/news/press-releases/2025/8/air-quality-health-advisory-issued-for-new-york-city-metro-lower-hudson-valley-upper-hudson-valley-adirondacks-eastern-lake-ontario-and-central-and-western-new-york-regions-0.

[cccli] "Environmental Resource Mapper," New York State Department of Environmental Conservation (NYSDEC), accessed December 17, 2025, https://gisservices.dec.ny.gov/gis/erm/.

[ccclii] " Environmental Resource Mapper," New York State Department of Environmental Conservation (NYSDEC), accessed December 17, 2025, https://gisservices.dec.ny.gov/gis/erm/.

[cccliii] Sheila S. Hess et al., "New York State Climate Impacts Assessment Chapter 05: Ecosystems," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 253–340, https://doi.org/10.1111/nyas.15203.

[cccliv] "Ecosystems Chapter Summary," New York State Climate Impact Assessment, https://nysclimateimpacts.org/explore-the-assessment/explore-by-sector/ecosystems-summary/.

[ccclv] Christopher Lamie et al., "New York State Climate Impacts Assessment Chapter 02: New York State's Changing Climate," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 91-145, https://doi.org/10.1111/nyas.15240.

[ccclvi] "Ecosystems Chapter Summary," New York State Climate Impact Assessment, https://nysclimateimpacts.org/explore-the-assessment/explore-by-sector/ecosystems-summary/.

[ccclvii] Sheila S. Hess et al., "New York State Climate Impacts Assessment Chapter 05: Ecosystems," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 263, https://doi.org/10.1111%2Fnyas.15203.

[ccclviii] Sheila S. Hess et al., "New York State Climate Impacts Assessment Chapter 05: Ecosystems," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 253–340, https://doi.org/10.1111/nyas.15203.

[ccclix] Tetra Tech, "Section 5.4.2: Drought," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 5-7, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-5.4.2-Drought_121520_Dfs.pdf.

[ccclx] "Climate Impact Spotlight: The South Hudson Region," New York Climate Impacts Assessment, accessed December 19, 2025, https://nysclimateimpacts.org/explore-by-region/the-south-hudson-region/.

[ccclxi] Tetra Tech, "Section 9.1: Putnam County," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 22, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-9.1-Putnam-County-122320_dfs1.pdf.

[cccliii] University of Rhode Island (URI) Cooperative Extension, *Understanding Storm Drains and Sewer Systems* (University of Rhode Island Cooperative Extension, last modified 2017), https://dem.ri.gov/sites/g/files/xkgbur861/files/ri-stormwater-solutions/documents/2.UnderstandingStormDrains.Factsheet.pdf.

[ccclxiii] Tetra Tech, "Section 9.1: Putnam County," in *Putnam County Hazard Mitigation Plan* (Putnam County, 2021), 15-21, https://www.putnamcountyny.gov/images/Departments/Emergency_Services/mitigation/2021/Section-9.1-Putnam-County-122320_dfs1.pdf.

[ccclxiv] "Putnam County Parks & Recreation," Putnam County Parks & Recreation, https://www.putnamcountyny.gov/parks-recreation.

[ccclxv] "Putnam County Department of Public Works (DPW)," Putnam County Department of Public Works (DPW), https://www.putnamcountyny.gov/public-works.

[ccclxvi] "Putnam County Parks & Recreation," Putnam County Parks & Recreation, https://www.putnamcountyny.gov/parks-recreation.

[ccclxvii] "Putnam County Parks & Recreation," Putnam County Parks & Recreation, https://www.putnamcountyny.gov/parks-recreation.

[ccclxviii] Janice Barnes et al., "New York State Climate Impacts Assessment Chapter 07: Human Health and Safety," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 293-294, https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15244.

[ccclxix] "Protect Yourself From the Dangers of Extreme Heat," United States Centers for Disease Control and Prevention (CDC), June 25, 2024, https://www.cdc.gov/climate-health/php/resources/protect-yourself-from-the-dangers-of-extreme-heat.html.

[ccclxx] Sheila S. Hess et al., "New York State Climate Impacts Assessment Chapter 05: Ecosystems," *Annals of the New York Academy of Sciences* 1542, no. 1 (2024): 253–340, https://doi.org/10.1111/nyas.15203.

[ccclxxi] Putnam County Records

[ccclxxii] "Tilly Foster Farm," Putnam County, https://www.putnamcountyny.gov/component/jbusinessdirectory/companies/tilly-foster-farm?Itemid=101.

[ccclxxiii] Putnam County Agricultural & Farmland Protection Board, *An Agricultural and Farmland Protection Plan for Putnam County: Agricultural Opportunities & Challenges in Putnam County* (Putnam County, 2004), 3, https://www.putnamcountyny.gov/images/Departments/Soil_Water_Conservation/Keep%20Putnam%20Farming/PDF_Documents/Final-Plan-08-04.pdf.

[ccclxxiv] Putnam County Agricultural & Farmland Protection Board, *An Agricultural and Farmland Protection Plan for Putnam County: Agricultural Opportunities & Challenges in Putnam County* (Putnam County, 2004), 3, https://www.putnamcountyny.gov/images/Departments/Soil_Water_Conservation/Keep%20Putnam%20Farming/PDF_Documents/Final-Plan-08-04.pdf.

[ccclxxv] "Agriculture Chapter Summary," New York State Climate Impacts Assessment, https://nysclimateimpacts.org/explore-the-assessment/explore-by-sector/agriculture-summary/.

[ccclxxvi] "Agriculture Chapter Summary," New York State Climate Impacts Assessment, https://nysclimateimpacts.org/explore-the-assessment/explore-by-sector/agriculture-summary/.

[ccclxxvii] "PE7 Action: Climate Vulnerability Assessment," New York State Climate Smart Communities, accessed January 13, 2026, climatesmart.ny.gov/actions-certification/actions#open/action/85.

[ccclxxviii] CCARP Template p. 21.

[cclxxix] Exploring and Identifying Indicators, Resilience Metrics, accessed March 5, 2026, https://resiliencemetrics.org/indicators-metrics/exploring-identifying.