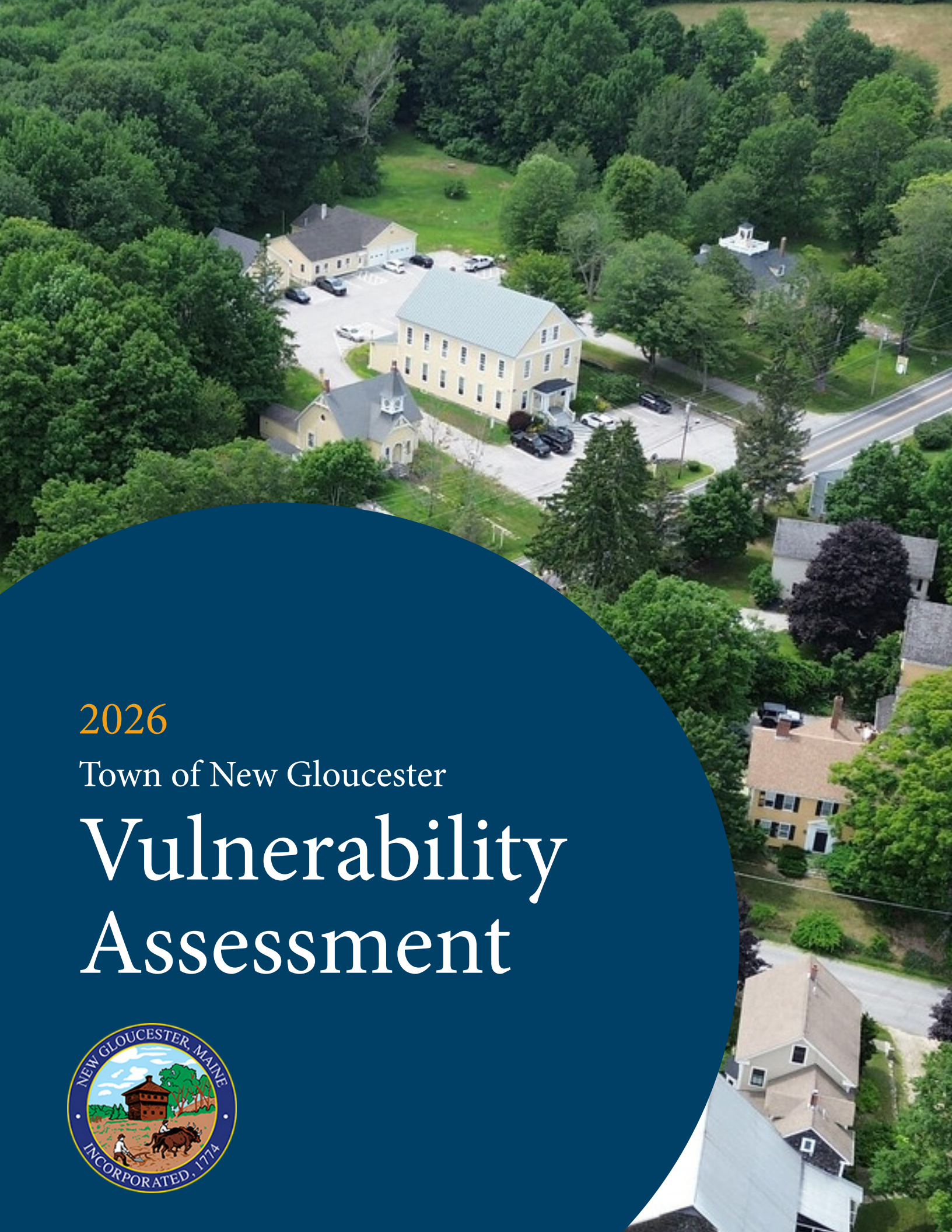

2026

Town of New Gloucester

Vulnerability Assessment

Acknowledgements

New Gloucester Environmental Resource Committee members

New Gloucester Town Staff

New Gloucester Select Board

Sabbathday Lake Association

Royal River Conservation Trust

BLING

GPCOG

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Section 1

INTRODUCTION

Section 1

INTRODUCTION

Climate change is already affecting our community by bringing rising temperatures, more frequent extreme weather events, and shifting precipitation patterns that threaten our health, infrastructure, and environment. However, local solutions through coordinated planning and action are within reach. On a community scale, we can build resilience and capacity to adapt to climate hazards, reduce existing vulnerabilities, and take steps to mitigate future impacts. Recognizing the need to prepare for these challenges, New Gloucester is completing a climate vulnerability assessment to provide a clear understanding of the people, places, and systems most at risk. By identifying vulnerabilities and the factors that drive them, this assessment will guide informed decision-making, help prioritize adaptation strategies, and strengthen our community's resilience both now and into the future.

The Vulnerability Assessment is not designed to be an indicator of definitive problems that will occur, nor dive into site-specific evaluations. Rather, it highlights areas that may need further study and provide guidance on what could be most at risk in the coming years due to climate change. It is designed to be adaptive, with the ability to be updated as new information becomes available.

WHAT IS CLIMATE VULNERABILITY?

Vulnerability to climate change is generally defined as the degree to which a system, community, or ecosystem is likely to experience harm due to its exposure to climate-related hazards, its sensitivity to its impacts, and ability to effectively adapt. Vulnerability increases as exposure to hazards increases and is further exacerbated when the sensitivity of a system to that hazard is greater and the capacity to adapt or respond is lower. For this report, exposure is largely used as a proxy for vulnerability and risk. Sensitivity and adaptive capacity are more qualitative in nature or require more extensive, individualized studies to evaluate. However, these components were taken into account when determining priorities.

Exposure
The extent and duration to which a resource comes into contact with a climate hazard. For example, a roadway being in an area prone to flooding.

Sensitivity
The degree to which a resource is impacted by the climate hazard, directly or indirectly. For example, a pump station might be more sensitive to the impacts of flooding than a roadway. This can also include the condition of the resource. For example, a house that is well maintained with a new roof is less sensitive to wind damage than a house that is already in need of repairs.

Adaptive Capacity
The ability or potential for the resource to respond to the climate hazard. For example, a neighborhood with many road connections will be able to navigate one flooded roadway compared to a neighborhood with a single access point.

Setting the Foundation

In 2023, with the support of 207Permaculture, New Gloucester enrolled in the Governor's Office of Policy Innovation and the Future (GOPIF) Community Resilience Partnership to take action in reducing greenhouse gas emissions and preparing for the effects of climate change. Through the Partnership, New Gloucester was awarded a Community Action Grant to conduct a Climate Vulnerability Assessment. The Climate Vulnerability Assessment aligns with many of the goals outlined in the 2021 New Gloucester Comprehensive Plan, including protecting natural resources, preserving New Gloucester history, supporting the economy, maintaining transportation and infrastructure, and ensuring the local government continues to provide valuable resources. It also expands on the suggestions and priorities developed during the Community Resilience Partnership enrollment process. The Town partnered with the Greater Portland Council of Governments to complete this assessment and conduct community engagement.

Sources: Building a Foundation for Regional Resilience New Gloucester Comprehensive Plan

1.1 Data and Methodology

This report relies on national, state, regional, and local data to assess climate hazards, historical records, future projections, and impacts on local assets. There is currently limited hyper-local data on climate hazards and much of the modeling being done is at the regional or state level. Therefore, this assessment relies primarily on information from the Maine Climate Council's Scientific and Technical Subcommittee "Scientific Assessment of Climate Change and Its Effects in Maine". Since there is a lack of localized data collection tools, such as air quality monitoring sites, this assessment uses regional data with specific discussions of New Gloucester's particular context when possible.

The data analysis for this vulnerability assessment generated quantitative risk-based information on how the community, infrastructure, and natural resources in New Gloucester are exposed to climate hazards, particularly inland flooding. When assessing specific resource vulnerabilities, this report uses town-provided data—both quantitative and qualitative—where available and is supplemented with state provided data but analyzed at the local level.

Information on the sensitivity and adaptive capacity of existing assets is qualitative and provided by town staff and community engagement. The report is made in collaboration with the New Gloucester Environmental Resources Committee and town staff. Local and qualitative data relies on input from municipal staff, committees, community organizations and the public through surveys, workshops, interviews, and community conversations.

This assessment uses the best available data and modeling tools; however, every dataset has limitations. The State of Maine and regional partners continue to research climate change and provide updated models, data, and resources. As improved data and more powerful models become available, this vulnerability assessment will need to be updated and refined.

UNCERTAIN CLIMATE FUTURE

Climate modeling experts develop global climate projection scenarios and pathways to explore future emissions, related impacts and risks, and possible mitigation and adaptation strategies. These modeled scenarios and pathways are based on a range of assumptions including carbon dioxide concentrations, and socio-economic variables, and only provide a hypothetical future that could unfold give the presence or absence of climate policies. Therefore, how communities prepare for and adapt to climate change will impact what the future will look like. To read more about potential climate change scenarios, please visit the IPCC's most recent climate assessment and the Fifth National Climate Assessment.

Inland Flooding

Inland flooding poses challenges to daily travel and access to resources, but also threatens the properties, businesses, and natural resources within New Gloucester's boundary. Inland flooding maps show the result of projected precipitation and where critical assets may be flooded during these storms. To determine the impacts of 100-year floods, particularly along inland waterways, this report uses 2050 projected 100-year flooding data from First Street Foundation's Flood Factor.[1]

This report uses data from Flood Factor to assess inland flooding exposure rather than FEMA Floodplain Management. While FEMA floodplain information reflects current estimates and historic flood risk, it does not project future risk under a changing climate. Most notably, it does not consider increased precipitation. Flood Factor includes flooding from all types in its application – rain, river, tidal and storm surge. According to First Street, by not accounting for precipitation, FEMA's Special Flood Hazard Area (SFHA) designation leaves over half of the country's risk unaddressed.[1] However, Flood Factor uses a single methodology on a national scale, which may limit accuracy at a local level. Currently this is the best available data, this data should be checked frequently and updated as new and better data is created.

1 First Street Foundation. Flood Factor Methodology

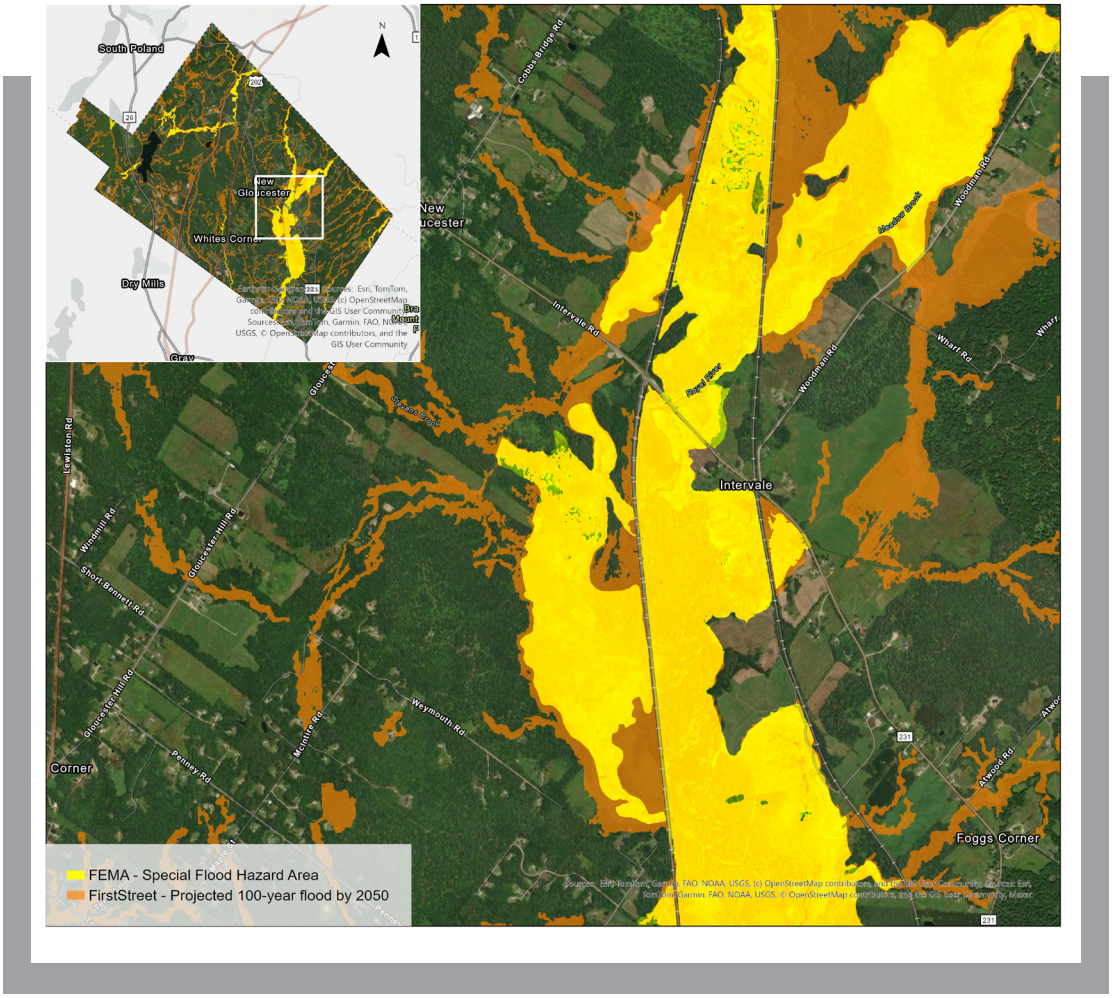


Figure 1: Example of the difference between First Street Foundation's Flood Factor and FEMA Floodplain. If New Gloucester wishes to calculate more localized projections, it can explore developing site-specific flood modeling to account for factors such as local topography and elevation.

Census Data

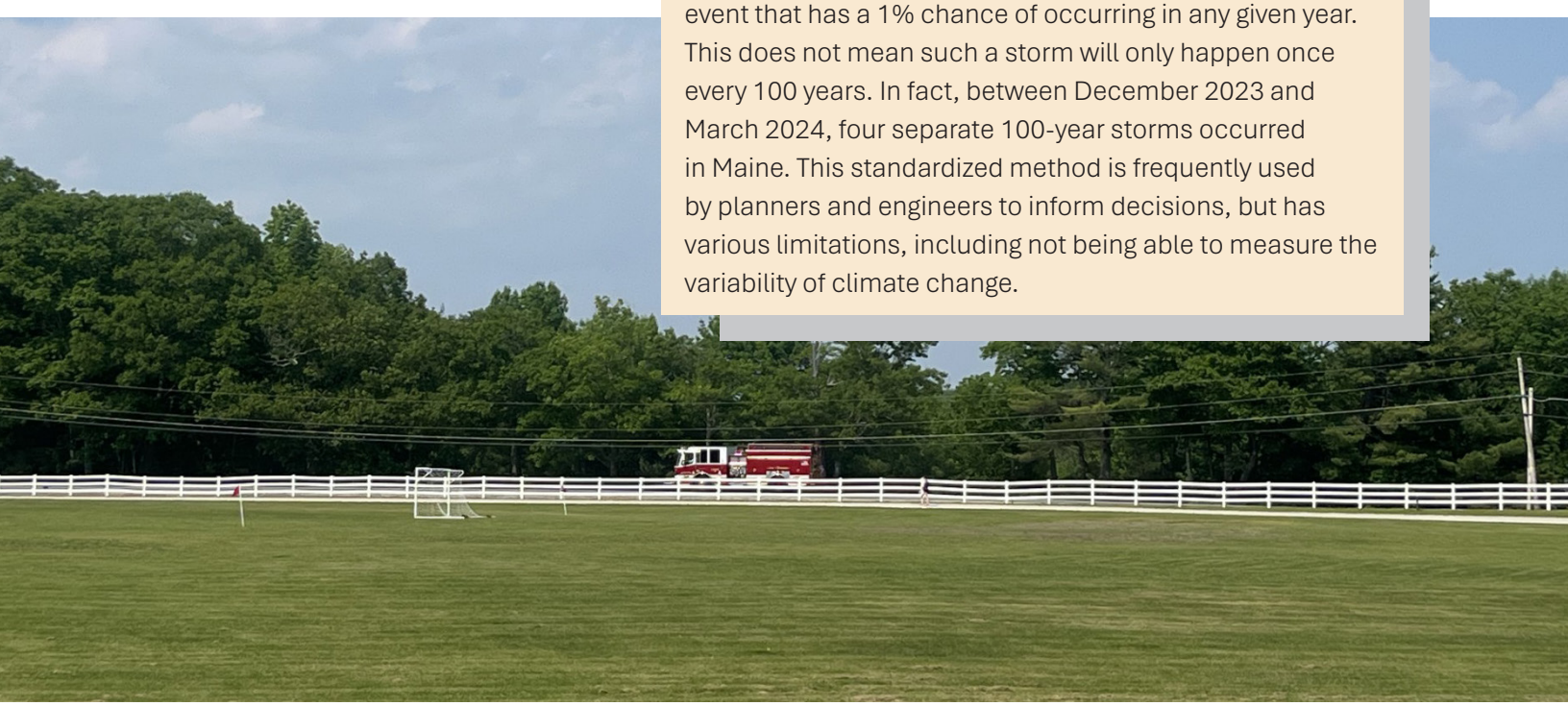
To develop a better understanding of populations at risk, this analysis uses the U.S. Census data to identify populations with the potential for high social vulnerability. Demographic data in this report relies primarily on American Community Survey (ACS) 5-year estimates (2019-2023) from the U.S. Census Bureau. ACS data is collected yearly by surveying only a portion of households and uses the results to estimate characteristics for the whole community. As a result, in a community like New Gloucester, the ACS estimates may be imperfect.

For example, typically people who respond to the census survey have higher average incomes, education levels, and homeownership rates than those who do not. This means that census data historically undercounts underrepresented populations. Although the data is flawed, it still provides New Gloucester with baseline information and the ability to compare shifts in demographics. Where possible this report provides supplemental local data or anecdotes provided by the community to better understand the local context. New Gloucester recognizes the limitations in this data and will try to refine its understanding of at-risk populations by working with emergency management staff and local community organizations to continually assess community risk.

Factors for analysis were determined based on the **Maine Social Vulnerability Index and the CDC's Social Vulnerability Index** to highlight New Gloucester's social vulnerability. The Maine Social Vulnerability Index developed for the Maine Climate Council identifies 19 social demographic characteristics that contribute to an individual's or household's vulnerability to climate impacts.[1]

100-year Storm Metric

The data in this report will often use a 100-year storm metric to assess risk. A "100-year storm" refers to a rainfall event that has a 1% chance of occurring in any given year. This does not mean such a storm will only happen once every 100 years. In fact, between December 2023 and March 2024, four separate 100-year storms occurred in Maine. This standardized method is frequently used by planners and engineers to inform decisions, but has various limitations, including not being able to measure the variability of climate change.



1 A lifeline and social vulnerability analysis of sea level rise impacts on rural coastal communities

1.2 Community Engagement

Qualitative data through public feedback played an integral role in shaping the final conclusions of this report, and various responses will be highlighted throughout the sections. Residents, local businesses, community organizations, and town committees and staff all played vital roles in shaping this plan. Through workshops, surveys, and conversations, the community shared their input and priorities, helping to ground truth the data and refine the plan's recommended actions.

Project Website

GPCOG created a project website to serve as a central resource for information created during the process, provide opportunities for community input, and share project updates.

Survey

A Climate Concerns Survey was hosted online from February 2025 to September 2025. A total of 75 community members responded anonymously, sharing their perspectives on: 1) specific concerns about climate impacts, 2) particularly vulnerable locations or populations within the town, and 3) local resources, challenges, and priorities. The survey was promoted through flyers, social media, and the project website, and was highlighted at each community engagement event.

Staff and Committee Input

Throughout the process, the Environmental Resources Committee (ERC) and town staff shared their feedback to help co-create the plan. The ERC and Town Staff have intimate knowledge of the resources required to accomplish actions and the landscape of other projects, priorities, and policies of the town. Town committees, with the support of Town staff, will be responsible for implementing the recommendations listed in this plan, and our collective success will rely on active collaboration, information-sharing, and clarity around roles and accountability.

First Public Workshop

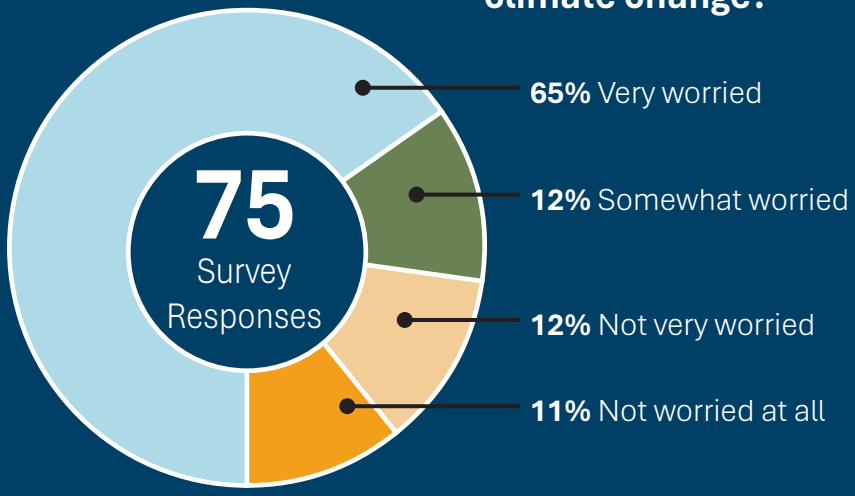
The first workshop was held in April 2025 to provide an overview of the project process, present on the climate hazards affecting New Gloucester, and showcase the initial analysis of vulnerabilities identified for the town. The public was encouraged to provide feedback, as questions, and share input that helped refine the analysis and provide qualitative data to guide the final report.

Second Public Workshop

The second public workshop will be held following completion of the assessment to present the findings highlighted in this report and discuss prioritization for addressing vulnerabilities. The workshop will also kick off community education events to help residents be better equipped to adapt to and mitigate impacts from climate change.

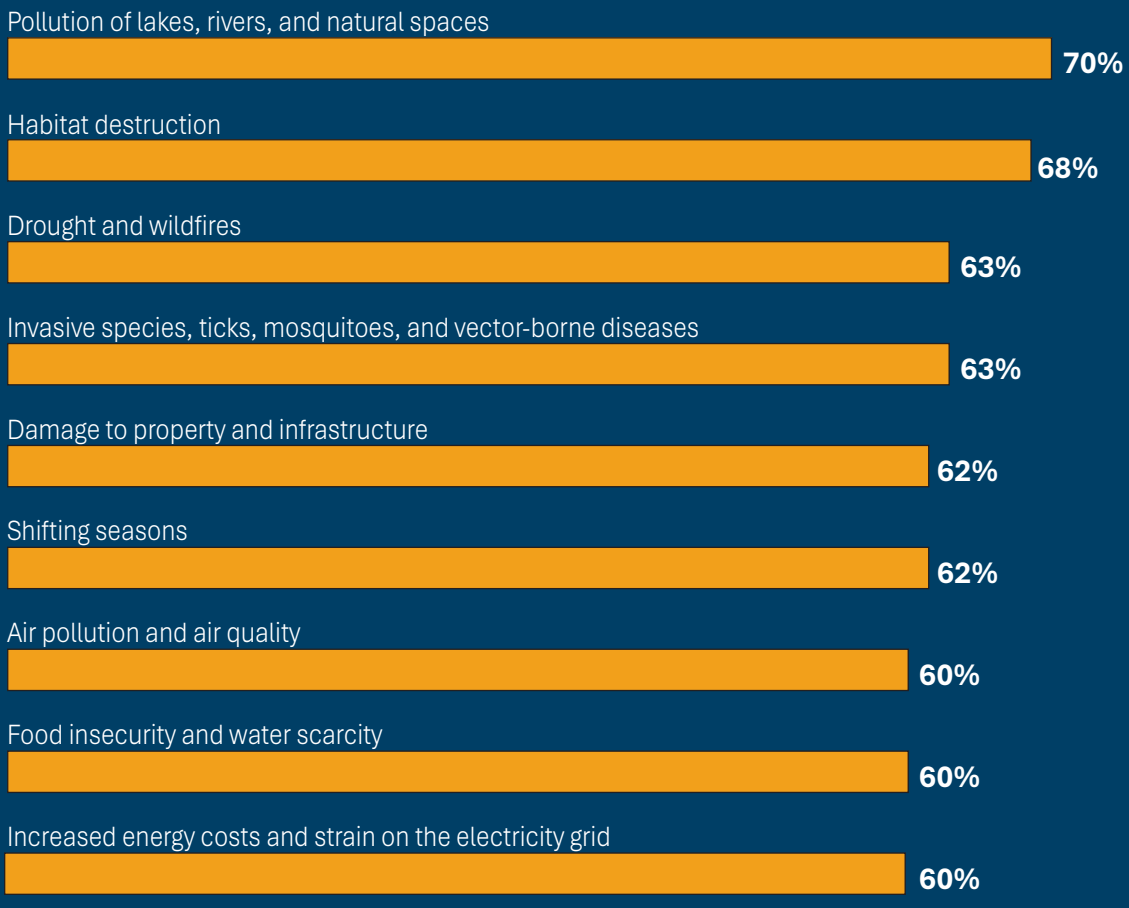
WHAT WE HEARD

How worried are you about climate change?



Think it is **very important** for New Gloucester to do something about climate change

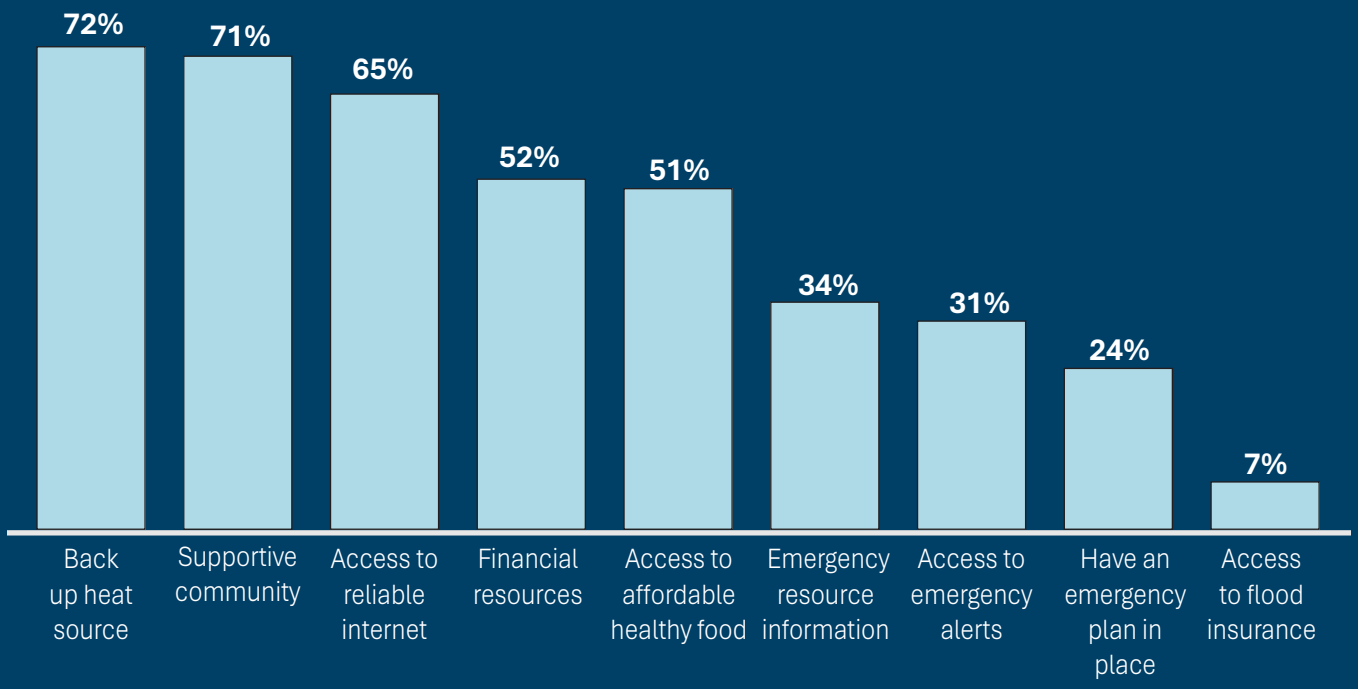
What climate impacts, if any, are you most concerned about?



WHAT WE HEARD

62% of respondants say **cost** is the biggest barrier they face for reducing emissions and decreasing the risk of climate impacts

How do you feel prepared for the challenge of climate change?



> *We all need to* **take climate change seriously**, *and protect the world for future generations.*

> *I am concerned about accommodating a potential* **popoulation growth without sacrificing the natural resources** *and character of New Gloucester and Maine in general.*

> **Rising sea levels with have impacts on upstream communities** *and ecosystems, and are not just confined to the immediate coast.*

> *New Gloucester is a small town with a limited budget. Please* **don't waste your time or our tax dollars** *on this climate change hoax*

1.3 Road map

The Vulnerability Assessment is divided into **three main sections:**

1. Identification of Climate Hazards: Identify regional climate hazards affecting New Gloucester and the broader region.

2. Analysis of At-Risk Populations and Resources: Identify and map community populations and resources most at risk, including an explanation of importance and recommendations for how to reduce the vulnerabilities.

3. **Recommendations for Priority Actions:** Suggest priority actions based on the assessment's findings and community feedback.

Resource Prioritization

In the analysis section under "Reducing Vulnerabilities", resources are rated on a scale from low to high as suggested prioritization for future implementation. While every identified risk requires attention, we recognize that the Town has limited capacity and financial resources to address all issues simultaneously. Therefore, the assigned urgency ratings to each topic helps strategically guide the Town's response efforts. The prioritization is based on staff, committee, and public feedback as well as the data analysis conducted in this report. Having a 'low' rating does not mean the resource is not important, but rather it doesn't rise to the same risk level as another resource. The recommendations presented are not exhaustive but provide a curated selection of practical ideas to support effective risk mitigation and resilience building.

1.4 Building a Resilient Community

This report examines New Gloucester's vulnerabilities to climate change to better understand the risks the community is facing. While such an assessment can sometimes feel "doom and gloom," it is equally important to recognize that both the town and residents are already taking meaningful steps to address these challenges and strength community resilience. Here we highlight current adaptation efforts, resources that support our resilience, and opportunities for future action. In the following section, for each of the resources analyzed we provide recommendations and potential next steps to further build our capacity to adapt to climate change.

SABBATHDAY LAKE ASSOCIATION
is a non-profit dedicated to protecting the water quality and natural ecosystem of Sabbathday Lake and its watershed. They take initiative in providing conservation education, conducting a water quality monitoring annual study, surveying the lake for invasive plants, and providing courtesy boat inspections among other projects that support New Gloucester's ecosystems.

ROYAL RIVER CONSERVATION TRUST
is a non-profit focused on conserving and protecting the natural, recreational, scenic, agricultural, and historic resources of the land within the Royal River watershed. The Trust leads land conservation efforts through acquisition, stewardship, and long-term management, while also providing educational programs and fostering community engagement. Collaborating with private landowners, municipalities, and various organizations, it has already protected over 6,020 acres of land and supported the creation or expansion of 18 municipal and state parks, preserves, and wildlife areas.

BLING (BUILDING LIVABILITY IN NEW GLOUCESTER)
is a volunteer-led community organization dedicated to making New Gloucester a healthy, active, and safe place welcoming for all ages, especially older adults. They group seeks to expand opportunities, remove barriers, and conduct programs that promote the safety, social connection, recreation, and civic engagement of New Gloucester. BLING has implemented initiatives such as a smoke detectors program, free winter sand buckets, informational events, volunteer transportation for older adults and those with disabilities, social resource gatherings, and emergency supply kits.

What Changes Can a Resident Make?

How you can increase resilience to climate change, reduce your greenhouse gas emissions, and do your part to make New Gloucester a sustainable community:

Engage in Community Action

- Support the efforts of New Gloucester's Environmental Resources Committee
- Attend public town meetings and give input on various planning initiatives
- Collaborate with local organizations and neighbors for community-wide environmental projects
- Spread awareness about climate issues and encourage others to take action

Make energy Efficient Upgrades

- Switch to renewable energy technology such as heat pumps, solar panels, and electric vehicles. Visit Home | Rewiring America to learn more about ways to make the transition.
- Use smart thermostats and energy-efficient appliances
- Consider home insulation upgrades to improve heating and cooling efficiency

Protect fresh water

- Ensure wells are in compliance with ordinances, maintained properly, and regularly tested. Visit Private Drinking Water Wells | US EPA for more information.
- Ensure septic systems are maintained and pumped regularly to prevent water contamination. Visit SepticSmart Education Materials | US EPA for more information.
- Reduce the usage of harmful chemicals such as synthetic pesticides and fertilizers
- Implement rain gardens and permeable surfaces to reduce stormwater runoff

Prepare an Emergency Response Plan

- Identify possible emergency scenarios and develop a plan, utilizing trusted online resources, such as Ready.Gov, to guide the development of your household plan
- Organize a community group to collaborate and coordinate an emergency response plan for your neighborhood

Reduce waste

- Compost organic material
- Recycle properly and reduce consumption of single-use plastics by using reusable bags, bottles, and containers. To learn how to properly recycle and reduce waste, visit Reduce, Reuse, Recycle, Maine Department of Environmental Protection.
- Clean up pet waste

Rethink your Lawn Care:

- Evaluate and reduce phosphorus output
- Plant native plants to encourage native pollinators. Check out this guide to learn about native plants in Maine.
- Properly remove invasives. Learn about Maine's invasive species here: Maine Natural Areas Program, Invasive Plants
- Use organic lawn care practices. View the Maine Organic Farmer and Gardener's Guide.

Waterfront Property Care

- Read Lake's Environmental Homeowner's Guide for best practices for waterfront property owners
- Stabilize shorelines using native vegetation to prevent erosion
- Avoid lawn fertilizers and pesticides

Section 2

CLIMATE HAZARDS

Section 2

CLIMATE HAZARDS

Climate hazards refer to the potential occurrence of climate-related physical events or trends that cause the damage and loss felt by communities. New Gloucester is already beginning to experience warmer air temperatures, increased precipitation, more severe storms, and intense flooding from climate change. These climate hazards degrade infrastructure and pose risks to people, ecosystems, and community assets.

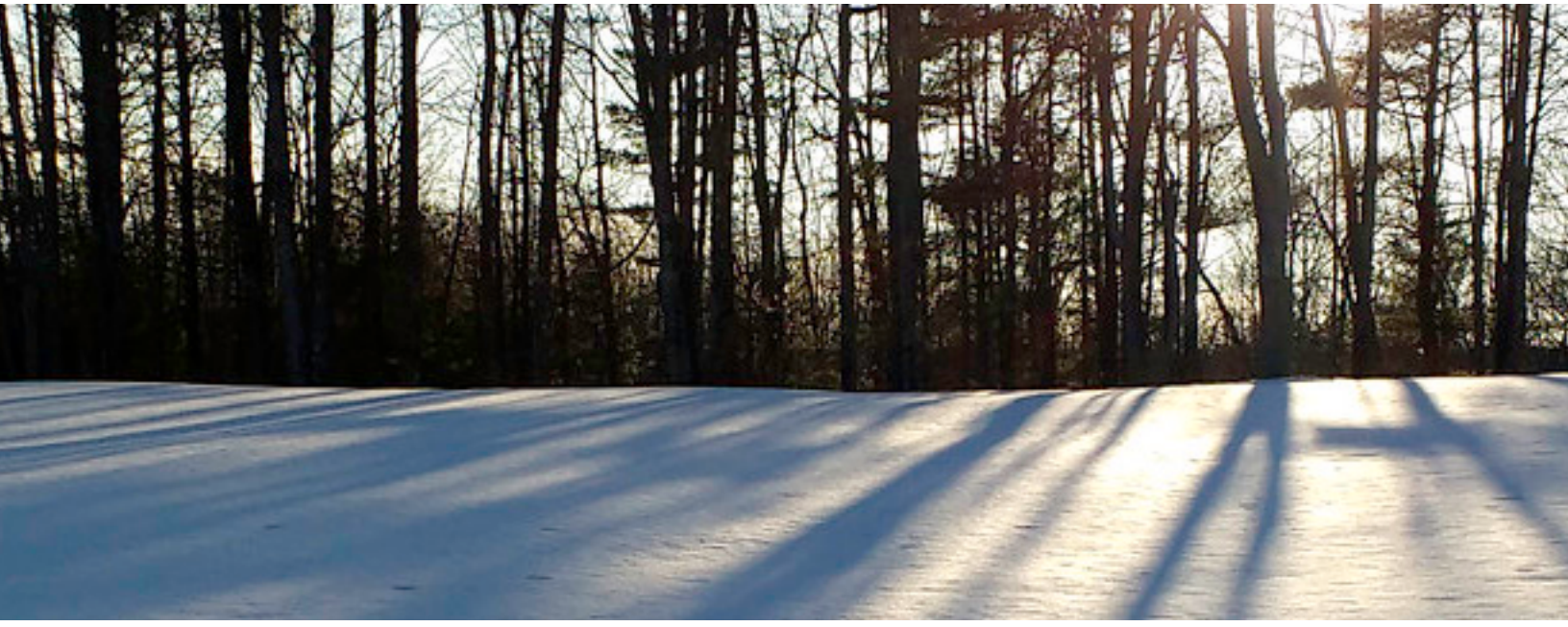
The intensity and frequency of these events have been unprecedented in recent history. Since 1980, the United States has experienced 403 confirmed weather disasters that each led to over a billion-dollar loss.[1] Maine has experienced many of its own climate disasters, including storms that hit in late 2023 and early 2024. The increased severity and intensity of these events have coincided with an overall increase in Earth's average annual temperature due to increased greenhouse gas emissions. Climate hazards combined with existing vulnerabilities have already led to widespread and devastating loss and will continue to wreak havoc.

Since local data is not available, this section relies primarily on regional and state data to assess the historical trends and future projections. This section provides information on the following climate hazards New Gloucester will face, both directly and indirectly:

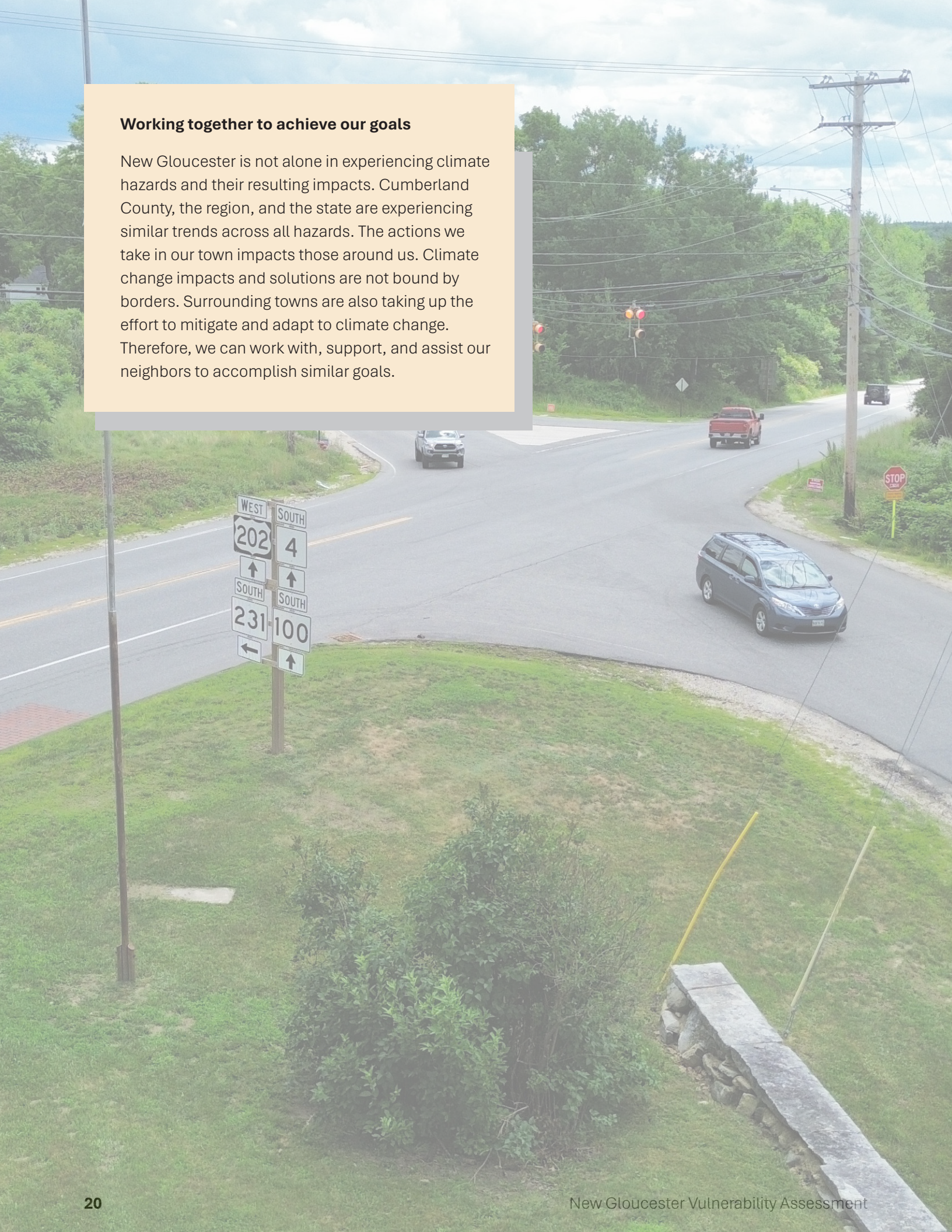
Warming, more variable temperatures

Changing precipitation patterns

Coastal hazards



1 NOAA's National Centers for Environmental Information (NCEI).



Working together to achieve our goals

New Gloucester is not alone in experiencing climate hazards and their resulting impacts. Cumberland County, the region, and the state are experiencing similar trends across all hazards. The actions we take in our town impacts those around us. Climate change impacts and solutions are not bound by borders. Surrounding towns are also taking up the effort to mitigate and adapt to climate change. Therefore, we can work with, support, and assist our neighbors to accomplish similar goals.

2.1 Warmer, More Variable Temperatures

Rising concentrations of greenhouse gases in the atmosphere increases the average annual global temperature. While all regions of the globe will experience impacts from climate change, the Northeast is warming at a faster rate than the global average.[1] The change in temperature alters the seasonal patterns of the region. As temperatures increase, the warm seasons (when the average daily temperature is above freezing) become longer and the cool seasons become shorter.

HISTORICAL TRENDS

Maine has seen an average annual temperature increase of 3.2°F since 1895. Every year since 1997 has been above the yearly average. Winter has warmed 5°F compared to a century ago and is the fastest warming season.

WHAT WE SEE TODAY

The past four years in Maine (2020-2023) have ranked among the ten warmest on record, with 2023 being the second warmest. The average warm season for 2010–2023 is about two weeks longer, and winters about two weeks shorter, in comparison to 1901–2000 the historical climate baseline. Similarly, there has been a two-week increase in the average length of the growing season since 1950.

ROAD AHEAD

As an inland community, New Gloucester has experienced slightly more warming than the state average and is projected to have annual temperatures 3.3° to 4° degrees Fahrenheit higher than 1895 by 2050 and up to 10°F by 2100. The region will experience 20 to 30 more high heat days annually by 2050 and the winter season will shrink by one to two weeks.

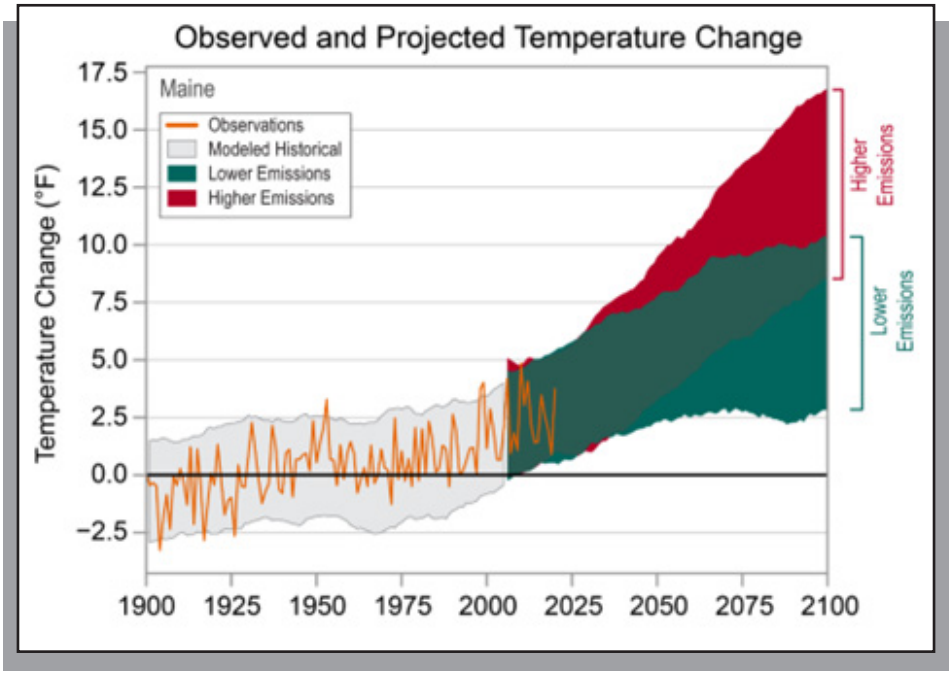


Figure 2: Observed and projected changes in near-surface air temperature for Maine, relative to the 1901–1960 average. Observed data cover the years 1900–2020. Projections for 2006–2100 are based on global climate models under two scenarios: one where greenhouse gas emissions continue to rise (higher emissions) and another where they increase more slowly (lower emissions). Source: NOAA National Centers for Environmental Information [Maine State Climate Summary]

1 Karmalker and Bradley (2017). Consequences of Global Warming of 1.5 °C and 2 °C for Regional Temperature and Precipitation Changes in the Contiguous United States

Impacts

Human

Increased heat-related illnesses

Increased vector-borne diseases (i.e. Lyme)

Strain on the health care system

Worsening air pollution

Changing tourism seasons

Infrastructure

Increased damage to roadways

Increased energy consumption

Ecosystem

Agricultural shifts

Increase frequency of pest outbreaks

Shifting ecosystems (i.e. invasive species)

Why does this change matter?

Changing temperatures not only perpetuate other extreme weather events that threaten lives and infrastructure, but it also has cascading effects on the everyday lives of people, industries, and ecosystems. The human body is able to regulate its internal temperature up to a certain level, but extreme temperatures have spurred many medical conditions and emergencies. Unpredictable temperature changes disrupt the natural cues plants and wildlife rely on, leading to ecological mismatch and imbalance. Many recreational and natural resource industries such as skiing, fishing, and agriculture also rely on the seasonal predictability of weather systems, but as these patterns shift, they face increasing uncertainty and disruption.

WHAT ABOUT EXTREME COLD?

Contrary to what you would expect, increased global temperatures have been contributing to the severity of cold weather events. For example, warmer temperatures lead to higher amounts of moisture in the atmosphere, which intensifies snowstorms. There is also evidence to suggest that disruptions to the polar vortex and jet stream from warmer temperatures can amplify cold weather conditions, although more data is needed to accurately illustrate the effect.[1]

1 NCEI. Climate Change and Extreme Snow in the U.S.

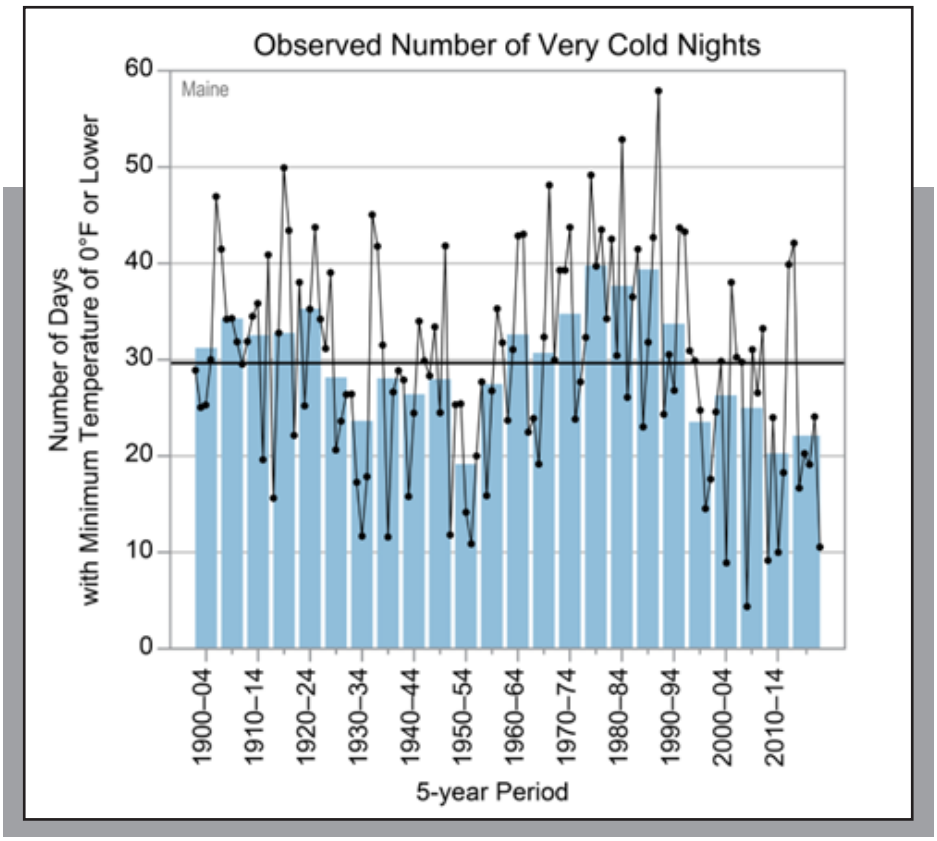


Figure 3: The number of very cold nights in Maine (minimum temperatures of 0°F or lower) is shown annually from 1900 to 2020. Annual values are marked with dots, while bars represent 5-year averages (with the final bar showing a 6-year average). The horizontal black line marks the long-term average of 29.6 nights. Very cold nights occurred more frequently at times, particularly in the 1970s and 1980s. Since the mid-1990s, however, their frequency has stayed below average, reflecting a trend of warmer winters. Source: NOAA National Centers for Environmental Information Maine State Climate Summary 2022.

2.2 Changing Precipitation Patterns

Higher temperatures will increase water evaporation from oceans and freshwater sources, resulting in overall higher humidity. Warmer air holds more moisture causing precipitation events to become more frequent and intense. Not only will total annual precipitation increase, but the frequency of heavy storms will increase. Heavy storms bring more intense rainfall and stronger winds that cover a wider geographic area and last longer. While average annual precipitation is projected to increase, warmer overall temperatures and less snowpack will create the conditions for longer periods of drought. Between periods of precipitation, warmer temperatures will cause higher evaporations rates for lakes, rivers, and other water bodies.

HISTORICAL TRENDS

Annual precipitation in Maine has increased 6 inches since 1895. Maine's climate is getting wetter overall, and although meteorological drought has not historically increased, interannual precipitation has due to the intensification of the hydrological cycle. This means dry periods are becoming drier and wet periods are becoming wetter.

WHAT WE SEE TODAY

Maine now receives 1–2 additional days per year with 2+ inches of precipitation, and 2–3 more days per year with 1 inch of precipitation. Precipitation variability between years is increasing and has recently produced impactful seasonal extremes; for example, the 2020 growing season was the driest on record, and summer 2023 was the wettest. In December 2023, Maine experienced significant flood and wind damage, triggering a disaster declaration in 10 counties.

ROAD AHEAD

Most climate models project more intense cyclones (lower central pressure and increased heavy precipitation), but with an overall decrease in the number of storms as the climate warms.[7] However, future storm frequencies remain uncertain because of model disagreement on average future positions of North Atlantic storm tracks. While future drought trends remain uncertain, warmer temperatures and earlier snowmelt can exacerbate dry conditions when they develop.

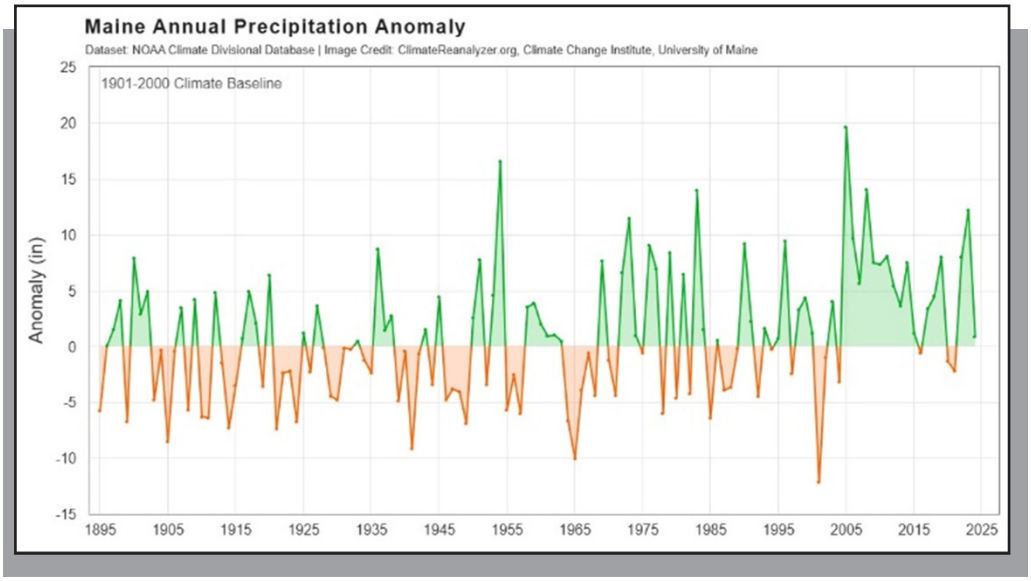


Figure 4: Annual precipitation deviations from the norm from 1895 to 2025. The horizontal zero line indicates the average precipitation for Maine. The positive anomaly value in green indicates that annual precipitation was higher than average, while the negative anomaly in orange indicates that annual precipitation was lower than average. Source: University of Maine Climate Change Institute Climate Reanalyzer.

2.2 Changing Precipitation Patterns

Impacts

Human

Decrease in property and municipal tax base

Decline in water quality

Infrastructure

Coastal and inland flooding

Coastal and inland erosion

Overburdened wastewater systems

Building and roadway damage

Ecosystem

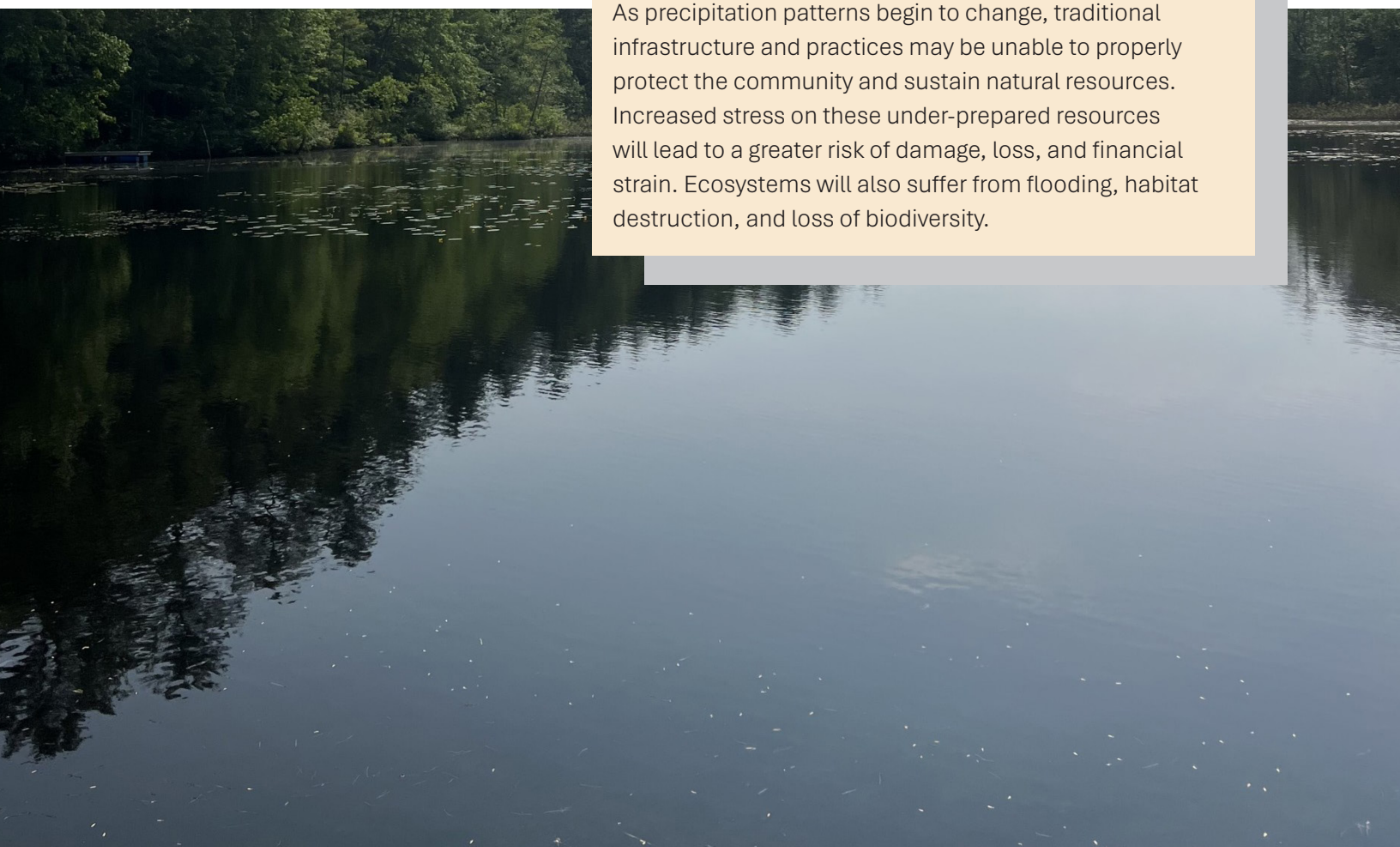
Agriculture damage

Decline in ecosystem health

Wildfires

Why does this change matter?

Precipitation trends influence infrastructure design and maintenance, agricultural choices, water resource management, and planning of emergency services. As precipitation patterns begin to change, traditional infrastructure and practices may be unable to properly protect the community and sustain natural resources. Increased stress on these under-prepared resources will lead to a greater risk of damage, loss, and financial strain. Ecosystems will also suffer from flooding, habitat destruction, and loss of biodiversity.



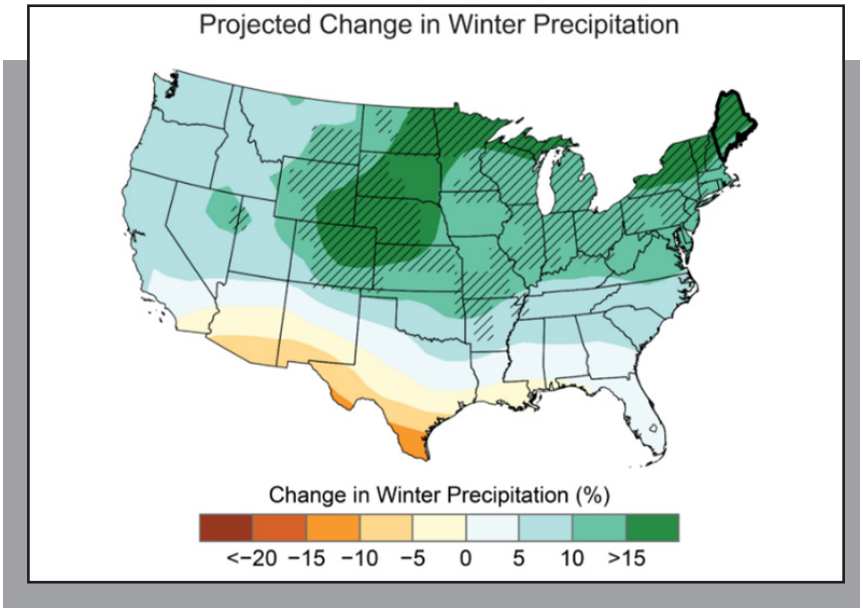


Figure 5: Projected percent change in total winter precipitation (December–February) for the mid-21st century compared to the late 20th century under a higher emissions scenario. Hatched areas indicate where most climate models project a statistically significant change. Maine lies within a broad region across the northeastern and central United States expected to see increased winter precipitation Source: NOAA National Centers for Environmental Information Maine State Climate Summary 2022.

DROUGHT

While average annual precipitation is projected to increase, warmer overall temperatures and less snowpack will create the conditions for longer periods of drought. Droughts are a crippling lack of precipitation over an extended period. While meteorological drought has not increased historically, greater year-to-year precipitation variability is causing more pronounced wet and dry cycles.

Maine, typically considered a “wet” state, experienced 35 statewide droughts from 1990 to 2020. The severe 2020 drought contributed to over 900 wildfires, the highest in a decade. Future atmospheric changes are expected to increase the frequency of short-term (one-to-three month) droughts and reduce summer streamflows. Droughts can create severe impacts, such as drying wells which threaten human health and safety, disruptions to agricultural growing cycles and pest dynamics, and significant stress on forest ecosystems. Source: Maines-Climate-Future-2020-Update

2.3 Coastal Hazards

As an inland town, New Gloucester will not be directly affected by sea level rise or warming ocean waters. However, individuals, such as those with marine-based jobs, would be directly impacted, and the town may experience indirect impacts due to economic shifts, climate migration, or disruptions in the food supply. While New Gloucester does not need to plan for direct coastal impacts, sea level rise and changing ocean conditions are still important factors to consider at a regional scale and are discussed throughout the assessment where applicable to the town.

Sea level rise impacts inland flooding through rivers, streams, estuaries, and lakes. Inland flooding often occurs after periods of intense precipitation, snowpack melting quickly, or dam or levee failure. Regardless, when the volume of water on land surpasses the capacity of drainage systems, flooding results. Sea level rise further perpetuates this phenomenon. Additionally, as inland flooding drains to the sea, it increases chances of coastal destruction and erosion.

Sea Level Rise

HISTORICAL TRENDS

Sea level is 7.5 inches higher than in early 20th century Maine, and the rate of sea level rise has nearly doubled in the past 30 years.

WHAT WE SEE TODAY

Record-high sea levels were measured along the Maine coast in 2023 and 2024. In Portland in 2023, monthly mean sea levels were between 4.8 to 8.4 inches higher than 1991-2009 mean sea level. Since 2010, sea level rise has caused coastal flooding in Portland to occur about three times more often compared to the past century.

ROAD AHEAD

The frequency of minor high tide flooding will increase over the next decade, driven by sea level rise and an increasing tidal range induced by a lunar cycle. Maine commits to manage 1.5 ft of sea level rise by 2050 and 4 ft by 2100, and prepares to manage 3 feet of sea level rise by 2070 and 8.8 feet in the 2120s.

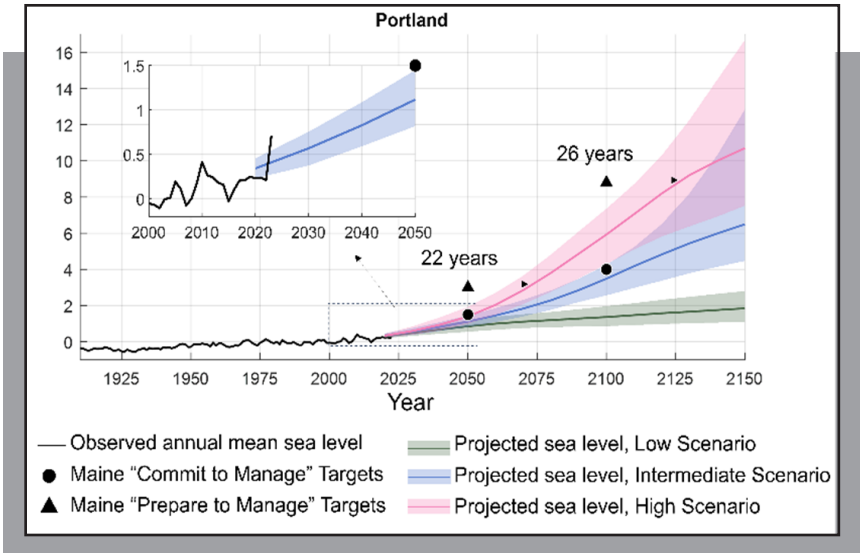


Figure 6: The graph displays historical sea level rise in Portland (black line) from 1900-2150 with projections for three different sea level rise scenarios. Each scenario has a range of likelihood, with the projected line representing a 50% probability. Values are measured in feet above 2000 mean sea level. Source: Gulf of Maine Research Institute, with data from the Scientific Assessment of Climate Change and Its Effects in Maine 2024 Update

Changing Ocean Conditions: Warming Waters and Acidification

HISTORICAL TRENDS

The Gulf of Maine is warming faster than 97% of the world's ocean surface and is experiencing near-constant ocean heat waves.

WHAT WE SEE TODAY

Marine heatwaves have increased in frequency, duration, and intensity in the Gulf of Maine over the past decade. In 2022, sea surface temperature met the heatwave criteria for 353 days, or 97% of the year.

ROAD AHEAD

The Gulf of Maine will experience ocean acidification conditions that are unfavorable for shell growth for most of the year by 2050.

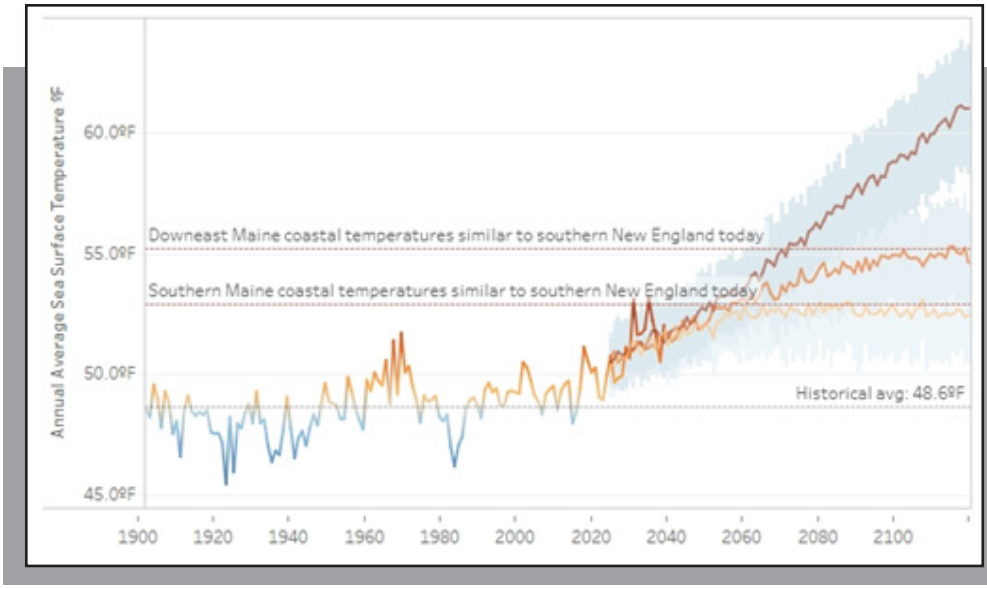


Figure 7: The graph displays the 12-month rolling average of annual Gulf of Maine sea surface temperatures, compared to the 1901–2000 baseline average and the three projected climate scenarios extending through the year 2100. The red dotted lines indicate future ocean temperature projections in relation to present ocean temperatures in southern New England. Source: Maine Climate Science Dashboard. Climate Data | Maine Climate Plan

ACIDIFICATION

Oceans act as a "carbon sink," absorbing atmospheric carbon dioxide, thus helping alleviate the impacts of climate change. As the atmospheric concentration of carbon dioxide rises, the ocean absorbs more carbon dioxide, causing the water to become increasingly acidic. Acidification is further increased by stormwater runoff with prominent levels of nutrients such as nitrogen, creating algal blooms. Acidification impacts the health of the ocean and harms marine life.

Impacts

Human

Decrease in property and municipal tax base

Contaminated groundwater

Changes in food supply

Infrastructure

Coastal and inland flooding

Coastal Erosion

Strain on stormwater systems

Ecosystem

Shifting ecosystems

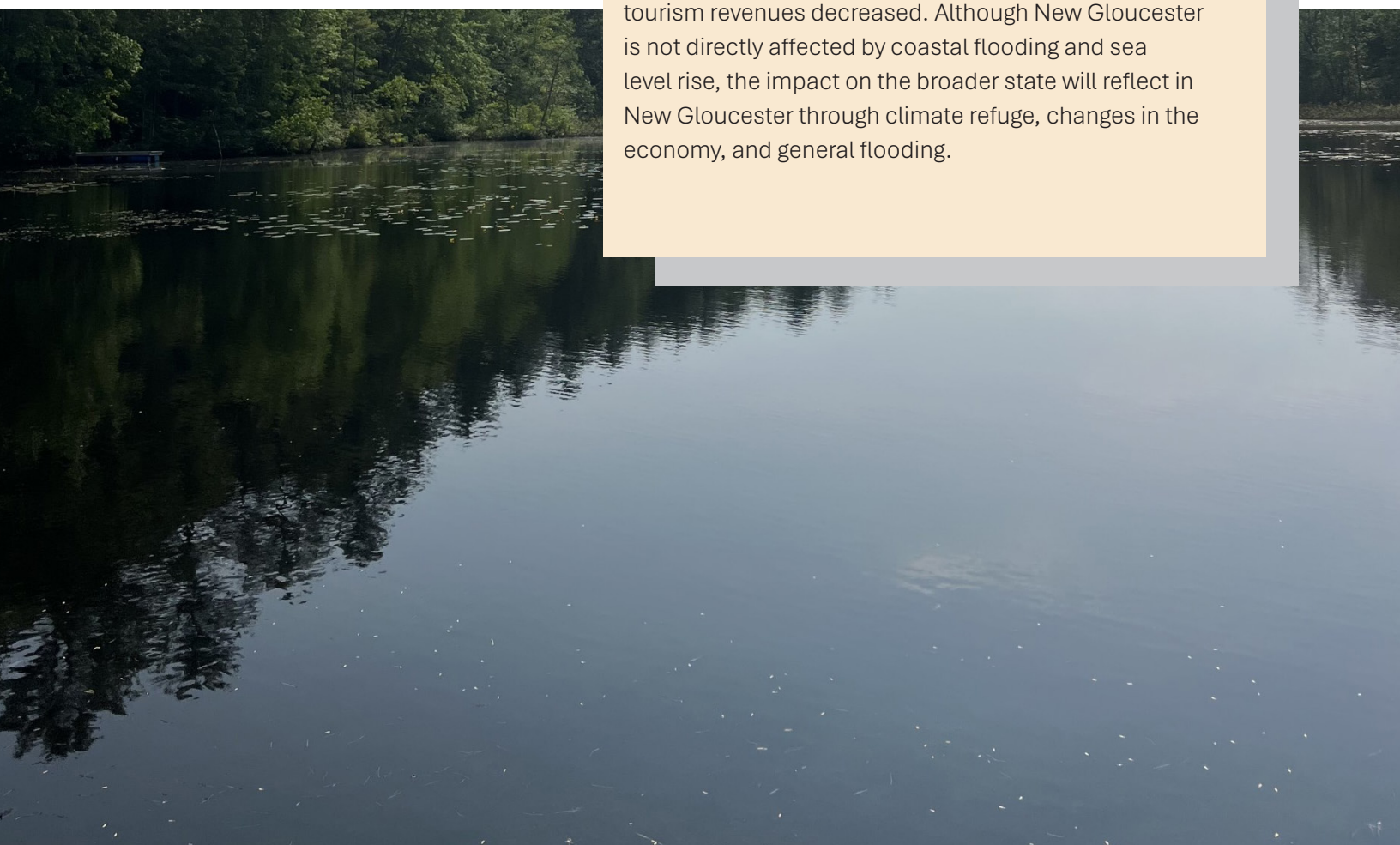
Changing groundwater levels and salt accumulation in soil

Decline in marine species health, particularly shellfish

Harm to fishing industry

Why does this change matter?

The Maine coast and working waterfront are significant economic drivers for the state. Businesses could be damaged, real estate lost, infrastructure destroyed, and tourism revenues decreased. Although New Gloucester is not directly affected by coastal flooding and sea level rise, the impact on the broader state will reflect in New Gloucester through climate refuge, changes in the economy, and general flooding.



Section 3

RISK ASSESSMENT

Section 3

RISK ASSESSMENT

The frequency and severity of these climate hazards have left many communities, ecosystems, and infrastructure unable to adequately withstand and adapt to the extreme forces. Our physical infrastructure and community services were not built to accommodate many of the challenges we are experiencing today. While it is difficult to adequately quantify the vulnerability or risk of various communities and resources, the following section uses available data to provide a baseline understanding of where New Gloucester is most at risk due to climate hazards.

This section provides information on the following sectors that could be impacted with the increase in climate hazards:

Infrastructure

Community Resources

Natural resources

People

Reminder!

The data in this report will often use a 100-year storm metric to assess risk. As defined under Section 1.1 – Data and Methodology, a "100-year storm" refers to a rainfall event that has a 1% chance of occurring in any given year.

Cascading Impacts

Climate hazards often trigger cascading impacts, where impacts to one resource ripples across many others. For example, a flooded road not only damages the infrastructure, it also cuts off access to properties and essential services, which impacts residents, businesses, and the economy, and can further strain resource availability for those who need it most. These interconnected effects amplify existing social, environmental, and economic challenges, disproportionately affecting people and resources already most vulnerable to climate change, and highlighting the importance of planning for both direct and indirect consequences of climate change. While capturing the full extent of cascading impacts is difficult as part of this analysis, they were taken into account when determining priorities and recommendations.

3.1 Infrastructure

Climate hazards damage critical infrastructure such as roads, buildings, and utilities through flooding, heat, and extreme storms. Today's infrastructure was not built to withstand the types of extreme climate events we see currently and predicted to occur in the future. Although a 100-year storm has a low percent chance of occurring in any given year, the most valuable infrastructure and access to neighborhoods needs to be protected given the potential impacts. This section provides a summary of risks and impacts New Gloucester's infrastructure faces from climate change.

SECTION SUMMARY	
Overview	Inland flooding across the town is New Gloucester's biggest risk to infrastructure due to increased precipitation and severe storms leading to ravine overflow. This damages the infrastructure, prevents access to resources or strands residents, and creates stormwater runoff that impacts the ecosystem.
Transportation	Flooding risk during 100-year storm: 7 miles of roadway, 19 bridges, 5 culverts, 4 miles of rail lines. Flooding will inundate transportation infrastructure which will degrade the infrastructure and cause costly repairs while also impeding residents' ability to evacuate and access critical services.
Buildings	Over 50 buildings in New Gloucester are located in projected flood-risk areas. The highest concentration of these buildings are located around Sabbathday Lake.
Water Utilities	Since the majority of properties in town rely on private well water and septic systems, flooding can degrade systems and introduce contaminants that negatively impact public health and the ecosystem.
Power and Information	Power, communication, and energy infrastructure are most at risk from high winds during severe storms, but New Gloucester-specific resources were not available for analysis.
Geographic areas of concern	Infrastructure located near waterbodies including Sabbathday Lake and the Intervale/Royal River region are the most at-risk. The Lower Village has historically had stormwater management issues that would be exacerbated with climate change.

3.1.1 Transportation

WHY THIS MATTERS

Effective and efficient transportation infrastructure supports resident mobility, economic development, emergency response, and social activity, but it is highly vulnerable to destruction from climate hazards. Heavy rainfall, inland flooding, and extreme heat can damage, destroy, and increase deterioration rates of transportation infrastructure, resulting in loss of access and increased maintenance and repair costs. Protecting and adapting transportation infrastructure ensures mobility, reduces economic disruption, and supports disaster response. Planning for resilient roads, bridges, and railways helps maintain safety, reliability, and accessibility in the face of more frequent and intense climate events.

RISKS IN NEW GLOUCESTER

Table 1: Transportation infrastructure in New Gloucester that is vulnerable to flooding based on projected a 100-year flood in 2050.

Resource	100-year Flood
Roads	7 miles
Bridges	19
Culverts	5
Railroads	4 miles

IMPACTS

Warming temperatures
Excessive heat causes buckling, cracking, and softening of pavement, warps rail lines, and shortens intended lifespan of materials which increases the cost for repairs and replacements, and makes the infrastructure more susceptible to damage during extreme storms. Increased freeze-thaw cycle also hastens the degradation of materials through cracking, further shortens the intended lifespan of the infrastructure and increases costs for repairs or need for replacement.

Changing precipitation
Roads, bridges, culverts, and rails could be damaged during intense storms or inundated with water which disrupts service and access for community members or emergency services, prevents access for service or repair, increases costs for maintenance and repair, and disrupts the broader supply chain and transportation system. Flooding and storm impacts on transportation infrastructure also affects natural resources as undersized or flooded culverts create barriers for wildlife and habitat, and flooding increases amounts of runoff and sediment from impervious surfaces into water bodies.

> *"The low-lying roads near water are vulnerable to flooding and some of the past recent rain and windstorms have made it almost impossible to reach my home at times due to flooding and trees across the roads.*

ROADWAYS

Climate change threatens to bring increased chance of flooding to roadways within New Gloucester. The town has around 140 miles of roadway—88 miles of public roads, 13 miles of toll roads, and 39 miles of private roads. Jurisdiction over the roads varies between MaineDOT, New Gloucester, and private owners. New Gloucester is responsible for approximately 52 miles of paved roads and 15 miles of gravel roads, plus an 9 miles of winter maintenance on state roads.

Modeling shows that approximately 7 miles of roadway would experience some degree of flooding during a 100-year storm event by 2050.

New Gloucester relies on various critical resources such as large hospitals and grocery stores of surrounding towns; however, sections of major corridors threaten to cut off access to these resources. The portions of following major routes could experience flooding by 2050, disrupting service:

- Interstate 95
- Intervale Road
- Highway 202
- Maine Street (Rt. 26)

With limited roadways and few, if any, alternative routes in rural communities like New Gloucester, flooding on even a single section of road can trap residents and completely cut off access to critical resources. The roads with the largest sections of projected flooding by 2050 include:

- Fish Hatchery Road
- Bald Hill Road
- Durham Road
- Morse Road

However, there are numerous other roads with sections of flooding that could additionally disrupt access to resources and trap residents.

BRIDGES

Climate change threatens to bring increased chance of flooding to local and state bridges within New Gloucester. Flooding not only makes bridges impassable, but also structurally unstable. MaineDOT has mapped 27 bridges in New Gloucester. During storm events by 2050, **19 out of the 27 bridges in New Gloucester are located in flood-prone areas.** The majority of impacted bridges are the roads and railways that cross the Royal River, including I-95. This analysis however, cannot determine the height of the bridge and degree, if any, to which the bridge deck itself would flood. Therefore, future studies should assess the bridge elevations of those most at risk to withstand flood water levels.

The MaineDOT Environmental Office developed a risk evaluation tool, Transportation Risk Assessment for Planning and Project Delivery (TRAPPD), to assess bridges and large culverts based on a set of 12 questions with criteria that span the range of risks including budget, process, schedule, events, and safety. Scoring is applied based on a summation of the questions and is used along with asset condition and performance to evaluate the overall priority and risk associated with the asset.[1]

- All of the bridges assessed as part of the program in 2018 are reported to be in good condition. While most bridge deck, superstructure, and substructure ratings were assessed to be in good condition, 7 bridges crossing water have concerns related to degraded streambanks.

1 MDOT. MaineDOT 2022 Transportation Asset Management Plan

CULVERTS

Not all culverts in town could be mapped, and therefore not analyzed for this report. MaineDOT mapped 3 large culverts and 68 cross culverts in town. While these culverts cross many waterways at risk of flooding, the capacity and likelihood of being overtopped could not be assessed. Flooding and overtopping of culverts on major routes, or small connector roads cut off access and severely limit those living in rural areas. This would make emergency access or evacuation difficult.

The Nature Conservancy developed an analysis of culverts at risk of overtopping in a flood.[1] According to these models, there are 5 culverts at risk of overtopping:

- 4 High risk culverts located on:
  - Fish Hatchery Road (no available detour)
  - Woodman Road (no available detour)
  - Snowhill Road (5 mile detour)
  - Rice Corner Road (3.85 mile detour)
- 1 medium risk Culvert on Ayer Road (no available detour).

Considering the physical dimensions of the culverts and the actual water flow dynamics not available in the data, some culverts may still be affected by flooding. A more extensive culvert study should be conducted to assess the capacity of smaller culverts.

RAIL

The Pan Am Railway operated by CSX and the Berlin Subdivision railway operated by St. Lawrence and Atlantic Railroad Co. travel through New Gloucester.

Portions of both rail lines along Royal River are at significant risk of flooding during storms.

TRANSIT

Limited public transportation is available through the Regional Transportation Program (RTP), which is a bus service by request only. The RTP provides low-cost transportation to the elderly, social service agency clients, the economically disadvantaged and persons with disabilities throughout Cumberland County. Impacts to the RTP include limited access during flooding events due to the flooded roadways, bridges, and culverts listed above.

There is also a park and ride at the intersection of Sabbathday Road and Route 26. This is not in a flood risk area.

1 The Nature Conservancy. Culvert Flood Risk Explorer | Maine

Figure 8: Roads and Railroads at risk of flooding

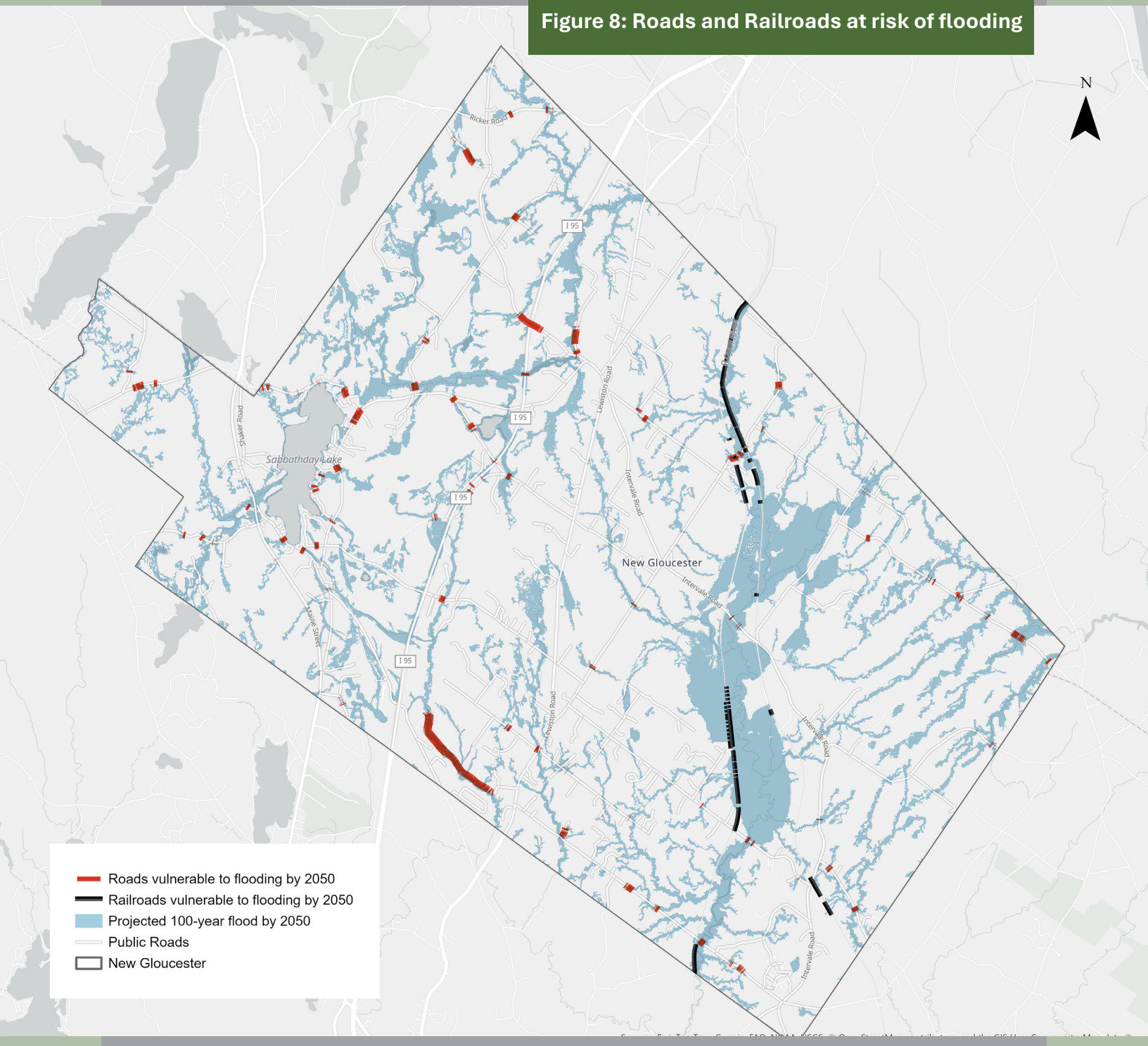
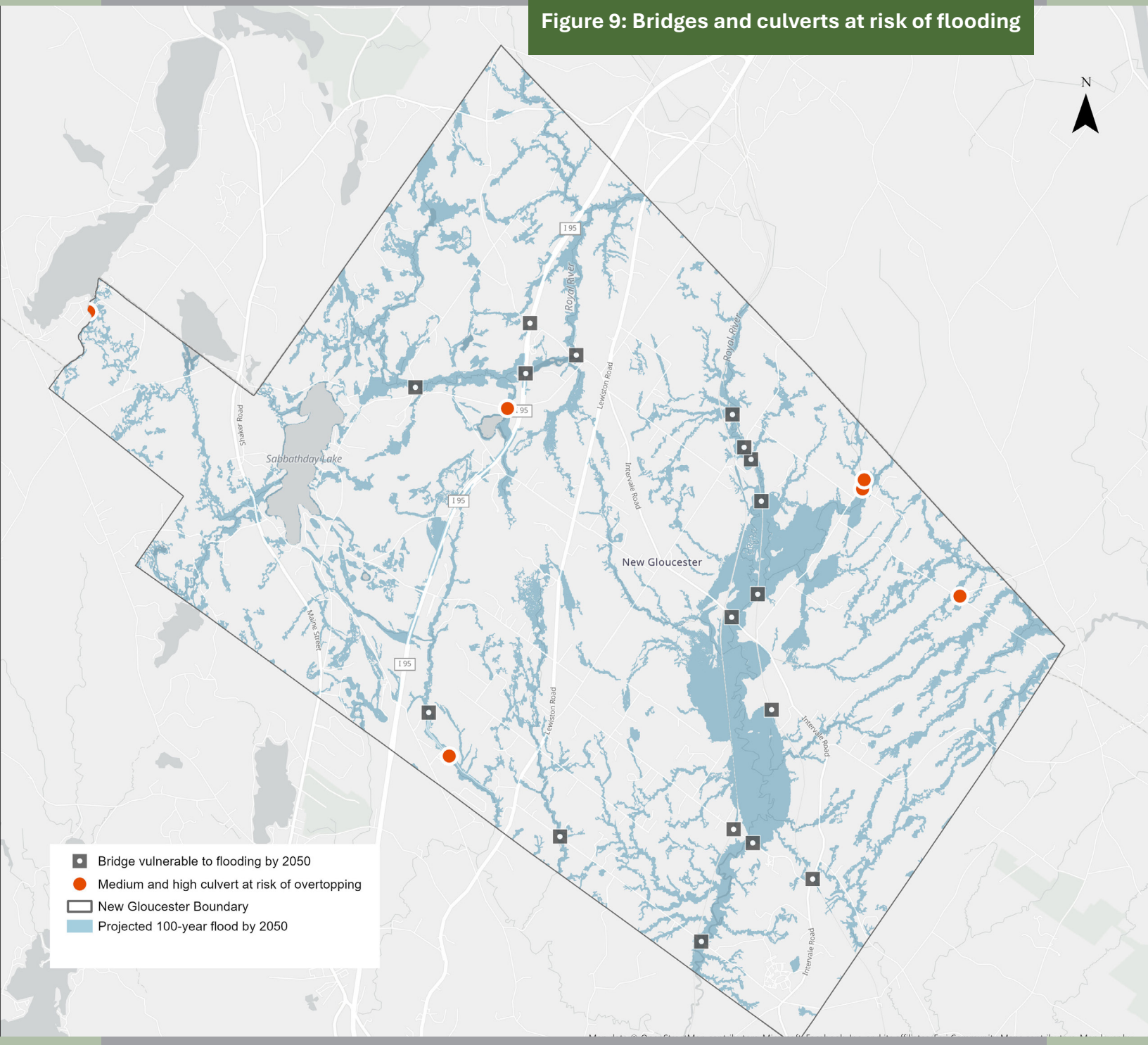
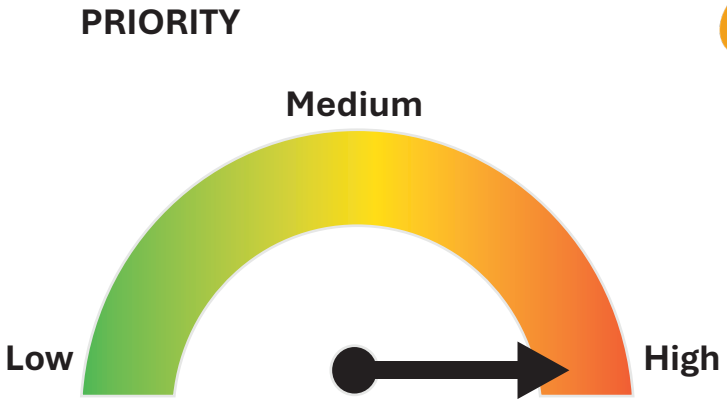


Figure 9: Bridges and culverts at risk of flooding



REDUCING VULNERABILITIES



> *The town's infrastructure for dealing with extreme weather events (like flooding) are inadequate. And the way that they have filled ditches with rip rap make it unsafe to walk on many roads as there is no shoulder.*

RECOMMENDATIONS

1. **General.** Provide resources and assistance to private landowners for maintaining and upgrading infrastructure, like culverts, to reduce flooding and handle downstream risk that impacts entire community and ecosystem

2. **Roadways.** Prioritize high-vulnerability roadways for modifications during infrastructure life cycle replacements with expedited action on critical routes vital for emergency access and connectivity. When repairing or replacing roadways, particularly those which are in flooding areas or have flooded in the past, the town should consider the financial costs of continually replacing in-kind versus developing other alternatives to avoid future flooding, such as road elevation, culvert improvements, or incorporating additional stormwater management infrastructure. The Town should also update an emergency management plan to assess access routes. The town should also coordinate with MaineDOT and private owners on roadways outside of their jurisdiction.

3. **Bridges.** Further analysis should be completed to ensure bridge height (roads and rail) exceed expected flooding levels, and determine structural integrity of bridges. Priority should be given to those in flood areas or priority corridors. Bridge modifications should be considered during natural infrastructure life cycle replacements to elevate bridges above projected flood levels.

4. **Culverts.** A more detailed culvert inventory could be completed to assess capacity level and potential for upgrades. The town should prioritize those culverts which have washed out in the past and those in higher flood risk areas. Culverts should then be upgraded to accommodate higher flow projected from increased precipitation.

5. **Rail.** Since the railways are outside of New Gloucester jurisdiction, there are limited modifications within the town's scope. The town can coordinate with the railway owners to ensure continued viability.

3.1.2 Buildings

WHY THIS MATTERS

Buildings house people, businesses, and essential services, making their resilience central to community well-being and economic stability. Buildings are increasingly at risk from heat stress, flooding, and storm damage which can damage property, compromise safety, and drive-up repair costs. Older housing stock are especially susceptible to damage and higher energy costs if they have not been properly maintained or retrofitted with more resilient building materials. Buildings along waterbodies are more prone to risk from inland flooding. It will be important to plan for and design climate-resilient buildings through energy efficiency, improved materials, and adaptive design in order to protect communities, reduce emissions, and ensure structures remain functional during extreme weather.

IMPACTS

Warming temperatures
Building materials degrade faster under sustained heat. Increasing extreme temperatures strains energy demand and increase costs

Changing precipitation
Flooding and extreme weather will damage buildings and degrade materials, which would require more costs for repair. Impacts to buildings will also strain availability of community resources and services, could alter property values, displace residents/businesses, and strain surrounding resources needed for recovery. Improper care after flooding can result in mold in the home, presenting health concerns in addition to the financial burden of repairs.

RISKS IN NEW GLOUCESTER

According to the analysis, there are 57 buildings at risk of experiencing impacts from at least a minor degree of flooding during a 100-year storm by 2050. The highest concentration of impacts are properties near Sabbathday Lake, extending down Sabbathday Road.

While these buildings are subject to direct flooding, it should also be noted that more buildings may be damaged by strong storms or high winds. However, this cannot be assessed through this report. Older buildings or buildings not upkept are most at risk of severe storm damage.

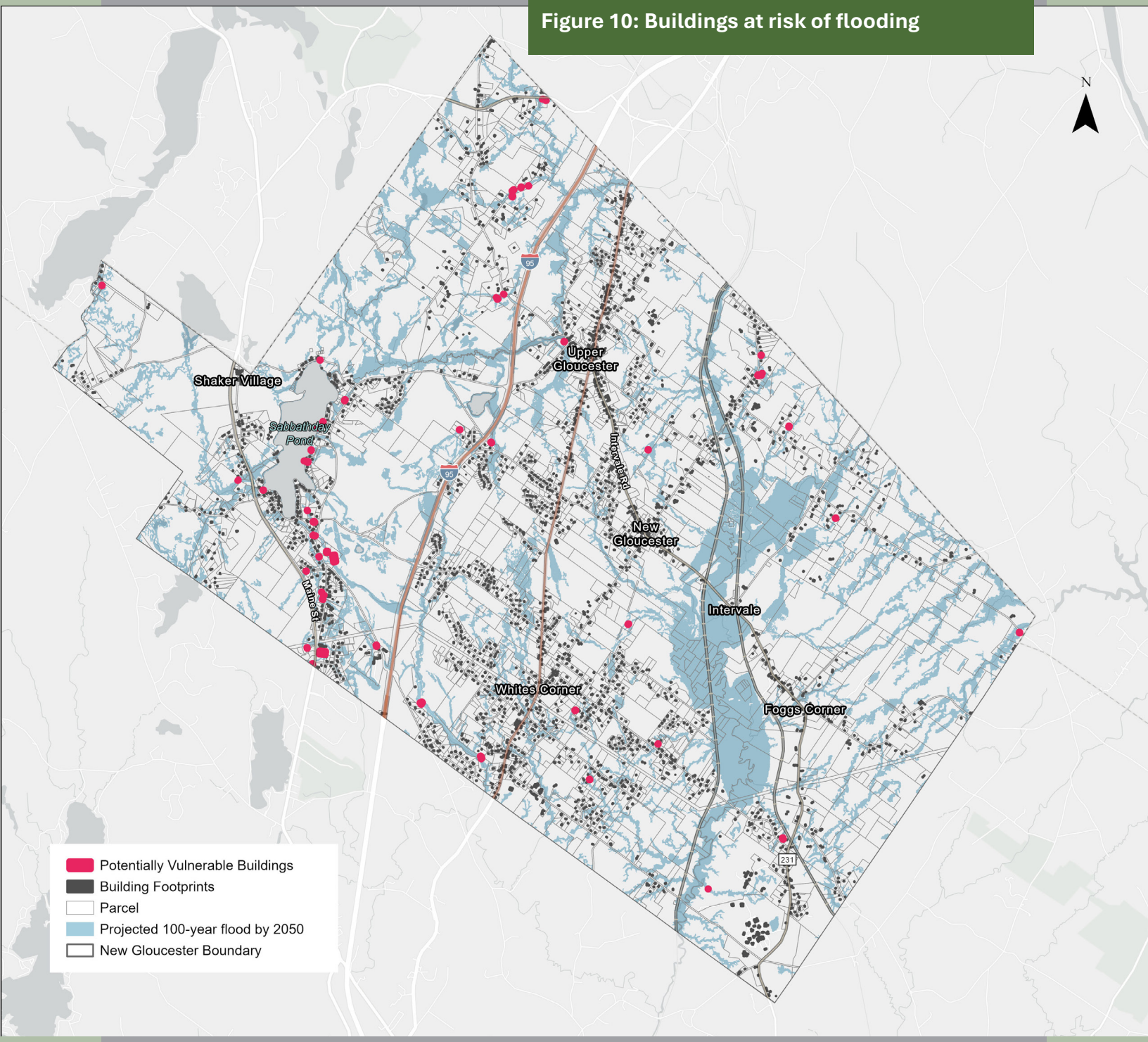
Over 1,500 parcels in New Gloucester—representing 48% of all parcels-- may experience flooding during a 100-year storm. This includes over 100 parcels designated as roads, rail, and utilities. It is important to note that the degree of flooding on each parcel varies, and most parcels will have very minimal flooding that does not impact the overall use of the property. Although flooding may not directly impact the principal building located on each parcel, water inundating the property still poses various risks to accessory structures and utilities. Flooding can disrupt access to buildings by overflowing driveways and sidewalks, carry contaminants into wells, overload septic systems, and interfere with other utilities.

Table 2: Buildings in New Gloucester that are vulnerable to flooding based on different flooding scenarios

Asset	100-year Flood
Buildings Impacted	57
Parcels Impacted	1,526

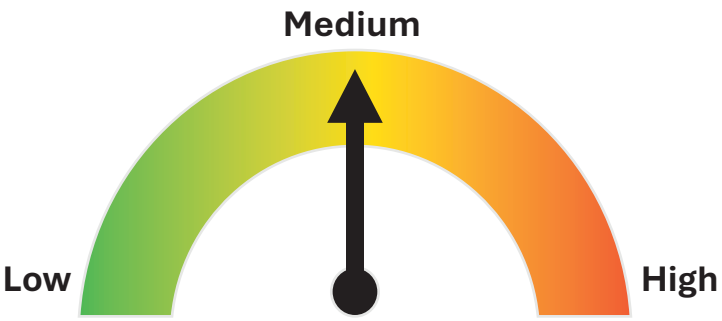
See Section 3.3 - Community Resources, for impacts to specific community resource buildings and properties.

Figure 10: Buildings at risk of flooding



REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

1. Consider limiting future development in flood-prone areas

2. Educate homeowners on building and property adaptations to climate change—such as elevating home systems in flood-prone basements, ensuring houses are well-maintained including repairing damaged roofs or siding, or including natural landscaping to improve stormwater retention

3.1.3 Water Utilities

WHY THIS MATTERS

Climate hazards pose new risks to the daily operation and structural integrity of water systems that are the backbone of safe drinking water, sanitation, and healthy ecosystems. Failure and/or damage to these systems could degrade water quality and impact public health. Any disruptions to the water systems could further impact residents and business owners. Protecting and adapting water systems ensures reliable access to clean water, safeguards ecosystems, and prevents costly service interruptions.

RISKS IN NEW GLOUCESTER

STORMWATER MANAGEMENT

New Gloucester Public Works Department is responsible for stormwater and infrastructure maintenance. There is currently no data mapped by the town to identify specific locations of stormwater management systems, and specific vulnerabilities cannot be assessed. However, stormwater infrastructure has been identified as a high concern for many residents through public engagement efforts, and the Lower Village has specifically been identified as having inadequate stormwater infrastructure.

IMPACTS

Warming temperatures
Extreme temperatures, and increased fluctuations in temperatures (freeze-thaw cycles) degrade materials quicker, and can result in costly repairs. Higher temperatures can alter the biological processes in septic tanks, plus drier soils in drought conditions can shrink and crack, reducing their ability to filter wastewater safely.

Changing precipitation
Flooding and extreme storms can damage structures, inundate or overwhelm systems, and restrict access for service or repair. Overwhelmed management systems lead to backups that cause localized flooding and further increase costs. Inundated infrastructure will have reduced capacity to convey flow, creating the possibility of overflows, cause sewage to back up into homes, and threaten water quality. It may also increase leaks and create overflows into waterways, directly contaminating waterways with untreated sewage or contaminated stormwater. Heavy rainfall and flooding can introduce contaminants, such as fertilizers or other chemicals, into wells, especially shallow or poorly maintained ones. Flooding can also damage well pumps and electrical components needed for recovery. Improper care after flooding can result in mold in the home, presenting health concerns in addition to the financial burden of repairs.

SEPTIC SYSTEMS

There are no public sewage systems in New Gloucester and waste is handled by private septic systems. The resilience of septic systems to climate disaster is dependent on their location on a parcel of land. Resiliency is challenged when the tank is in an area that floods more frequently. Therefore, properties more at risk of flooding would also have a vulnerability to septic system failures.

According to the Comprehensive Plan, properties near Sabbathday Lake have a higher density of septic tanks with aging infrastructure that would not meet current permitting standards. This is a concern since these systems increase the risk of contaminant runoff into the lake.

Although New Gloucester has not yet conducted a Greenhouse Gas Emissions Inventory, septic releases carbon dioxide and methane as it decomposes, producing significant greenhouse gases.

DRINKING WATER SYSTEMS

The New Gloucester Water District, which was formed in 2014 to address salt and petroleum contamination, supports some properties in the Upper Village with drinking water, however, almost all residents rely on private wells. The Water District infrastructure is in a low-risk area for flooding.

Factors such as well depth, proximity to contaminant sources, age, and maintenance contribute to the vulnerability of wells.

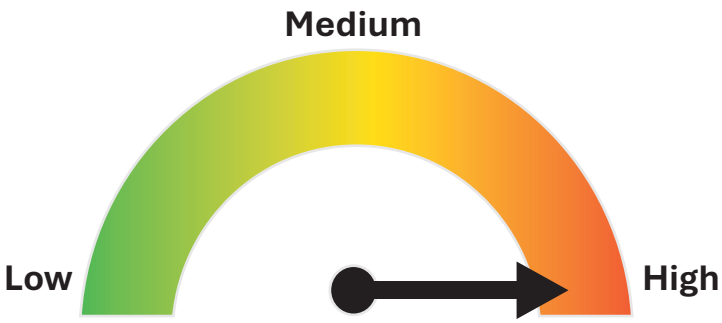
The Maine Geological Survey identified 1,051 wells in New Gloucester.[1] Based on the Maine Geological Survey, there is a high concentration of wells around Upper Village and the Mayall and Sabbathday Road area that have wells less than 50 feet deep.

For information on drinking water quality and its impact on public health, see Section 3.2.2.5 (Public Health - Drinking Water Quality).

1 Maine Department of Agriculture, Conservation, and Forestry. Water Well Database

REDUCING VULNERABILITIES

PRIORITY



> *Living in the Lower Village, flooding groundwater is common and not covered by insurance.*

RECOMMENDATIONS

Stormwater

1. The town should consider introducing more green infrastructure (rain gardens or permeable pavement) to help absorb runoff.
2. All stormwater systems including culverts, pumps, pies, or grates should be inventoried and upgraded as needed to handle larger storm events.
3. During planning efforts, the town should continue to integrate stormwater considerations with floodplain and watershed management.

Septic Systems

1. The town can conduct outreach and education around septic system vulnerabilities and maintenance.
2. Replace older or failing systems with advanced treatment technologies that perform better in saturated or shallow soils.
3. In flood-prone or coastal areas, elevate components or relocate septic systems farther from shorelines and high-water tables to reduce flood and saltwater intrusion risks.
4. Buffer zones between septic systems and drinking water wells, wetlands, or waterways to reduce contamination risks during floods.
5. Improve site grading, add swales, or install stormwater management features to divert rainwater away from drain fields and reduce saturation.

Wells

1. Conduct education and outreach on the maintenance and testing of wells.
2. On any future well construction, wells should be installed deeper into aquifers where appropriate and use watertight casings to ensure proper seals to reduce risk of contamination from flooding or runoff.
3. Consider raising wellheads above projected flood levels for those in flood-prone areas.

3.1.4 Power and Communications

WHY THIS MATTERS

Energy and information systems, including radio towers, data centers, substations, transmission, and cable lines, have become lifelines for society, enabling everything from healthcare to commerce to daily life. Climate change is increasingly impacting the efficiency of the system and reliability of supply through storms or heatwaves, which can cause cascading failures across other sectors. Strengthening and adapting these systems ensures communities stay connected, safe, and operational during disruptions.

RISKS IN NEW GLOUCESTER

The energy and communications systems that service New Gloucester, including cell towers, are interconnected within broader regional systems, and most assets are serviced by private utilities which have ultimate jurisdiction over any infrastructure systems. Maine's regional energy system is part of the New England regional transmission grid, which is operated by ISO-New England. New Gloucester is supported locally by Central Maine Power (CMP). Internet service in the town is primarily through wire connections.

Damage or disruption to these systems from climate hazards could impact infrastructural assets, however, there are no specific datasets collected by the town which can be used to assess specific risk and vulnerability in this report. The town also does not have a local emergency communication system or alert system.

Understanding local infrastructure connections in the context of both the regional systems and climate hazards is necessary to determine potential actions for risk mitigation. These plans should be included in local emergency management plans.

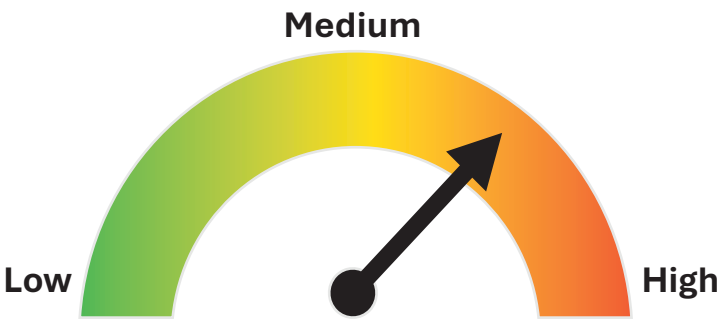
IMPACTS

Warming temperatures
Heat stresses power grids, reduces efficiency of transmission, and increases demand for cooling. This strains the system and increases chance of partial power outages and brownouts on high heat days. Strain on the energy grid from increased demand or disruptions in equipment due to climate change could create financial burdens on residents, businesses, and the Town.

Changing precipitation
Faster wind speeds, heavier precipitation events, flooding will increasingly disrupt transmission lines, inundate substations and data centers, and erode communications systems, leading to widespread outages. Power and communication failures halt water systems, disable buildings climate control, and cripple transportation operations and coordination.

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

With limited control over energy systems themselves, the Town should coordinate with utilities and regional partners to strengthen the grid, improve power and communication utilities, and advocate for improved systems. However, internal communications can be improved. Future emergency management plans should consider climate impacts on communication systems, and how to strengthen these connections to improve community resilience.

ELECTRICAL GRID

As towns electrify buildings and vehicles, concerns are rising about the electrical grid's ability to accommodate higher demand. However, the electricity industry is actively developing solutions to ensure the grid can manage this growth. Maine is investing in technology to ensure that the modern electrical grid is reliable, resilient, and reduces energy costs. Utility companies, policymakers, and other stakeholders are collaborating to plan for the future to make data-driven decisions about grid upgrades. Substantial funding is being directed towards improving and cleaning the grid. One example includes the Bipartisan Infrastructure Land and Inflation Reduction Act, where Maine received $65 million to upgrade grid technology and better integrate renewable energy sources in 2024. Efforts to electrify are also coinciding with major investments in Clean Energy Growth. While many factors outside a town's control influence the grid, including policy mandates, regional market dynamics, technological advances, and climate impacts, local action is still important for an affordable, reliable, and sustainable future.

3.2 Community Resources

The impacts of climate change will affect many of the community resources that support the quality of life and cultural identity of New Gloucester. Extreme weather can disrupt business operations and supply chains that sustain the local economy. The health and productivity of workers whose labor contributes to a productive economy will also be at risk. Homes and historic sites are subject to damage and loss from warmer temperatures and more frequent storms, which would affect property values and tax base in addition to the loss of personally and historically significant infrastructure. The demand for social services and community-provided resources will increase due to the financial, physical, and emotional stressors created by climate change. At the same time, however, extreme weather threatens to damage and disrupt access to these services. New Gloucester could also experience an influx of climate refugees migrating inland that could place further strain on community resources.

SECTION SUMMARY

Overview	While several properties, particularly parks and agriculture will experience minor degrees of flooding, the biggest vulnerability for New Gloucester is the strain climate change will place on the resources and disruption in access to the resources due to flooding.
Economies and Livelihoods	Property impacts and access are the biggest risks to general employment and the economy, while New Gloucester's natural resource industry will be particularly impacted by the shifts in temperatures.
Essential Services	The greatest risk is access to/from essential services during flooding events and the increased strain placed on the systems due to extreme temperatures.
Social Services	The biggest impact to services in New Gloucester will be restricted access during storm events, due to flooded roads and bridges, and increased strain on resources from climate hazard impacts.
Agriculture and Food Systems	Several farming properties could experience an increase in flooding during storm events. However, the biggest risk to the overall food system is the strain from changing temperatures and precipitation patterns, in addition to development.
Trails, Parks, and Recreation	Most recreational areas will experience minor flooding during events that could impact access. The biggest impact will be the increased need for repair and maintenance of trails and facilities to keep them accessible and safe following more frequent and intense storms.
Archaeological and Historic	No historic structures or cemeteries are projected to be impacted by flooding. Properties which contain waterways will experience an increased risk of flooding, but would not impact the overall function of site.
Geographic areas of concern	Since disrupted access to community resources from flooding poses the greatest threat, the geographic areas of concern would be Sabbathday Lake and the Intervale/Royal River region, as they are identified as being the most at-risk of flooding under Section 3.1 - Infrastructure

3.2.1 Economies and Livelihoods

WHY THIS MATTERS

Economies and livelihoods are essential to community resilience and well-being. Climate change threatens the strength and reliability of the infrastructure, industries, and services that support this foundation. Extreme weather impacts businesses' physical properties, changes the demand and type of employment, affects commuting routes, and ultimately impacts the overall economy of a town. In a region reliant mainly on private vehicle transportation, both workers and businesses are vulnerable to temporary flooding and long-lasting damage to roads. Changing temperature and ocean conditions makes the natural resource industry particularly vulnerable to shocks and stressors.

In particular, Maine's economy is heavily reliant on natural resources from forestry to fishing. As temperatures rise, these sectors are increasingly under threat. Farmers could see a shift in agricultural productivity as high temperatures and extreme precipitation damage resources. The lumber and timber industry will also become threatened by these climate hazards impacts on native trees. Individuals who rely on fisheries for their livelihoods, especially lobster, may experience economic impacts as species' ranges shift with climate change. Recreational fishing opportunities for non-commercial license holders may also be impacted, representing a significant cultural loss for the community.

IMPACTS

Warming temperatures
As seasons shift, the number and visiting days for tourists will shift particularly impacting food service, hospitality and recreation employment. As winters shift, businesses that rely on winter recreational activities like ice skating, snowmobiling, and skiing will be negatively impacted. The natural resource industry will be hit particularly hard due physical stress of working outdoors in extreme temperatures and due to ecological shifts in species.

Changing precipitation
Extreme storms and flooding can impact access to businesses, cause property damage, and disrupt supply chains. Those who either need to commute in or out of town for work could be impacted by flooded roadways, thereby impacting business revenue and overall economy. Increased precipitation could impact businesses who rely on outdoor recreation.

RISKS IN NEW GLOUCESTER

Livelihoods

New Gloucester is home to several small businesses, such as convenience stores, cafes, offices, orchards, greenhouses, a garden center, and many farms. Pineland Farms has a business center, recreation venues, educational classes, and market in addition to its 5,000 acre working farm. The Economic and Community Development Committee works to support and promote local businesses within the town that meet the needs of all residents. New Gloucester is also one of the communities represented by the Sebago Lakes Chamber of Commerce, established to support the economic growth and prosperity throughout the Lakes region.

Property impacts and access are the biggest risks to general employment and the economy, while New Gloucester's natural resource industry will be particularly impacted by the shifts in temperatures.

Employment

According to the Maine Center for Workforce Research and Information, in 2024 New Gloucester had over 230 establishments which employed over 1,600 people.[1] The largest sectors of employment in the town are educational services; health care and social assistance; and professional, scientific, and technical services. The center also listed the unemployment rate at 2.5%, which was lower than State average of 3.1%.[2]

According to the US Census, in 2022 the largest percentage of those employed in New Gloucester also lived in New Gloucester (16%). However, that still means that 84% of people employed in town live outside the town boundary and are commuting in. Conversely, almost 92% of people who live in New Gloucester commute outside of the town for work. The largest places of employment for those who live in town are Portland, Gray, Lewiston, Auburn, and South Portland.

Flooding or degraded roadways will impact access and commuting patterns, which in turn impacts both employers and employees, straining the overall economy.

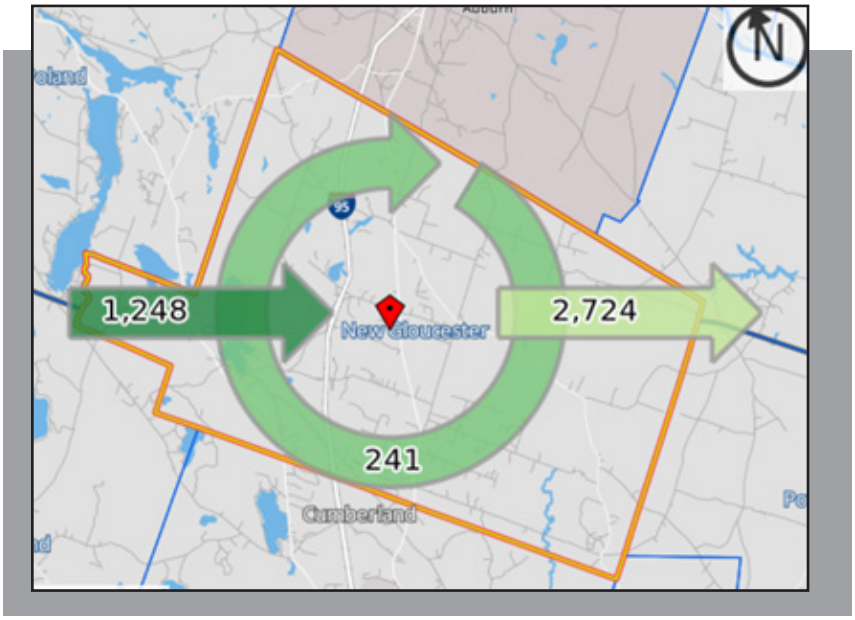


Figure 11: Graphic showing the inflow and out flow of New Gloucester residents and workers. 2,724 people live in New Gloucester, but work outside of New Gloucester. 1,248 people live outside of New Gloucester, but work in New Gloucester. 241 people live and work in New Gloucester.

1 Maine Center for Workforce Research and Information. Quarterly and Annual Employment and Wages
2 Maine Center for Workforce Research and Information. Unemployment and Labor Force Estimates by City/Town

Natural Resource Industry

Prior to 2024, the leading industry for employment in town was Agriculture, Foresty, Fishing, and Hunting.[1] For those employed within town, approximately 8% are employed in agriculture, forestry, fishing, or hunting. However, according to the U.S. Census less than 2% of New Gloucester's residents are employed in the natural resource industry. Although there's no specific data about the sector's composition, it can be presumed that majority of that sector is in the agriculture realm.

There are numerous farms in the New Gloucester boundary, and several gardens or homestead products sold independent of an official business. While not all agricultural land is enrolled in the Farmland Tax Program—such as Pineland Farms--, around 1,133 acres were identified as land used for agricultural purposes in 2020.

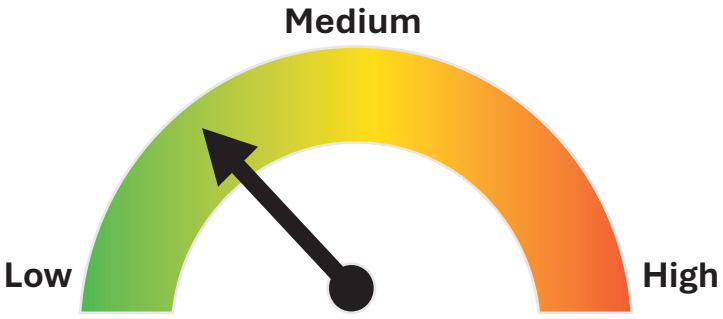
In 2020, New Gloucester had over 6,700 acres of land in the State of Maine's Tree Growth Tax Program, highlighting the town's connection to forestry. This represents over 22% of all land in town. While climate change will impact the forest industry, the biggest threat is development.

According to the Department of Marine Resources, New Gloucester has 8 fishing/harvesting licenses, which represents a small but present fishing and harvesting sector. Two licenses were for student purposes, indicating that there is continued interest to enter this field.

- New Gloucester's natural resource industry face similar risks to those in the region and state which is largely based on the changing temperatures and shifting ecosystems.

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

1. New Gloucester can encourage climate-resilient business practices, such as ensuring backup power or contingency plans
2. Support resilient infrastructure and collaborate with surrounding towns to manage roadways and provide access for residents and business owners during flooding events
3. Consider conducting a regional vulnerability assessment with neighboring towns to address shared risks and support resource sharing

1 Maine Center for Workforce Research and Information. Quarterly and Annual Employment and Wages.

3.2.2 Essential Services

WHY THIS MATTERS

Essential services, such as healthcare, emergency services, supermarkets, or utilities, are vital for continued community resilience. People rely on these services to stay safe and healthy, but climate change, particularly extreme weather events, can make accessing these services difficult. In addition to both physical damages and access to the services, climate change can exacerbate strain on the systems—limiting availability or increasing financial constraints. The indirect strain placed on essential services will impact the overall system as much or more than the physical impacts of climate change. These services provide support for vulnerable populations, so changes in these services can be detrimental to those most in need.

IMPACTS

Warming temperatures
Warming temperatures places indirect strain on many of these services and systems such as increased public health challenges strain healthcare or overloading the power grid.

Changing precipitation
Extreme weather can cut off access to essential services, such as through flooded roads or bridges and downed trees or powerlines. This can slow emergency response times, prevent people from getting to their jobs, or limit ability to receive services.

RISKS IN NEW GLOUCESTER

New Gloucester has minimal in-town essential services. Community members instead rely on and need to commute out of town for most of their services. New Gloucester Fire and Rescue Department operates 24/7 out of the town and responds to over 650 calls a year. According to the comprehensive plan, around 90% of calls are for emergency medical services. The Fire and Rescue Department facility is not in a flood-risk area and will continue to have access to/from the property.

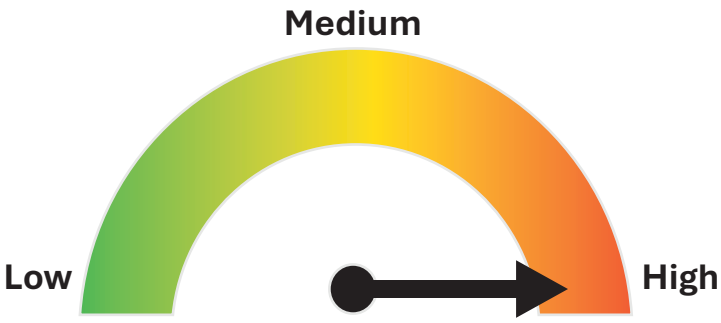
The town does not have any major health care facilities but are served by Central Maine Medical Center and St. Mary's Regional Medical Center in Lewiston and Maine Medical Center and Mercy Hospital in Portland. There is also an urgent care located in Gray. Police in town is provided by Cumberland County and the State of Maine.

The greatest risk for New Gloucester is access to/from essential services during flooding events and the increased strain placed on the systems due to extreme temperatures.

The condition of many residential roads, and especially when exacerbated by extreme flooding, could limit access for residents and emergency responders to receive the necessary medical care. As most staff and services are outside of town, during severe weather events, essential workers will face difficulty coming to the Town to provide support, and once in town could face difficulty getting resources to residents and businesses. Anecdotally, one resident shared that a public safety vehicle crashed in the Jack Woods Neighborhood when responding to a call due to poor infrastructure. This is also true for winter storms, where the public works is responsible for clearing roadways.

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

1. New Gloucester can encourage climate- New Gloucester can strengthen their emergency management systems and communications
2. Foster regional collaboration to ensure seamless service even during storm events

3.2.3 Social Services

WHY THIS MATTERS

Social services, such as schools, libraries, town services, food assistance programs, disability services, or additional community support, are critical to maintaining a resilient community. These services are particularly important for those who may be socially or economically disadvantaged to adapt and recover from climate-related events. Demand for social services and community-provided resources will likely increase due to the financial, physical, and emotional stressors created by climate change. Climate disasters can also strain the capacity of community resources, such as food pantries or financial assistance organizations, as more people experience impacts from climate change. Overburdened social services weaken long-term recovery and deepen inequities within the community.

Southern Maine has seen an influx of migration over the past few years, and this could increase as we see more climate refugees at the national and international scale. There is little data available to understand if Maine is going to be a receiving state for climate migrants in the future, however, being prepared for growth is a key resilience strategy for communities. Social services help to reduce disparities and protect those most at risk. Ensuring access and capacity to increase community resources will be essential to maintaining a healthy and resilient community.

IMPACTS

Warming temperatures
Extreme temperatures increase the demand for services, such as cooling centers or food assistance. Increasing energy costs create financial burdens which places further demand on social services such as general assistance.

Changing precipitation
Flooded roads can prevent access to these services temporarily, while extreme storms can cause permanent damage to the buildings or properties.

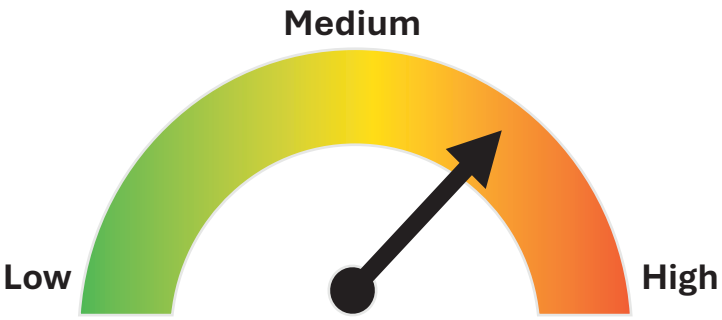
RISKS IN NEW GLOUCESTER

New Gloucester Library and Town Hall, both located in the Lower Village serve as important community resources for the town, providing municipal services and community support. The New Gloucester food bank is housed at the First Congregational-Christian Church. General assistance is administered by the Cumberland County Regional General Assistance Program, located outside town boundaries. New Gloucester is partnered with Gray in the Maine School Administrative District 15 (MSAD 15). Two of the district schools, Memorial School and Dunn School, are located in New Gloucester, while the middle school and high school are in Gray.

None of these facilities are in flood-risk areas. However, the biggest impact to services in New Gloucester will be restricted access during storm events, due to flooded roads and bridges, and increased strain on resources from climate hazard impacts. As mentioned earlier, flooding along key roadways will limit residents' ability to access resources within New Gloucester and outside of the Town boundary. People may need to find alternative routes to access these services.

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

1. Continue to build strong partnerships with nonprofits and community organizations such as BLING
2. Consider expanding funding and/or staffing for emergency and social service programs
3. Provide outreach and educational materials on the services available in the town and ensure they are reaching those most vulnerable (elderly, low-income)
4. Support expanding services provided by the library. Consider establishing the library as a formal heating/cooling center

3.2.4 Agriculture and Food Systems

WHY THIS MATTERS

A changing climate is predicted to disrupt food availability, reduce access to food, and affect overall food quality. Impacts will occur across the food supply system from growth to distribution. This includes increased food illness from pathogens and contaminated water, disrupting food availability, decreasing access to food, disruption in shipments, or increasing prices due to fuel or product scarcity.[1] Reliance on non-domestic food increases households' vulnerability to these climate-induced impacts.

Local agriculture supports the food system, supports livelihoods and boosts the economy, limits greenhouse gas emissions from long-range transportation, and often provides more sustainable, nutrient-rich food. Protecting agricultural lands is vital to maintaining cultural roots in a community.

1 Fanzo et. al. (2025). Climate Change, Extreme Weather Events, Food Security, and Nutrition: Evolving Relationships and Critical Challenges

IMPACTS

Warming temperatures

Farmers have experienced a longer growing season due to warming temperatures. However, these warm temperatures also bring an increase in pests, puts heat stress on crops, and requires higher water demand. Temperature changes also lead to frost damage if the increase in growing days is not synchronized with the shift in the spring and fall frosts, or if heat waves, droughts, or other extreme weather events degrade productivity.[1]

Changing precipitation

Although the growing season is lengthening, these benefits are offset by intense storms and increasing drought which lead to crop damage, erosion, soil loss, runoff, and leaching. Extreme weather events also flood fields and make access more difficult, reducing agricultural productivity.

1 Wolfe (2019). On "Increasing Resiliency, Mitigating Risk: Examining the Research and Extension Needs of Producers"

RISKS IN NEW GLOUCESTER

FOOD DISTRIBUTION AND CONSUMPTION

On average, 90% of food consumed by Mainers comes from outside the state.[1] Similarly, New Gloucester residents rely heavily on external food sources and will feel impacts from increased pricing, shipping disruptions, or food shortages due to climate impacts. There are no food deserts in New Gloucester, which are geographic areas where residents with lower-incomes or no vehicles do not have access to affordable, healthy food.

There are no grocery stores located in New Gloucester. The closest grocery store is in Gray. Link's Variety and Nouria are convenience stores which have limited food and various supplies. Food security can be worsened for those individuals who are already cost-burdened. The New Gloucester food bank is housed at the First Congregational-Christian Church, but there is additional access to the Gray Food Pantry, Good Shepherd Food Bank in Auburn, and Community Food Pantry in Cumberland.

While these buildings are not at risk of flooding, flooded roads and bridges will make it difficult for people to access these organizations or for them to distribute their resources.

> *"My little garden was completely out of sync this year in it's growing patterns compared to last year due to initial increased rain and cool temperatures and then the drought.*

1 The Council of State Governments Eastern Regional Conference (2021)

FOOD PRODUCTION

New Gloucester has a strong agricultural heritage, and many prominent farms still remain central to its identity with almost 1,200 acres reported for agricultural use. According to the 2022 Census of Agriculture prepared by the United States Department of Agriculture, there are a total of 56,704 acres used for farm operations in Cumberland County, resulting in commodity totals of $62,909,000, or $1,109.13 per acre.[1] In 2020, the Farm Services Administration issued an emergency declaration for Cumberland County because of prolong, severe drought conditions, resulting in increased operational costs due to increased irrigation.[2]

The USDA Plant Hardiness Zone Map serves as a standard tool to assist growers in determining which perennial plants are most likely to thrive in a specific location. The zoning is based on the coldest temperatures of the year, as these temperatures determine which plants and insects can survive through the Winter. New Gloucester currently falls within Zone 5b. While this zone remained the same during the 2023 update, warmer zones shifted north and will likely encroach in the area in the coming decades. Increased temperatures expand the ranges of many harmful plants and insects, which leads to greater loss of crops and higher costs for disease and pest management. Many of these commonplace disease and pest management practices contribute additional harmful chemicals to the environment.[3]

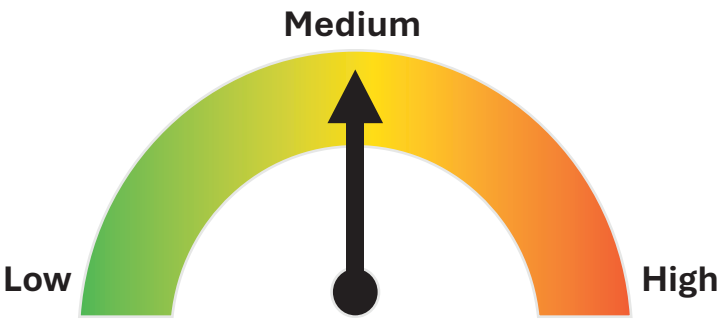
Additionally, the plant hardiness zone map does not account for other factors such as extreme heat, snow fall, wind and soil drainage that affect agricultural productivity.

Several farming properties could experience an increase in flooding during storm events. However, the biggest agriculture vulnerabilities in New Gloucester are similar across the region and state, with changing temperatures and precipitation patterns, in addition to development, putting extra strain on farming operations.

1 USDA. Maine State and County Data
2 Cumberland County Hazard Mitigation Plan. Hazard Mitigation
3 USDA. Plant Hardiness Zone Map

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

1. Strengthen local and regional food supply to reduce reliance on transport
2. Create or encourage community gardens or home gardens to expand local food sources, while fostering networks for coordinated distribution
3. Provide education and support on climate-smart agricultural policies
4. Provide support and protection for food assistance programs and agricultural lands
5. Consider surveying or conducting targeted outreach to farmers to better understand their challenges and how the municipality could better support their operations.

3.2.5 Trails, Parks, and Recreation

WHY THIS MATTERS

Parks, trails, and other recreational areas bring many benefits for residents. Green space helps lower surrounding air temperature, promotes active living, improves public health, serves as community gathering spots, increases surrounding property values, and provides ecological benefits.46 Maintaining and expanding access to these spaces creates a more vibrant community and builds resilience to climate change.

IMPACTS

Warming temperatures
Increased heat stress reduces safe use of outdoor spaces. Decreased water quality from extreme temperatures impacts property values and recreational economic benefits.

Changing precipitation
Storms and flooding can damage or erode existing facilities and reduce access. This requires more maintenance and repair, straining municipal resources Loss of recreational access reduces community health benefits, tourism, and local economic activity.

RISKS IN NEW GLOUCESTER

Access to natural resources is vital to the community's character, and New Gloucester hosts a diverse range of outdoor activities. In total, New Gloucester has over 170 miles of trails.

The Town manages two recreational facilities: the Fairgrounds and Rowe Station Fields. Neither of these properties are in flood-risk areas

The Royal River Conservation Trust has four main preserves: The Pisgah Hill Preserve, The Intervale Preserve, The Talking Brook Preserve, and The Flowing North Preserve. Each of these preserves is open to the public with formal trails or opportunities for exploration. They are also in partnership with other organizations to manage additional parcels of land include Talking Brook Public Land and River Elf Trail.

All properties managed by Royal River Conservation Trust could experience some degree of flooding during storm events. Although some are minimal, this would impact public access and increase property maintenance. The biggest impact is to the Intervale Preserve which could experience wide spread flooding and impact trail usage.

3.2.5 Trails, Parks, Recreation

The Pineland Farms property maintains an extensive trail network that has around 18 miles of trails for hiking, biking, and cross-country skiing. Pineland Farms property has minimal risk of flooding. However, some of the trails around the property may experience minimal flooding during storms.

Chandler Mill Pond, managed by the Maine's Department of Inland Fisheries and Wildlife, also has hiking trails around the pond. There is potential for flooding around the pond during a flood event which could impact access.

Additional properties are owned or managed as part of conservation easements by the Maine Woodland Owners. These lands are open to the public but may not contain formal trails. All properties could experience some degree of flooding during storm events. This would impact public access and increase property maintenance.

Gray New Gloucester Little League owns two field sites. Both sites are in flood-prone areas and are at risk of flooding impacts.

The Casco Bay Trail Alliance is also working towards creating a 72-mile trail loop that connects the region. The proposed trail would run through New Gloucester along the Royal River. The proposed trail would have several miles vulnerable to flooding during a storm.

New Gloucester also has several water recreation areas including Sabbathday Lake, Royal River, and Chandler Pond. Royal River Conservation Trust identified the Royal River as a water trail and monitors the conditions. There are several public access points along the river. Sabbathday Lake is primarily through private lands. Outlet Beach is privately run but open to the public for a fee.

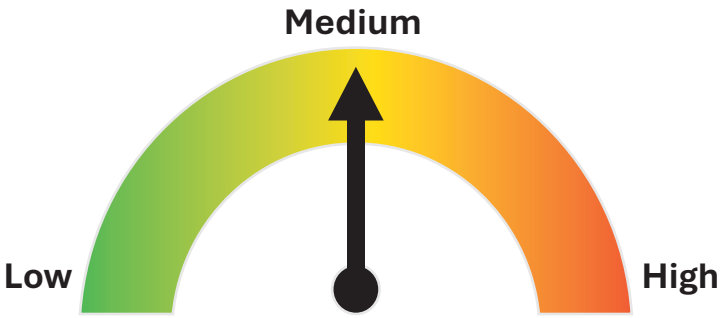
Studies have shown that water clarity is the biggest factor impacting users' enjoyment of lakes. Results from the study by University of Maine and Maine DEP suggest that even a minor decline in the water clarity will result in a loss recreation and economic benefit.[1] Protecting recreational areas, both water and land, will provide economic benefits to the town, support community health, and provide ecological protections.

Refer to Section 3.4.3 - Water Resources for a more detailed analysis of water quality in New Gloucester

1 Maine DEP. The Economics of Lakes - Dollars and $ense

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

1. Expand shaded areas and water access for users
2. Ensure capacity and funding to maintain and repair facilities
3. Consider climate resilient landscaping management practices at town-owned facilities. This can include restoring some areas to natural landscapes or creating a native species planting plan
4. Work with local organizations to encourage trail and park development in town

3.2.6 Archaeological and Historic Sites

WHY THIS MATTERS

Climate change threatens the integrity of archaeological and historic structures and sites. These sites provide connections and insights into our history, culture, and identity. The Maine Historic Preservation Plan sites the challenge of protecting historic and archaeological resources from the effects of climate change.[1] Rehabilitating historic buildings to be more sustainable can be challenging due to modern building codes, cost and effort to improve energy efficiency, and securing funding. Archaeological sites are also of great concern. The State is committed to collaborating with partners to assess the impact of climate change and providing greater protections for particularly vulnerable resources.

1 Maine Historic Preservation Office. Heritage for the Future

IMPACTS

Warming temperatures
Extreme heat and fluctuations in temperature can accelerate material degradation and deterioration.

Changing precipitation
Increasing storms, flooding, and erosion may damage structures or result in permanent loss of historically significant places.

RISKS IN NEW GLOUCESTER

New Gloucester takes pride in historic homes and structures. The Town has done a good job to protect historic areas by establishing the Historic Resource Overlay District to protect the historic character by regulating land use, new construction, and modifications within its designated area. The Historical Society maintains the History Barn that houses many artifacts and special exhibits related to New Gloucester's past.

Two pre-European and 25 post-colonization archaeological sites have been identified by the Maine Historic Preservation Commission in New Gloucester.

The specific locations of archaeological sites were not available for this analysis, however, sites along the Royal River or Sabbathday Lake are most at risk to being damaged by flooding and erosion.

Four properties are listed on the National Register of Historic Places: The Shaker Village Historic District, New Gloucester Historic District (The Lower Village), Intervale Farm, and Universalist Meetinghouse. In addition, the town has identified 11 other historic sites, 2 of which are the Shaker Library and Town Library.

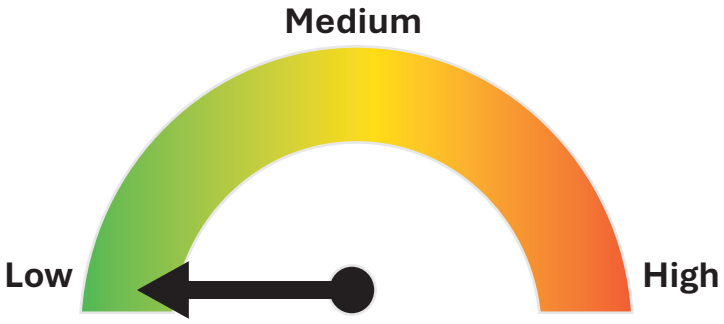
None of the historic structures are projected to be impacted by flooding. Properties which contain waterways will experience an increased risk of flooding, but would not impact the overall historic nature of the property.

Five cemeteries are located within the town: Hill Cemetery, The Lower Gloucester Cemetery, Pineland and Webber Cemeteries, Pond Cemetery, and The Upper Gloucester Cemetery

None of the sites within the cemeteries are within flood risk areas. However, the Lower Gloucester Cemetery and New Gloucester Hill Cemetery may experience flood waters along the waterways that cross through the property, but this is not anticipated to impact burial sites.

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

The Town should review past surveys and consider conducting additional surveys in areas that are vulnerable to flooding destruction that may contain historic or archaeological resources.

3.3 Natural Resources

Climate hazards strain the health of aquatic and terrestrial ecosystems and have the potential to lead to long-term impacts. Changes in temperature and precipitation are expected to increase stress and disturbances in forests and water bodies. As ecosystems are transformed, species will migrate to more desirable habitats or face challenges to survival. New Gloucester's natural resources have been recognized as a defining characteristic of the community, therefore, understanding how and where the environment is vulnerable can guide decision-making to conserve and protect its natural resources.

SECTION SUMMARY	
Overview	New Gloucester is home to valuable natural resources, including Sabbathday Lake, which feeds into the Royal River, and an abundance of forests. All of these assets are expected to be impacted by climate hazards to varying degrees. Protecting the waterbodies and conserving forests can safeguard these valuable assets.
Shifting Ecosystems	New Gloucester has a number of critical native species and habitats that are vulnerable to changes in air and water temperature. A number of invasive species and pests have been documented in town. Monitoring and managing these habitats are crucial more preserving a healthy ecosystem.
Conserved Lands	In addition to the stress extreme temperatures will place on the lands, almost all the conserved lands in town will experience some degree of temporary flooding from a 100-year storm by 2050. This will negatively impact the overall ecosystem, ability to maintain and access the spaces, and public health of New Gloucester.
Water Resources	To maintain high water quality, especially in Sabbathday Lake and Royal River, it is important to address stormwater runoff. As the waters continue to warm, waterbodies will see a decrease in dissolved oxygen that will further stress aquatic species. Protection of these water resources is crucial for ecosystems and community recreation.
Inland Erosion	New Gloucester has experienced limited erosion; however, this will increase due to increasing precipitation and runoff. Areas near Sabbathday Lake, the Royal River, Chandler Mill Brook, and surrounding wetlands and streams are most vulnerable to severe inland erosion.
Land Use, Forests, and Carbon Sinks	Most of New Gloucester is forested which improves New Gloucester's ability to mitigate and adapt to climate change. However, the area is still at risk of losing critical forests and open space through unmanaged development.
Geographic areas of concern	Most flood zones stem from the overflow of the Royal River and Meadow Brook Wetlands, and therefore areas surrounding it are more vulnerable

3.3.1 Ecosystems: Habitat and Biodiversity

WHY THIS MATTERS

A native, biodiverse ecosystem provides a solid foundation for healthy environment. However, climate-induced conditions force native species to shift further north, while invasive, non-native species migrate from the south into Maine. Invasive species disrupt ecosystems by developing self-sustaining populations that are dominant or disruptive to native species by outcompeting them for resources.

> *I am concerned about loss of habitat for amphibians in vernal pools.*

IMPACTS

Warming temperatures
Warmer air and water temperatures cause shifts in species' geographic ranges, leading to declines in native aquatic and terrestrial life while promoting the spread of invasive species, pathogens, and pests. These shifts make ecosystems more vulnerable to stressors such as habitat destruction.

Changing precipitation
Combined with human development, flooding will fragment or even eliminate habitats, putting greater stress on native, threatened, or endangered species. Changing precipitation patterns impact rivers and vernal pools which affects amphibians and other aquatic creatures. Extended drought will place pressure on plant and animal species and can damage critical habitat areas.

RISKS IN NEW GLOUCESTER

AQUATIC

There are 11 different types of invasive aquatic plants that threaten lakes in Southern Maine, but no plants have been identified in Sabbathday Lake with the continual monitoring by Sabbathday Lake Association Volunteers. Based on conversations with the Lake Association, recent findings of Pike in Sabbathday Lake have been a cause of concern as Pike threaten brown trout and other native species.

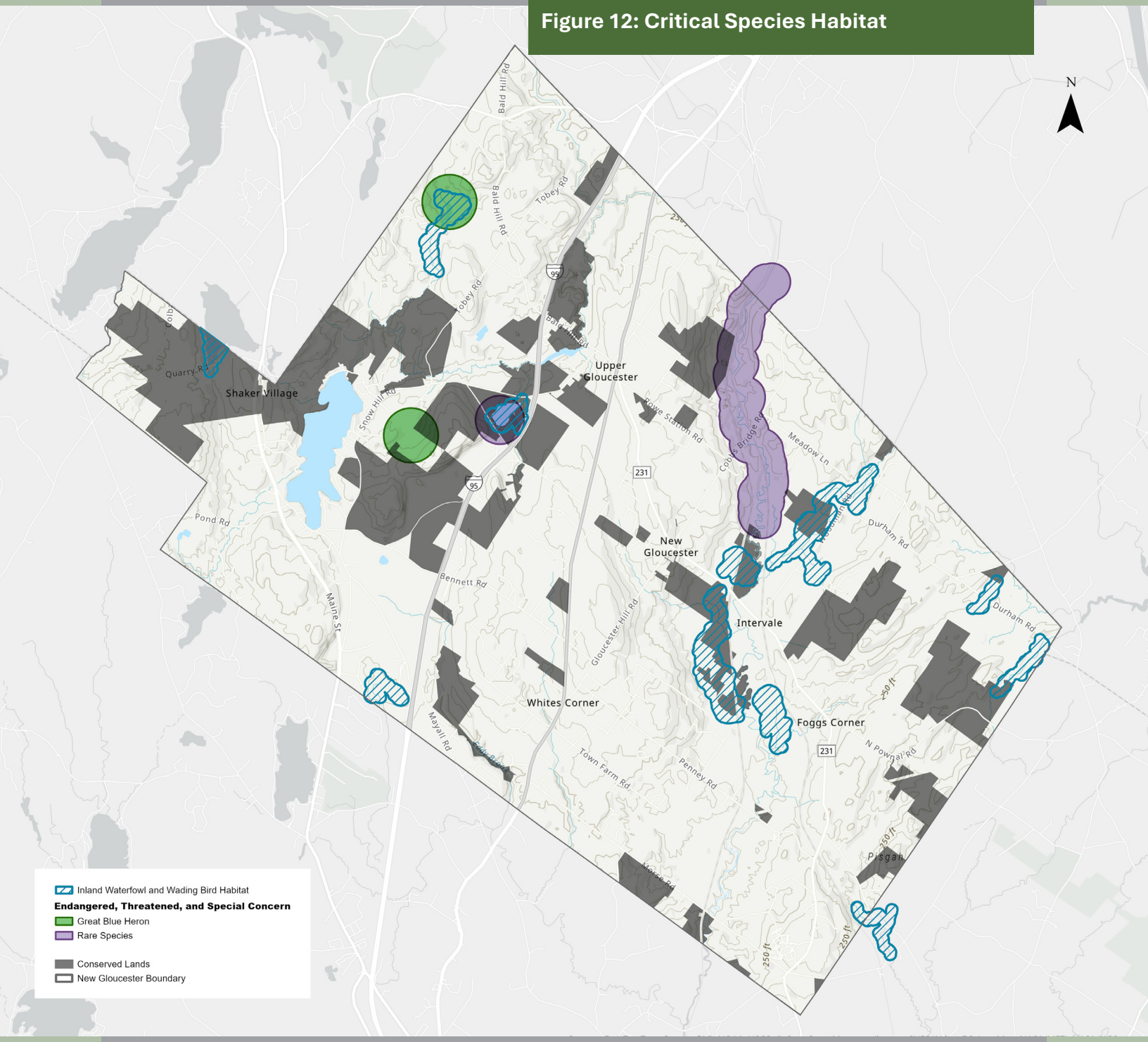
TERRESTRIAL

New Gloucester is home to two species of special concern, the Great Blue Heron and the Wood Turtle, as well as one rare plant, the wild leek.

New Gloucester is already seeing invasive species throughout town, however, monitoring across town is still limited and there is likely more invasive species present on private properties.

The following invasive species have been found in New Gloucester: Asiatic Bittersweet, Autumn Olive, Black Locust, Burning Bush, Buckthorn, Honeysuckle Shrub, Japanese Barberry, Japanese Knotweed, Largeleaf Lupine, Morrow's Honeysuckle, Multiflora Rose, Norway Maple, and Purple Loosestrife.

Figure 12: Critical Species Habitat



Gypsy moths have been identified as a concern in New Gloucester as they defoliate deciduous trees.

In Cumberland County, with a 2C (3.6F) increase in temperature, 3 birds are highly vulnerable, and 57 bird species are moderately vulnerable to changing habitat conditions.[1]

Out of Maine's 120 resident and visiting butterfly species, 25 (21%) are listed as state endangered, threatened, special concern, or extirpated. While habitat loss to development ranks first as the leading cause of species endangerment, seven (28%) of the state's 25 at-risk butterfly species are also considered imminently threatened by climate change.[2]

The Maine BumbleBee Atlas, a 5-year statewide bee inventory survey, found that 4 of the state's 17 historically documented bee species were absent, suggested possible extirpation. Native bee decline is linked to habitat loss from land development and harmful chemical use such as herbicides.[3]

1 Audubon. Vulnerable Birds in Cumberland County

2 Butler, R. G., deMaynadier, P. G., Klymko, J., Wilson, W. H. Jr., & Calhoun, J. V. (2023). Butterflies of Maine and the Canadian Maritime Provinces. Cornell University Press. ISBN 9781501768941.

3 Maine Department of Inland Fisheries and Wildlife. Maine Bumble Bee Atlas

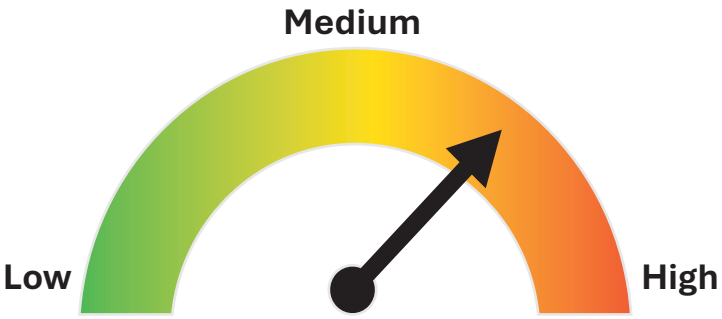
INVASIVE SPECIES

Invasive species are plants and wildlife that spread to the point that they can cause harm to ecosystems, usually out-competing local species for resources or hunting prey down to dangerously low populations. While not a comprehensive list, common invasive species found in Cumberland County include Variable-Leaf Milfoil, Japanese Knotweed, Japanese Barberry, Asiatic Bittersweet, Shrubby Honeysuckles, Phragmites, Buckthorn, Multiflora Rose, and Burning Bush. Source: Maine DACF: Maine Natural Areas Program Invasive Plant Fact Sheets

Plant identification top to bottom Asiatic Bittersweet / Japanese Knotweed / Japanese Barberry. Source: Maine Natural Areas Program Invasive Plant Fact Sheets

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

1. Work with regional partners to conserve lands that have been identified as critical habitat
2. Conduct an invasive species assessment
3. Develop a landscaping management plan or ordinance for town-owned lands that prioritizes planting native species and avoids insecticides and herbicides
4. Develop educational materials for residents on native landscaping

3.3.2 Open Space and Conserved Lands

WHY THIS MATTERS

Open space, or undeveloped lands such forests and fields, provide numerous benefits to humans and the environment that are all threatened by climate change:

- Critical habitat for native species
- Flood mitigation
- Recreational space that supports public health
- Maintains good water and air quality
- Act as a carbon sink to remove carbon dioxide from the atmosphere

The U.S. Forest Service estimates that every acre of forested land on average absorbs between 1 to 2 tons of carbon every year based on the forest type, age, and management practices.[1] Conserving open space with sustainable management practices protects these lands and allows them to continue mitigating climate change and enhancing the resilience of climate impacts.

1 Forest Service (2021). Standard Estimates of Forest Ecosystem Carbon for Forest Types of the United States

IMPACTS

Warming temperatures

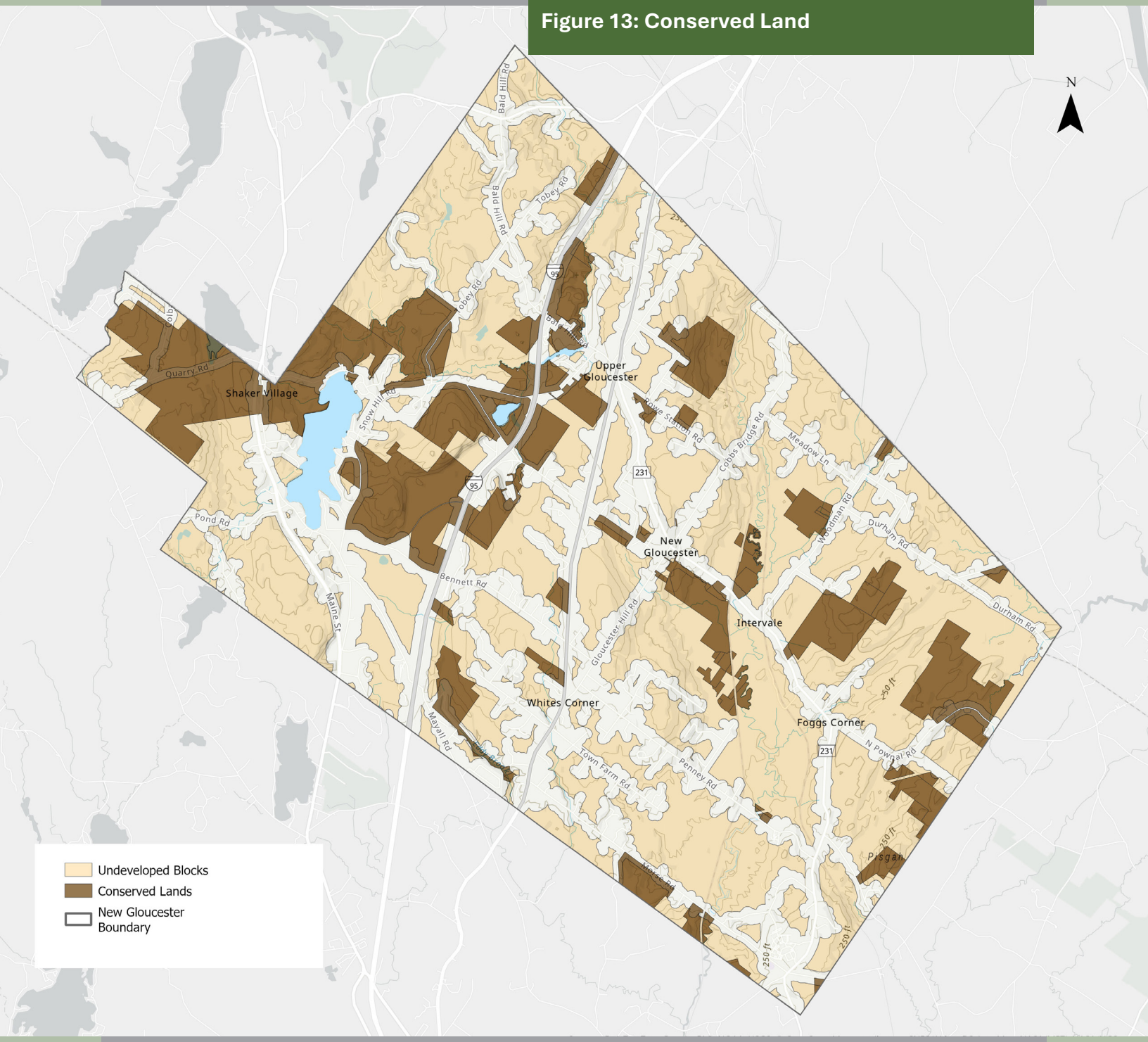
Warming temperatures put these natural resources at risk by shifting the ecosystem (i.e., impacts which species can grow in the area), increasing the presence of invasive species, and contributing to erosion and sedimentation from drier soils. Loss of open space will also increase the urban heat island effect, which strains public health and increases risk of heat-related illnesses.

Changing precipitation

Heavy flooding can damage the land, prevent access, degrade habitats, and cost the town money for repairs. Frequent or prolonged droughts have the potential to alter these areas by limiting biodiversity and interrupting natural drainage patterns. Flooding to natural areas also impacts recreation, public health, and public access.

Conserving ecosystems requires an integrated approach that values both agricultural lands and forests for the services they provide. Conserving ecosystems does not necessarily mean “leaving land as is,” which can allow problems like invasive species, degraded soils, and fire risk to worsen. Conserved land can support multiple uses through active, sustainable management that helps restore ecosystem functions, maintain productivity, and build resilience for present and future generations.

Figure 13: Conserved Land



RISKS IN NEW GLOUCESTER

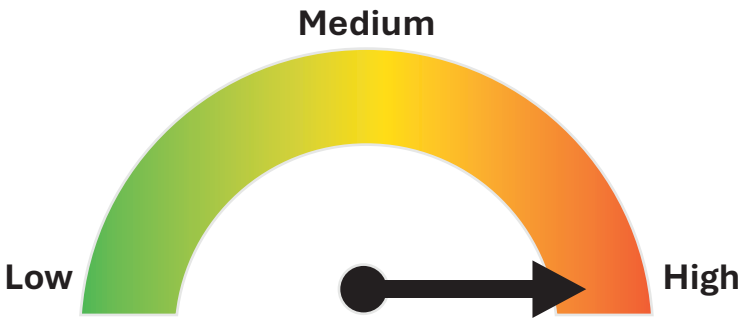
New Gloucester has demonstrated a strong commitment to conserving land. There is over 5,600 acres of conserved land in Town, constituting 17% of total land. The largest area of conserved land is the Sabbathday Lake Shaker Village. Lands within town are conserved by a number of entities including the Royal River Conservation Trust, the Maine Woodland Owners, The New England Forestry Foundation, Maine Farmland Trust, and the State of Maine.

There are several undeveloped blocks of land, which are areas of land 50 acres or larger that help protect essential habitat for plants and wildlife. The largest block of undeveloped land is the 2,500 acres bound by Woodman Road, Durham Road, North Pownal Road, and Intervale Rd, which extends slightly into Pownal. Undeveloped blocks have the potential to be conserved which would help maintain open space and support habitat retention. Most parcels of undeveloped land are privately owned.

In addition to the stress extreme temperatures will place on the lands, almost all the conserved lands in town will experience some degree of temporary flooding from a 100-year storm by 2050. This will negatively impact the overall ecosystem, ability to maintain and access the spaces, and public health of New Gloucester.

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

1. The town should aim to conserve 30% of land to align with the State's goal. Work with partner organizations and landowners to conserve additional land where feasible, and implement sustainable management practices to enhance the ecological benefits of conserved areas
2. Consider completing an Open Space Plan to formalize priorities and consider additional conservation methods

3.3.3 Water Resources

WHY THIS MATTERS

Water resources include rivers, streams, lakes, wetlands, and groundwater. Clean water resources are vital for the health of the ecosystem as they provide abundant habitat and support wildlife, in addition to providing drinking water, recreational opportunities, and boosting the economy. Wetlands in particular act as flood mitigation and carbon sinks. Combined with warming temperatures, climate change negatively impacts water resources by harming aquatic life, promoting shifts in invasive species, and increasing algal blooms.1 Studies show that low water quality and presence of algal blooms decreases property values.2 Maintaining and supporting these water resources is vital to preserving the community character.

See Sections 3.2.2.5 on risks to water quality for public health and 3.1.3 for risks to water utilities.

1 Fernandez et. al. (2020). Scientific Assessment of Climate Change and Its Effects in Maine

2 DEP. The Economics of Lakes - Dollars and $ense

> *Impacts of heavy rain events causing road sand and other soil from surrounding uplands/erosion to wash into the lake.*

IMPACTS

Warming temperatures
Warming waters lead to lower dissolved oxygen levels, foster algal blooms, and strain aquatic ecosystems.

Changing precipitation
Increased precipitation and more intense storms create a greater volume of stormwater runoff, which delivers pollutants such as nutrients, sediment, bacteria, and trash into waterbodies. These pollutants and excess nutrients impair rivers, streams, lakes, and coastal waters. Increased flooding can alter stream and river geomorphology by reshaping stream channels, eroding banks (see Section 3.4.4 on Erosion below), increasing sediment deposition, and damaging aquatic life.

DISSOLVED OXYGEN

Water bodies must have sufficient dissolved oxygen to support healthy aquatic communities. Low levels of dissolved oxygen cause stress, and at very low levels aquatic organisms may suffocate. Warming waters leads to lower dissolved oxygen levels and strain aquatic ecosystems. Source: Dissolved Oxygen (DO)

RISKS IN NEW GLOUCESTER

The Royal River which originates from the Sabbathday Lake are the two primary water resources in New Gloucester. Chandler Pond is the second largest lake in town. These waterbodies and their surrounding areas offer important locations for wetland ecosystems, recreation, and critical species habitat. The wetlands surrounding The Intervale along the Royal River and Meadow Brook is the most significant in town.

All rivers and streams in New Gloucester meet water quality standards and there are no designated impaired waterways in town.

However, Sabbathday Day Lake is identified as "sensitive" on the Maine's Department of Environmental Protection's Nonpoint Source Pollution Priority Watershed list with modeling that projects a significant increase in the lake's phosphorus concentration over the next 25 years.[1] The Maine DEP also identified it as a lake most at risk from new development.[2]

The Sabbathday Lake Association (SDLA) regularly monitors the water quality of Sabbathday Lake. While its water quality is above average, there have been continual reports of low dissolved oxygen levels in its deepest waters.[3]

Low dissolved oxygen impacts the habitat of cold-water fish and can promote algal growth from phosphorus release. The Sabbathday Lake Association Reports that just 15% of the volume of Sabbathday Lake provides the year-round oxygen and temperature conditions needed for cold-water fish to survive.

As waters continue to warm, Sabbathday Lake along with the Royal River and other waterbodies will see a decrease in dissolved oxygen that will further stress fish species.

In order to maintain the high quality of New Gloucester's water, it is important to address stormwater runoff.

Stormwater runoff from impervious cover is likely the largest source of pollution to these water bodies. The surrounding area is largely developed which causes stormwater to flow quickly off the impervious surface, carrying dirt, oil, road sand, and other pollutants into the nearby streams.

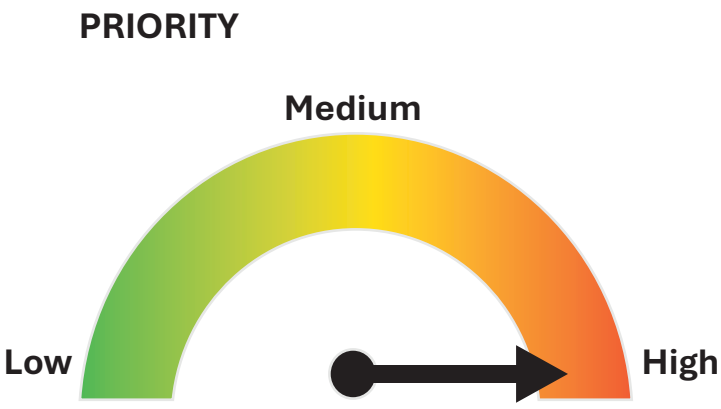
Elevated phosphorus levels also come from septic tank runoff, fertilizers, and erosion. As there is a higher density of septic tanks around Sabbathday Lake than what would currently be permitted, this threatens the water quality of the lake.

1 DEP (2023). Nonpoint Source Priority Watersheds List

2 DEP. DIRECT WATERSHEDS OF LAKES MOST AT RISK FROM NEW DEVELOPMENT, AND URBAN IMPAIRED STREAMS

3 Sabbathday Lake Association.

REDUCING VULNERABILITIES



RECOMMENDATIONS

1. Protect water resources through land management practices such as conservation buffers, wetland restoration, or erosion control
2. Improve stormwater management to reduce pollutant loading
3. Continue to support monitoring and education efforts by Sabbathday Lake Association
4. Consider monitoring and testing plan for other water bodies to identify emerging threats
5. Coordinate with surrounding communities to protect the larger watershed

3.3.4 Erosion

WHY THIS MATTERS

Unstable riverbanks or bluffs leads to an increased risk of erosion and landslides. Erosion and landslides threaten water quality, native habitats, recreation, and infrastructure. Therefore, mitigating the risk of erosion is vital to protect the surrounding properties and maintain a healthy riverine ecosystem. Maintaining stable riverbanks and abating pollutants protects surrounding infrastructure and habitat and prevents excess soil or nutrients from eroding into waterways and degrading water quality.

IMPACTS

Warming temperatures
Warmer temperatures dry out the soil and reduce plant growth, destabilizing the land. This, in combination with wind and rain from increased storms, exacerbates erosion.

Changing precipitation
Increased precipitation threatens the integrity of inland waterways and makes them prone to landslides. Inland flooding can change the composition of soil along riverbanks and compromise the integrity of pre-existing structures built along inland waterways. During extreme storms, the rainfall that soaks into the slope adds weight and reduces strength, and the excess water undermines the slope with additional flooding.[1]

1 DACF. Landslides in Maine

RISKS IN NEW GLOUCESTER

The slope of the land, sediment type, vegetation, bedrock, surrounding upland land use, and development pressures can all impact the vulnerability of bank stability and erosion. Infrastructure and properties alongside all waterbodies are more vulnerable to unstable ground and inland erosion. With storm damage and increasing rain intensities, destruction is likely to be more prominent along the larger waterways in the town.

The areas most at risk of erosion include:

- Intervale Wetlands, specifically surrounding the Royal River and Meadow Brook
- Areas surrounding the Royal River and tributaries
- The Westcott Brook southwest of the lake
- Sabbathday Lake
- Chandler Mill Pond
- Peacock Hill and Little Hill

The most recent report of the Sabbathday Lake Watershed Survey conducted in 2008[1] identified 58 erosion sites, with 38% of those sites associated with town roads and 31% associated with residential areas.

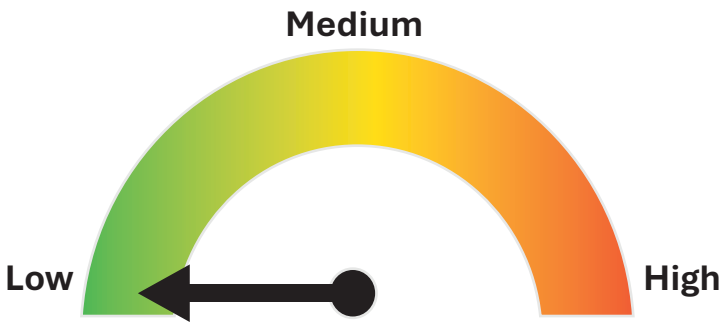
Many of these sites have been addressed through the efforts of local organizations and the Town. Sabbathday Lake Association also noted that erosion from heavy rains in 2023 were the reason for historically high rates of phosphorus and chlorophyll in the lake.[2]

The Maine Geologic Survey identified one prehistoric landslide in New Gloucester occurring west of the Royal River near Cobbs Bridge Road and Underpass Road.

1 DEP. Sabbathday Lake Watershed Survey
2 Sabbathday Lake News. Summer-Fall 2024

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

Continue to monitor riverbanks and soil health. Ensure the 'Limited Residential Shoreland' and 'Resource Protection' zoning ordinances, specifically those along waterways, are enforced and strengthened to protect against erosion. Provide educational materials, especially around lakes, that educate residents on the importance of shoreland protection.

3.3.5 Land Use, Forests, and Carbon Sinks

WHY THIS MATTERS

Climate vulnerability and resilience are influenced by how we build and where we build. Existing development patterns and town regulations impact where the community may experience climate change. Areas of town with more impervious surface will experience higher temperatures, create more stormwater runoff, and decrease water quality.[1] Some of this can be offset by conserving open space and tree canopy. Creating "urban forests" such as planting street trees or maintaining pocket parks are a great way to offset the urban heat island effect and reduce stormwater runoff.[2]

Forests, open grasslands, wetlands, and agricultural lands are key in combating the impacts of climate change as they sequester carbon dioxide through photosynthesis and improve air quality. However, as temperatures rise, precipitation events become more extreme, and invasive pests spread, Maine's carbon sequestering land cover will face increasing challenges. Loss of these spaces, especially if they are converted to impervious surfaces, accelerates the pace of climate change, reduces the ability for the ecosystem to adapt, and decreases flood protection. Therefore, it will be important for towns to retain these natural areas to sequester carbon dioxide and minimize the impacts of climate change.

1 USGS. Impervious Surfaces and Flooding | U.S. Geological Survey
2 USDA. Climate Change Resource Center | USDA Climate Hubs

IMPACTS

Warming temperatures

The full impacts of climate change on forests are variable as the longer spring and summer season will help spur growth, but the warmer winters and decreased snowmelt will harm some forest species, particularly the spruce-fir forests.[1]

Changing precipitation

Disturbances such as flooding, ice storms and wildfires can open forest canopies, expose mineral soil, and reduce tree cover, providing greater opportunities for invasion.[2]

1 Arnold et. al. STS_2024_digital.pdf
2 Ryan, M.G., et. al. (2012). Effects of climatic variability and change

ZONING

Zoning ordinances are another tool town's use to impact how the community develops. Zoning may be used to control building density, limit sprawl, or maintain green space in ways that reduce vulnerability or maximize the utility of resilient infrastructure.[1] For example, setting a shoreland overlay district creates restrictions on what and how close development can occur around bodies of water to protect water quality.

1 Planning and Land Use | U.S. Climate Resilience Toolkit

RISKS IN NEW GLOUCESTER

LAND USE

New Gloucester contains ample tree canopy with moderate areas of impervious surfaces. The maps of impervious surface and tree canopy provide a proxy for understanding which areas of town may be most at risk. Forestry is an important resource for the town, with over 6,700 acres, or 22% of all land, registered in Maine's Tree Growth tax program.

Since most of New Gloucester is forested, this improves New Gloucester's ability to mitigate and adapt to climate change. However, the area is still at risk of losing critical forests and open space.

1 Arnold et. Al. Maine Climate Council 2024 Updates
2 NOAA. CCAP Landcover Atlas
3 NOAA. CCAP Landcover Atlas

Forests currently cover nearly 89% of Maine and sequester over 60% of the state's annual carbon emissions, in addition to supporting the state-wide economy.[1] According to the NOAA Coastal Change Analysis Program Land Cover Atlas, between 1996 and 2021 Cumberland County lost 3.4% of forest land cover with over 7 square miles of loss being converted to developed land.[2] Based on NOAA's map, New Gloucester has seen limited areas of conversion compared to the rest of the county.[3]

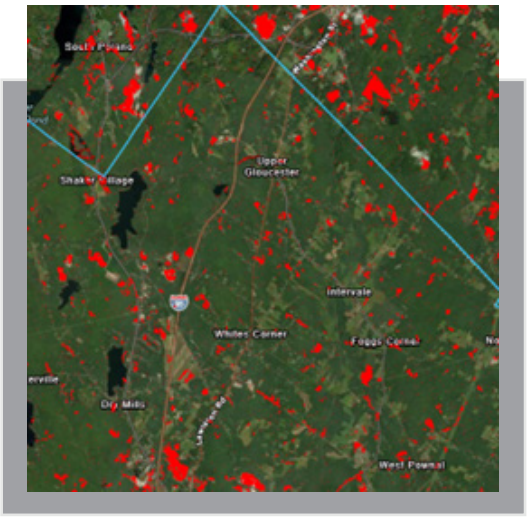
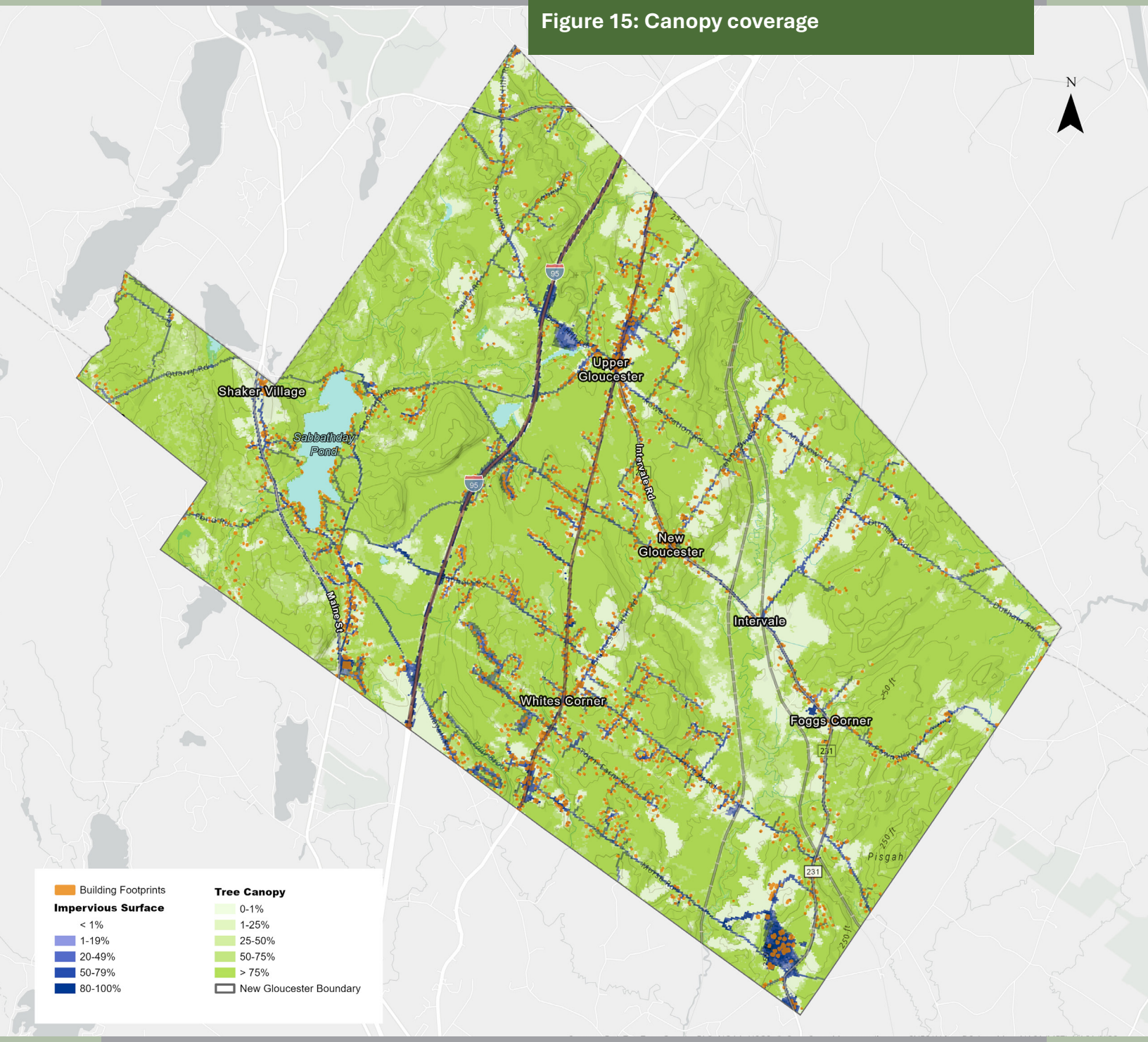


Figure 14: The image illustrates a change in forest cover, where red symbolizes a loss of forest cover. Source: CCAP Atlas

Table 3: Land cover change in Cumberland County from 1996 to 2021. Source: NOAA

Land Cover Class	1996 Area (Sq Miles)	2021 Area (Sq Miles)	Change in Area (Sq Miles)
Forested	549.63	530.76	-18.87
Woody Wetland	84.55	83.34	-1.21
Agriculture	55.31	52.03	-3.29
Scrub/ Shrub	15.41	20.40	4.99
Grassland	6.65	10.56	3.91
Emergent Wetland	15.65	18.11	2.46

Figure 15: Canopy coverage

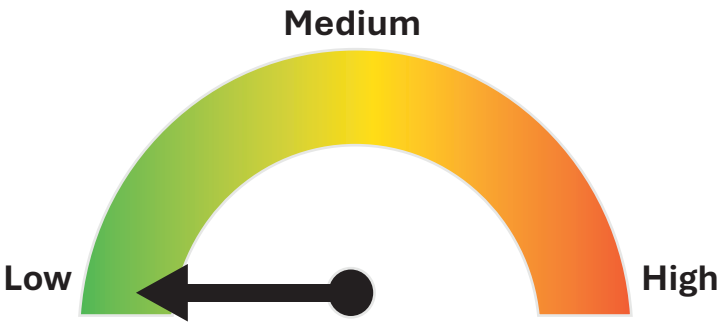


ZONING

Shoreline Zoning codes work to protect the water from excessive interference. In addition to its primary zoning districts, the zoning map also accounts for Shoreland Zoning and Resource Protection, Ground Water Protection, Historic Resources, and Mobile Home Park. All these layers must be highly considered before development is enabled. Several existing zoning designations promote climate resilience (listed below). However, the current zoning ordinance does not account for existing or projected climate hazards, such as increased precipitation.

REDUCING VULNERABILITIES

PRIORITY



> *Being in the foothills of the coastal plain, the whole community is vulnerable to the impacts of a climate emergency.*

RECOMMENDATIONS

1. Consider updating zoning, especially the Shoreland Zoning, to account for climate change, such as increased precipitation
2. Use land-use planning to limit development in high-risk areas and preserve open space
3. Protect forests, wetlands, and open space as natural carbon sinks through conservation methods
4. Promote sustainable forestry and agriculture practices
5. Consider investing in green infrastructure to absorb carbon and reduce heat

Table 4: Example zoning code ordinances that align that increase resiliency to climate change

Ordinance Name	Purpose
Groundwater Protection Overlay	Protects the quality of ground water resources by regulating activities and land use practices which are likely to affect those resources.
Transfer of Development Rights	Preserves agriculture, forestry, and undeveloped lands by directing development from a Sending District with sensitive land to Receiving Districts which have room for growth.
Shoreland Zoning	State zoning ordinance that protects water quality, wetlands, and riparian habitats by establishing setbacks and restricting development. Includes Resource Protection District to impose further restrictions on areas that are most environmentally sensitive.
Wind Energy Conversion Ordinance	Encourages and regulates wind energy conversion systems to reduce fossil fuel reliance.

3.4 People

Climate hazards will have a direct impact on New Gloucester's social and public health, which in turn could bring economic shocks. Climate change will not affect everyone equally; it will be felt most by those most vulnerable. Climate change may even further amplify social inequity by amplifying many of the existing vulnerability factors. To account for the most vulnerable populations, New Gloucester will need to ensure it has the capacity to support heightened social vulnerability from climate change, and to ensure equitable processes and outcomes in future planning for climate resilience.

SECTION SUMMARY	
Social Vulnerability	New Gloucester's total population is 5,733. The following statistics focus on demographic groups that are more vulnerable to the impacts of climate change: • **Financially Insecure:** 2% live below or close to the poverty line. 14% of homeowners are cost-burdened. Just under 26% of renters are cost-burdened. • **Vulnerable Age Groups:** 15% of New Gloucester's population are 65 years or older and 23% of the population are under 18 years old. • **Race and Ethnicity:** Around 4% of New Gloucester's community fall into a racial or ethnic minority. • **Disability:** 31% of residents live with a disability
Public Health	New Gloucester residents will experience a range of physical, emotional, and mental health impacts; however, these impacts will be similarly felt across all communities in the greater region. Those with existing social vulnerabilities will be most susceptible.
Housing	Increasing climate hazards contribute to property damage and declining property values while simultaneously increasing homeownership and renting costs. New Gloucester has a number of potentially energy inefficient homes that can contribute to the financial strain of households and greenhouse gas emissions. • There are 2,274 households. 25% of these homes are categorized as "old," meaning they were built before 1970. • 69.2% of residents use fuel oil or kerosene for home heating.

3.4.1 Social Vulnerabilities

Due to existing social vulnerabilities, the burden of climate change will not be felt equally across the community. People with existing social vulnerabilities will be disproportionately impacted by climate hazards. Communities with higher populations of at-risk individuals will be less resilient to climate hazards, and have less capacity to prepare for, respond to, or recover from climate events. Using demographic information to identify the populations most vulnerable to climate hazards allows the Town of New Gloucester to better direct planning and resources when preparing for future climate impacts.

This sub-section discusses the following social vulnerabilities for New Gloucester:

3.4.1.1 Demographic

3.4.1.2 Socioeconomic

3.4.1.3 Housing characteristics

COMPOUNDING SOCIAL VULNERABILITY

Although the town has overall low vulnerability, it does not mean the effects are not being felt. Each individual factor increases a person's vulnerability to climate change; however, many people and households experience multiple factors. The more simultaneous factors someone experiences, the harder it will be to adapt to climate change. For example, an elderly resident living alone may also live in poverty and lack access to a vehicle. Evacuating during a severe storm could be difficult due to decreased mobility, reliance on public transportation, fewer communication channels, and limited financial means.

While this section discusses the historic impacts of climate change on social vulnerabilities, there is still variability within each factor. This means that an individual classified within a historically vulnerable group may not have the same risks as the broader group. Similarly, it is not assumed that people of one factor are automatically at risk for additional factors. Demographic and socioeconomic characteristics are only one indicator of climate risk. Putting proper steps into place will work towards climate change mitigation and adaptation.

3.4.1.1 Demographics

WHY THIS MATTERS

Age, race, ethnicity, and disability are strongly correlated with disparities in health, exposure to environmental pollution, and vulnerability to natural hazards. Older and younger populations are more at risk for climate-related health impacts due to weakened immune systems and pre-existing conditions. Also, both populations are more likely to rely on caregivers for basic needs. Climate risks are even greater for elderly residents who live alone, as they are less likely to receive the necessary help during emergencies. Due to historic and institutional racism, people of color tend to have multiple socioeconomic factors that make them more susceptible to climate impacts. Residents with poor health or a lack of access to health care will be inherently more susceptible to dangers such as high heat, worsening air quality, and power outages caused by intense storms. The social marginalization of people with disabilities further increases the threat of isolation during a climate-related event.

IMPACTS

Warming temperatures
These populations are likely to face heat-related illnesses such as heat stroke, have a higher prevalence of asthma, and exacerbate existing health conditions.

Changing precipitation
These populations could have a harder time accessing resources during extreme storms. For example, older individuals may not have the technology or societal connections to receive storm alerts or recovery resources. Similarly, people who are linguistically isolated or have limited English proficiency may be less likely to hear about upcoming events or have challenges communicating their needs during an emergency.

RISKS IN NEW GLOUCESTER

Although some of these numbers represent a small percentage of the community, in addition to the potential for compounding vulnerabilities, pressure on these populations will lower the resilience of the overall community and can further strain community resources. New Gloucester will need to consider uplifting all areas of their community to ensure the town can adapt to climate change.

23% Population under the age of 18

15% Population over the age of 65

31% Individuals living with a disability

15% Adults 65 and over who live alone. This is approximately 2% of the total population

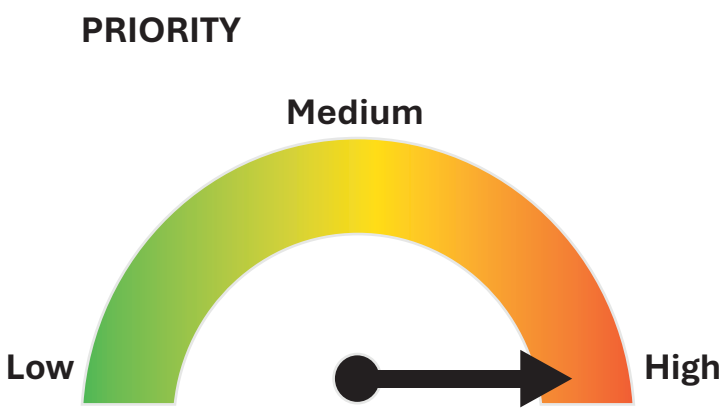
4% Speak English 'less than well'

4% People of color

8% Single parent households

> *People who live alone, particularly older residents are particularly vulnerable when there are outages and floods. Many do not use the internet, or do not have cell phones. A big need is to have a way to communicate with vulnerable people during times of emergencies.*

REDUCING VULNERABILITIES



RECOMMENDATIONS

Work to develop a community resilience hub system to support all people in the community. New Gloucester should continue to support organizations that assist these populations, including BLING, the school system, and general assistance programs. New Gloucester should consider future resilience and engagement efforts that specifically target these populations.

3.4.1.2 Socioeconomics

WHY THIS MATTERS

Added expenses of climate change, such as increasing energy costs or repairs due to storm damage, are particularly detrimental to those who are already financially burdened. Financially insecure households are less likely to have property insurance or savings for added or unexpected expenses or evacuate or relocate in case of a disaster.

Employment status, especially those who work in a natural resource industry, are seasonal workers, live on a fixed income, or are unemployed are also more vulnerable to the stressors of climate change and may have a harder time recovering from a climate emergency.

Finally, lack of access to key resources, such as broadband, limits a household's ability to communicate, respond, and recover during a climate crisis. Without access to technology, communities miss crucial warnings, evacuation notices, and other disaster-related information.

IMPACTS

Warming temperatures
Financially burdened households will have a harder time paying for higher energy costs from extreme temperatures or upgrading to energy efficient appliances to offset the costs. Shifts in the ecosystem from warming temperatures put pressure on those in the natural resource industry.

Changing precipitation
Property damage from flooding or extreme storms will create additional financial insecurities.

RISKS IN NEW GLOUCESTER

15% Total households who are cost burdened

4% Working age population who is unemployed

13% Self employed

6% Households with no internet subscription

2% Living below the federal poverty line

4% Does not have health insurance

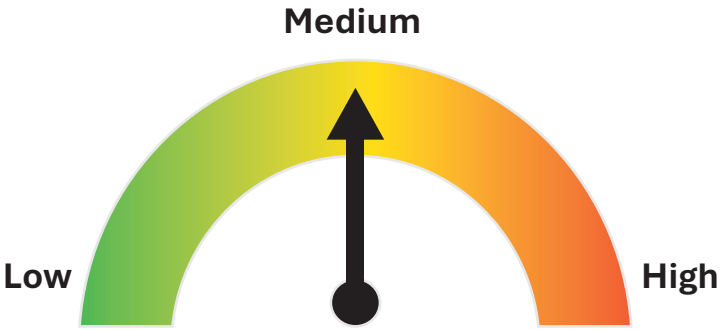
4% Does not have a high school diploma

2% Works in a natural resource occupation

REDUCING VULNERABILITIES

> *Households in remote areas of town that may experience delays in receiving help in the setting of an acute weather event.*

PRIORITY



RECOMMENDATIONS

Future planning efforts, including specific resilience or emergency management outreach should target individuals who are socioeconomically vulnerable.

3.4.1.3 Housing Characteristics

WHY THIS MATTERS

During a climate disaster, housing type and household characteristic will impact how individuals are able to adapt and recover. For example, renters have far less freedom in preparing for climate hazards than homeowners, as major renovations or upgrades are ultimately decided by the property owner. During a climate disaster, individuals living in multi-unit housing have limited access and limited ability to evacuate due to their dense population. Crowded structures also increase the psychological stress of residents, contribute to the spread of disease, and impact the overall health of residents. Sometimes these properties are also not as well maintained and less likely to be retrofitted or weatherized. Households without a vehicle lack the mobility to evacuate during a climate disaster and obtain necessary resources.

IMPACTS

Warming temperatures
Extreme temperatures degrade building materials faster, strain energy systems, and increase energy costs.

Changing precipitation
Property damage from flooding or extreme storms will create additional financial insecurities.

RISKS IN NEW GLOUCESTER

14% Multi-unit houses

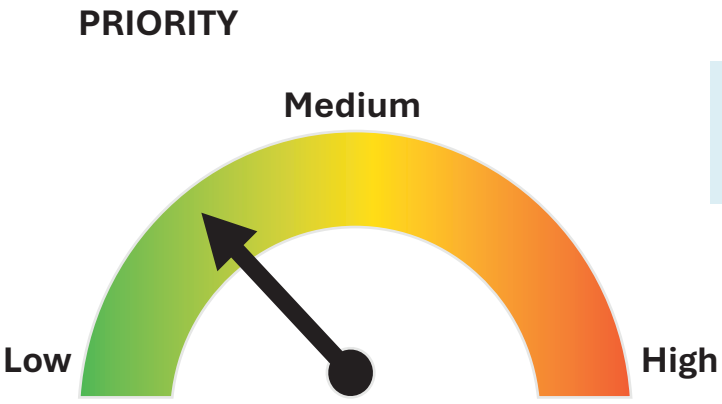
12% Households occupied by renters

<1% Population living in group quarters

8% Mobile homes

4% Considered 'crowded' or have more people than rooms

REDUCING VULNERABILITIES



RECOMMENDATIONS

Outreach efforts should try to target renters and those living in multi-units or mobile homes.

3.4.2 Public Health

Good public health supports worker productivity and economic stability, reduces the burden on healthcare systems, and ensures all people can actively participate in their community. Climate change impacts a wide range of public health concerns for both physical and mental wellbeing. For example, extreme heat poses serious health consequences from dehydration to heat stroke. Increased precipitation can contaminate water bodies, reduce water quality, and increase the risk of waterborne illness, especially as heavy storms overwhelm stormwater and septic systems. Climate change can further affect human health by impacting the severity or frequency of existing health problems such as asthma and cardiovascular disease.

Flooded roadways or properties can limit access for emergency services or prevent residents from reaching critical community services. This, combined with the decline in physical and mental health posed by climate change, strains the healthcare system and increases individual health expenditures. Collectively, this reduces the community's resilience and ability to withstand, recover, and adapt to climate hazards.

This sub-section discusses the following public health concerns for New Gloucester:

3.4.2.1 Air Quality

3.4.2.2 Extreme temperatures

3.4.2.3 Mental health

3.4.2.4 Vector-borne diseases

3.4.2.5 Drinking water quality

> *Everyone is or will be impacted by a variety of climate change effects in New Gloucester, regardless of demographics or exact location.*

3.4.2.1 Air Quality

WHY THIS MATTERS

Climate change will likely exacerbate poor air quality over time, as rising temperatures speed up the chemical reactions that create smog, and changes in wind patterns may potentially reduce local air circulation, trapping pollution at the ground level.[1] Residents with existing health conditions will be more vulnerable to poor air quality. These changes worsen asthma, allergies, and other respiratory conditions, while also causing serious cardiovascular problems.[2] In 2021, 12.5% of adults in Maine had asthma.[3] The elderly, children, those with preexisting health conditions, and those who primarily work outside are particularly vulnerable to worsening air quality. These health impacts can also increase healthcare costs, which can be particularly challenging for individuals who are already cost-burdened.

1 U.S. Global Change Research Program (2016). The Impacts of Climate change on Human Health in the United States: A Scientific Assessment

2 Eguiluz-Gracia et. al. (2020). The need for clean air: The way air pollution and climate change affect allergic rhinitis and asthma

3 Centers for Disease Control and Prevention. (2020).Most Recent Asthma State or Territory Data.

IMPACTS

Warming temperatures

Higher annual temperatures and the shifting seasons are likely to bring earlier flowering, boost pollen production, and the potential for a longer pollen season. Increases in temperature and humidity will influence air pollution, affecting the number of cases and severity of respiratory conditions.[1]

Changing precipitation

Increased wildfire, even from sources located hundreds of miles away, will bring smoke and fine matter to the state. Increased flooding and humidity can also lead to mold growth in homes and buildings, impacting air quality and triggering health problems.

1 Eguiluz-Gracia et. al. (2020). The need for clean air: The way air pollution and climate change affect allergic rhinitis and asthma

WILDFIRES

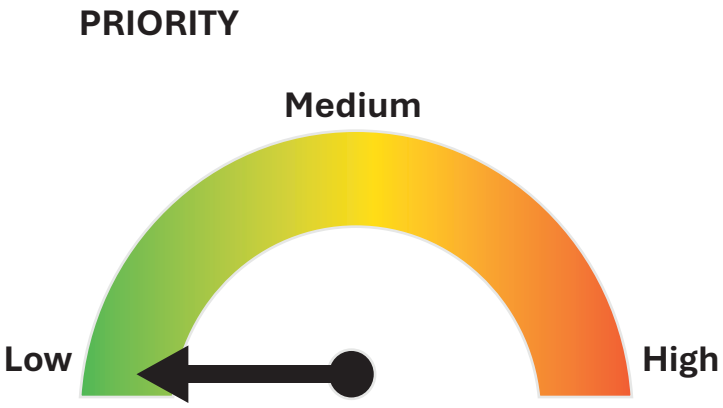
Increasing severity and prevalence of wildfires, in Maine and beyond, increases particle pollution. Higher levels of particulate matter can cause irritation and infection; trigger allergic responses, asthma, and other respiratory stress; and even cause serious cardiovascular problems such as heart attacks and strokes or lead to chronic respiratory conditions. In the summer of 2021, fires in the western United States and Canada began impacting the air quality index in Maine, prompting warnings from the state Department of Environmental Protection. Source: Portland Press Herald. (2021). Smoke from western wildfires affecting air quality throughout Maine.

RISKS IN NEW GLOUCESTER

There is no specific air quality measurement for New Gloucester, however, the Environmental Protection Agency (EPA) maintains a monitoring station in Portland for Cumberland County. **Overall, Cumberland County has relatively clean air.** The EPA's Air Quality Index report is an indicator of overall air quality and considers all the criteria air pollutants measured at the monitoring station.[1] The graph below shows the number of days where the Air Quality Index experienced unhealthy days. The County has not experienced any "Very Unhealthy" or "Hazardous" days in the last 20 years. Cumberland County has experienced 7 years (2001-2003, 2005, 2007, 2010, 2013) where the 8-hour ozone daily maximum concentration exceeded the National Ambient Air Quality Standard of 0.070 ppm which was set in 2015.[2]

1 EPA. Air Quality Index Report
2 EPA. Air Quality Statistics Report

REDUCING VULNERABILITIES



RECOMMENDATIONS

Deploy low-cost air quality sensors to monitor reactive gaseous air pollutants in New Gloucester.

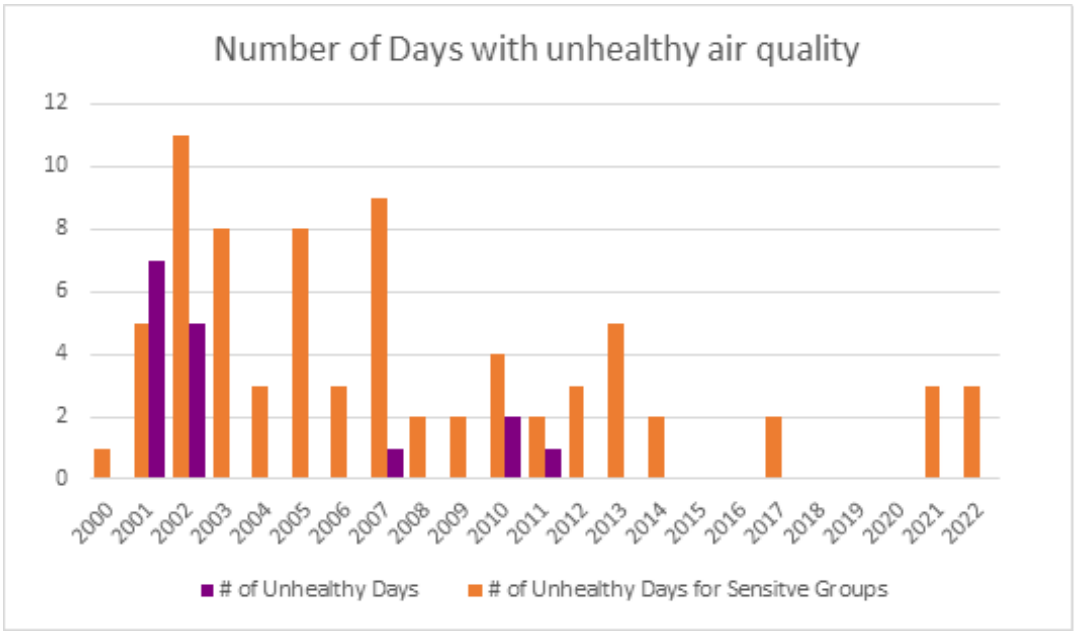


Figure 16: Graph showing number of unhealthy days in Cumberland County from 2000 to 2022. Source: EPA

3.4.2.2 Extreme Temperatures and Health

WHY THIS MATTERS

Climate change leads to more intense and longer-lasting heat events. Elderly, children, individuals with preexisting health conditions, and those who work outside are at greater risk of health-related impacts such as dehydration, heat exhaustion, or worsening of chronic illnesses.[1] To combat heat, officials often recommend staying in air-conditioned buildings. However, many Maine homes and businesses lack air conditioning, making people more vulnerable to heat stroke in the summer. Additionally, those with financial and mobility burdens are less able to afford air conditioning or access cooling centers.

Extreme cold-related illness also poses a serious threat to residents, especially the more vulnerable populations such as the elderly, children, individuals with preexisting health conditions, and those who work outside. Hypothermia and frostbite are the two most common cold-related illnesses in Maine, but there are also concerns related to slip and fall injuries and respiratory infections. It is important to have reliable sources of heat and access to warm and safe spaces.

All of this can increase hospitalization rates, strain health care systems and emergency response, increase demand for public cooling services, or strain the power grid and cooling systems.

1 DHS. Heat-Related Illness

IMPACTS

Warming temperatures
Extreme temperatures exacerbate existing health conditions, and create higher risks for heatstroke, dehydration, and cardiovascular stress.

Changing precipitation
Loss of power or impaired access for medical services during storms disrupts care, can exacerbate health problems, and further strains the medical system.

HEAT ISLANDS

"Heat islands," or areas of town with more impervious surfaces like buildings, roads, or parking lots, retain more heat and have higher surface temperatures. Residents who live or work in high-impervious areas are at greater risk of heat-related illnesses.1 Areas with more trees and vegetation reduce the effect of heat islands and remain cooler. Historically, the most vulnerable populations within a community have the least access to open, green space. Farmland also tends to exhibit higher heat severity due to several key environmental factors: they often have fewer trees for shade and the cooling effects of evapotranspiration; bare soil and harvested fields tend to absorb more solar radiation which increases surface temperatures; and many of the metal and plastic storage infrastructure retains heat.

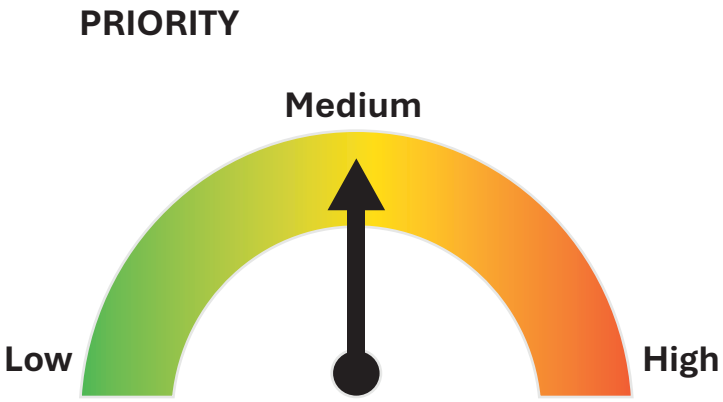
1 EPA. Heat Island Trends | US EPA

RISKS IN NEW GLOUCESTER

Based on the heat severity map, most of New Gloucester is at a low to moderate risk from heat. The highest heat severity areas are farmlands due to the reflective properties of harvested fields and potential bare soil present at the time the data was taken. By maintaining conserved lands and maximizing green spaces across the town, New Gloucester can work to decrease the impact of rising temperatures. With varying humidity levels, there may be many more days that "feel" very hot despite what the thermometer says.

There is no data or information specific to New Gloucester regarding the impacts of either extreme hot or cold temperatures. According to the Maine Tracking Network, in Cumberland County, there were 69 heat-related and 204 cold-related emergency department visits in 2024. While cold-related ED visits were higher, it is important to also understand confounding variables, such as how an increase in viruses can cause an increase in numbers (see callout box). New Gloucester should consider the impacts of both extreme temperatures on vulnerable populations and ensure adequate resources are available. As increased temperatures alter cold weather precipitation patterns, the more intense storms could create additional hazards for community members. Ensuring access to reliable heating sources, proper maintenance of infrastructure, and the availability of warming centers within the community help reduce the risks of severe winter weather.

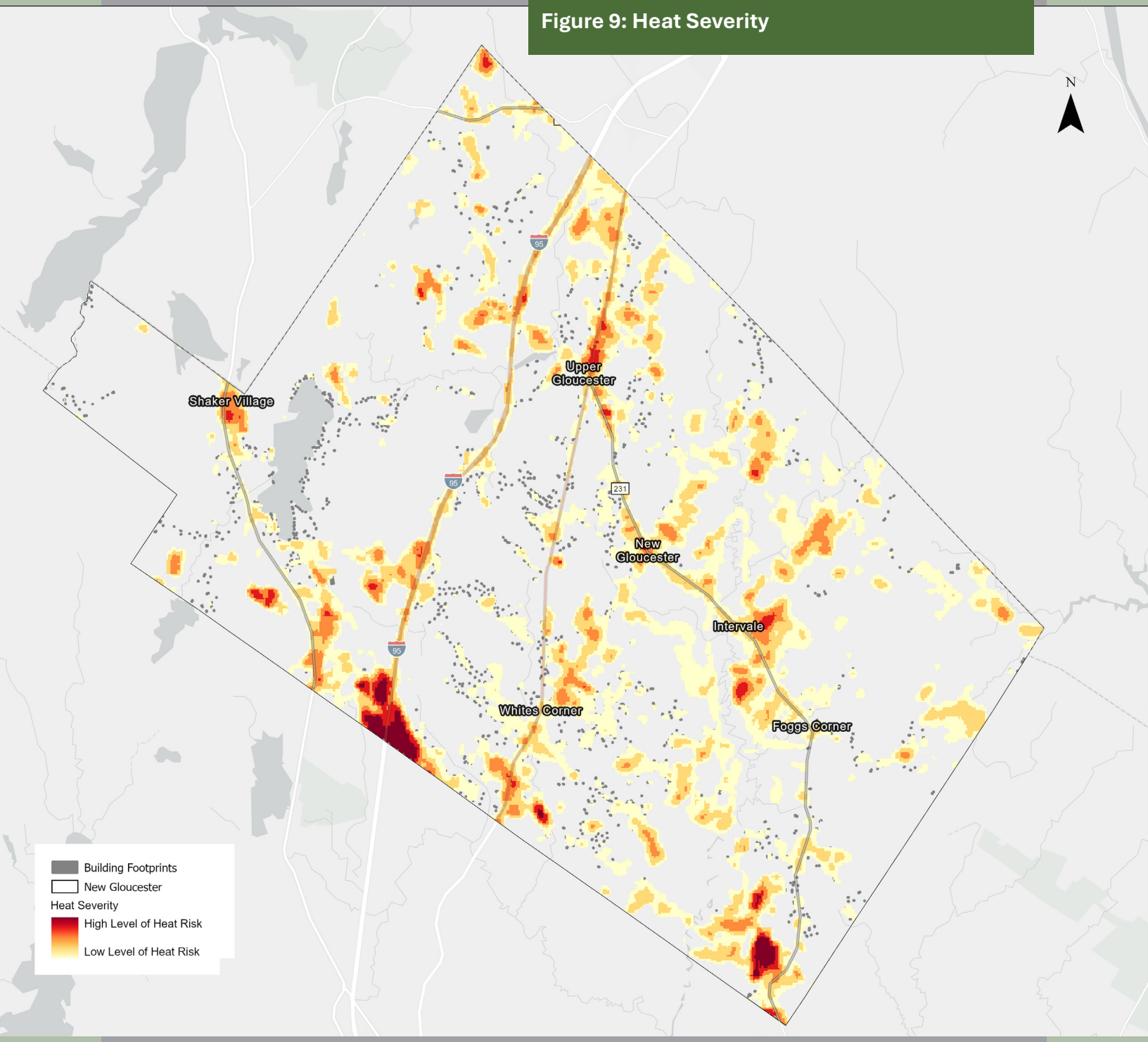
REDUCING VULNERABILITIES



RECOMMENDATIONS

1. Expand heating and cooling centers for resident use during extreme temperature days
2. Propose public health campaigns for residents to understand the risks and symptoms of temperature-related illnesses
3. Maintain access during extreme events to ensure emergency vehicles can access those most in need

Figure 9: Heat Severity



TEMPERATURE-RELATED DEATHS

Temperature-related deaths can result from both extreme heat and extreme cold. Seasonally, cold-weather related deaths outnumber heat-related deaths; however, when non-weather factors such as viral winter infections as removed, severe heat waves lead to larger spikes in acute death than extreme cold days. On a day-to-day basis, there seems to be a sharper spike in mortality on extreme heat days than on extreme cold days. Studies also suggest that heat-related deaths will increase at a faster rate than cold related deaths will decrease. Although deaths related to heat and cold are both a concern, it is worth noting that the infrastructure in Maine is better equipped to protect from colder temperatures than hotter temperatures since buildings are more likely to have home heating than air conditioning. Sources: Lee and Dessler (2023). Temperature related deaths and illness and NIH. Between Extremes: Health Effects of Heat and Cold- PMC

3.4.2.3 Mental Health

WHY THIS MATTERS

Climate change will not only impact people physically, but mentally and emotionally as well. This can include trauma from a climate disaster, stress from changing job industry or increasing financial burdens, or the persistent emotional toll of processing information about climate change.[1] The mental health impacts can be temporary stress from immediate events to long ranging post-traumatic stress disorder, anxiety, and depression. Those who already face social vulnerabilities, described earlier in the report, are more likely to have adverse mental health outcomes. This includes people who are economically vulnerable, the elderly, children, first responders, and those which rely on the natural environment for their livelihood.[2]

Climate change, specifically extreme heat, will also exacerbate impacts for people with who experience mental health conditions. Further, the mental and emotional stress of climate change interacts with factors, such as relationships or jobs, which further strains social and environmental resilience.

1 U.S Global Change Research Program (2016). The Impacts of Climate Change on Human Health: A Scientific Assessment

2 U.S Global Change Research Program (2016). The Impacts of Climate Change on Human Health: A Scientific Assessment

IMPACTS

Warming temperatures
Prolonged heat, or cold, especially those without property heating/ cooling systems increases anxiety, irritability, and mental health risks.

Changing precipitation
Climate disasters can trigger trauma, grief, and post-traumatic stress for those affected. This is especially true for those who are more social vulnerable and financially burdened.

RISKS IN NEW GLOUCESTER

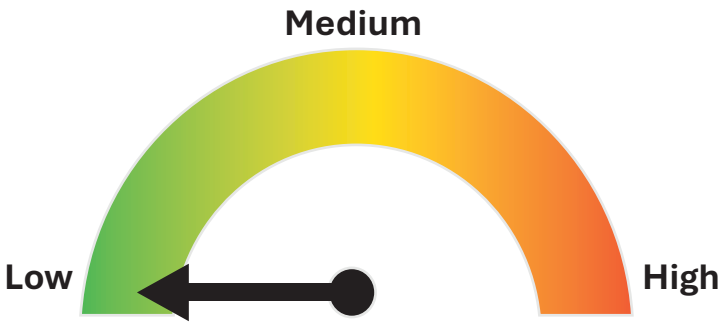
There is no data or information specific to New Gloucester regarding the impacts of climate change on mental health.

The Center for Disease Control produces the Behavioral Risk Factor Surveillance System, a health risk survey aggregated by state, including questions on mental health. Based on the survey, in 2023, **27% of respondents in Maine said they experienced between 1 to 13 days where their mental health was not good, and 18% of Maine respondents said they experienced 14 or more days where their mental health was not good.**[1] These percentages have increased every year since 2019.

1 CDC. BRFSS Prevalence and Trends Data

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

Build community support networks and outreach programs. Support organizations that provide mental health services.

3.4.2.4 Vector-Borne Diseases

WHY THIS MATTERS

Vector borne diseases, such as Lyme disease, are those passed to humans through non-human vectors, such as mosquitoes, ticks, fleas, and bacteria. These vectors pass diseases that are often debilitating and sometimes fatal. Increasing the number of people inflicted with these diseases strains the healthcare system and can place financial burdens on individuals for medical bills. Warmer winters, higher humidity, and more precipitation impact the breeding and survival rates of ticks and mosquitoes, as well as the pathogens they carry.

Nine vector-borne diseases (two mosquito-borne and seven tick-borne) have been identified in Maine. In 2024, Lyme disease, which is spread by black-legged ticks or deer ticks, was the most common vector-borne disease in Maine. Rates of Lyme disease have increased significantly over the past decades from less than 250 reported cases in 2005 (70 in Cumberland County) to 3,218 reported cases in 2024 (412 in Cumberland County), which is a state record.[1] Two other prevalent tickborne diseases – Anaplasmosis and Babesiosis—also had a high number of cases in 2024 with 1,284 and 309, respectively.[2]

1 Maine Tracking Network. Tickborne Diseases
2 Maine Tracking Network. Tickborne Diseases

IMPACTS

Warming temperatures
Warming temperatures and shortening winters allow mosquitoes, ticks, fleas, and other vectors to survive in areas that were previously too cold. The change in temperature can also extend the breeding season and impact the rate of reproduction or pathogen transmission.

Changing precipitation
Increased precipitation and humidity can create more standing water which provides ideal breeding sites for mosquitoes.

RISKS IN NEW GLOUCESTER

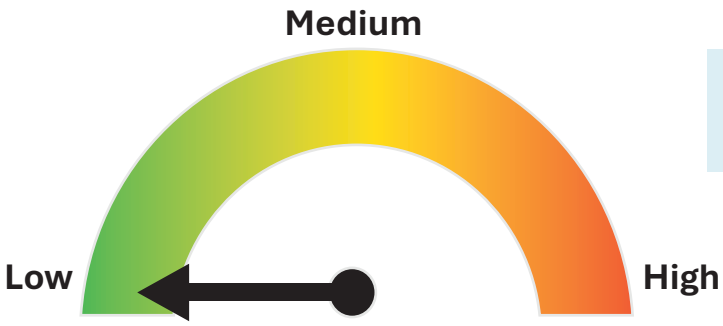
Like communities across the state, New Gloucester is experiencing a prevalence of tickborne diseases. The Maine CDC tracks three diseases at the town level: Lyme, Babesiosis, and Anaplasmosis. Between 2018 and 2022, New Gloucester had 44 reported cases of Lyme, 10 reported cases of Anaplasmosis, and 3 reported cases of Babesiosis.

Table 5: Rate and number of confirmed and probable cases of tick-borne disease in New Gloucester from 2018-2022. Source: Maine Tracking Network Data Portal.

2018-2022	Lyme Disease	Babesiosis	Anaplasmosis
Number of confirmed and probable cases	44	3	10
Rate per 100,000 people (ranking out of 28 communities in Cumberland County	150.3 (9th)	10.2 (7th)	34.2 (12th)

REDUCING VULNERABILITIES

PRIORITY



RECOMMENDATIONS

Conduct an education and outreach initiative on public health impacts, including the risk, signs, and symptoms of vector-borne diseases.

3.4.2.5 Drinking Water Quality

WHY THIS MATTERS

Healthy drinking water is critical to safeguarding public health, supporting commercial enterprises such as agriculture, and strengthening the economic well-being of a community. Residents face direct health risks from contaminated or unhealthy water, including exposure to harmful chemicals and waterborne diseases. Climate change, with increased precipitation and higher temperatures, threatens water quality by impairing drinking water sources and filtration systems.

Public and private water utilities that sustain healthy drinking water are also at risk of being compromised by climate change. Wells located near water bodies are particularly vulnerable, as pollutants from runoff can seep into groundwater and contaminate the water supply. Unsafe wells compromise household drinking water, creating public health risks, increasing water treatment costs, and adding stress to municipal water supplies.[1]

Further, the quality of drinking water in a community can impact the town's ability to attract new residents and businesses; concerns about water quality may discourage future growth and investment if drinking water is perceived as unsafe or unclean.

1 EPA. Potential Well Water Contaminants and Their Impacts

IMPACTS

Warming temperatures
Lower groundwater recharge during prolonged drought can reduce well yields or dry shallow wells entirely. Lower water supply levels lead to higher concentrations of contaminants in what water remains. Higher temperatures may also worsen groundwater contamination by increasing the release and concentration of harmful substances like algal toxins and nitrates.

Changing precipitation
Stormwater runoff delivers larger quantities of pollutants such as nutrients, sediment, bacteria, road salt, and trash into waterbodies, increasing the likelihood of water-related illness through recreation and consumption.[1] Heavy rainfall causes flooding, raises groundwater, and saturates the soil, which can undermine septic systems and reduce their ability to effectively treat wastewater.[2]

1 U.S Global Change Research Program (2016). The Impacts of Climate Change on Human Health: A Scientific Assessment

2 The Hidden Risk to Clean Water in the Age of Climate Change: Septic Systems - Conservation Law Foundation

RISKS IN NEW GLOUCESTER

New Gloucester Water District (NGWD) serves around 130 connections from a public groundwater source in the Upper Village area.[1] The water district regularly tests both the source and treated water. The Maine Drinking Water Program (DWP) evaluates public water supplies as part of the Source Water Assessment Program (SWAP) to assess how likely drinking water sources are to being contaminated by human activities in the future. **The NGWD 2024 Consumer Confidence Report listed no contaminants above the allowable limit in drinking water.[2]**

However, the majority of households rely on private wells for drinking water. According to the Maine Geological Survey, New Gloucester has approximately 1,051 wells. **Households which rely on private wells for drinking water are specifically at risk for contaminated water quality.** Private wells are not regulated under the Federal Safe Drinking Water Act or state laws which means well owners are responsible for testing and maintaining water quality.[3] Most areas in town are subject to naturally occurring contaminates in well water, such as radon, arsenic, and uranium. Most wells in New Gloucester have not been impacted by droughts, however, several residents reported dry wells in 2022 to the Maine Dry Well Survey.[4]

> *I'm worried about the impacts on Sabbathday Lake including heavy rain events and erosion along watershed impacting tributaries and lake quality. Warmer summers with potential of causing algae blooms harming lake water quality.*

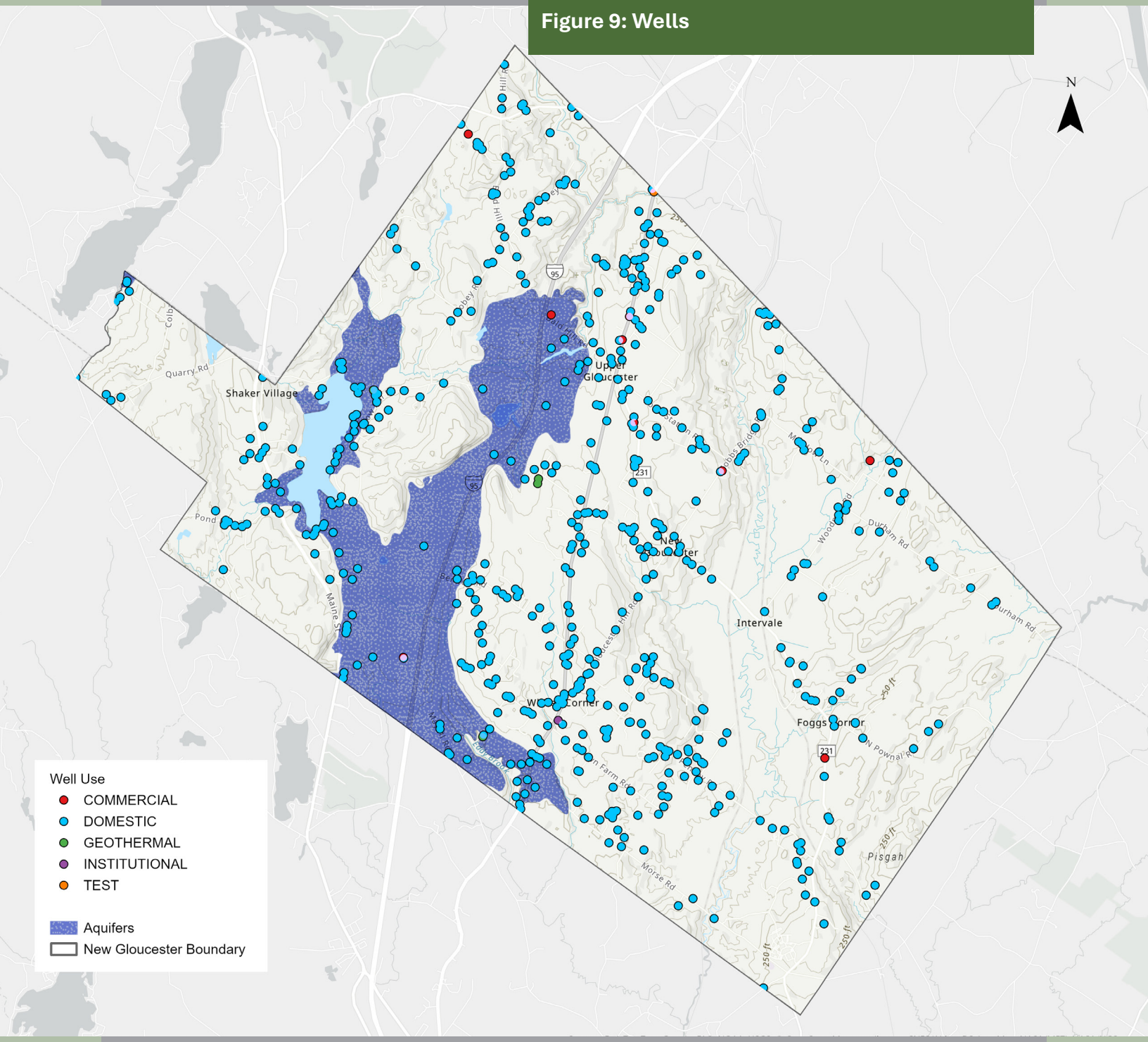
1 EWG. New Gloucester Water District

2 New Gloucester Water District 2024 Consumer Confidence Report

3 Arnold et. al. Maine Climate Council 2024 Updates

4 Dry Well Survey - Maine Drought Task Force /

Figure 9: Wells



REDUCING VULNERABILITIES

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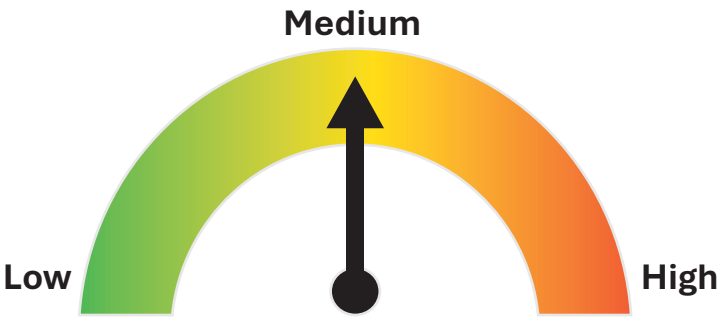
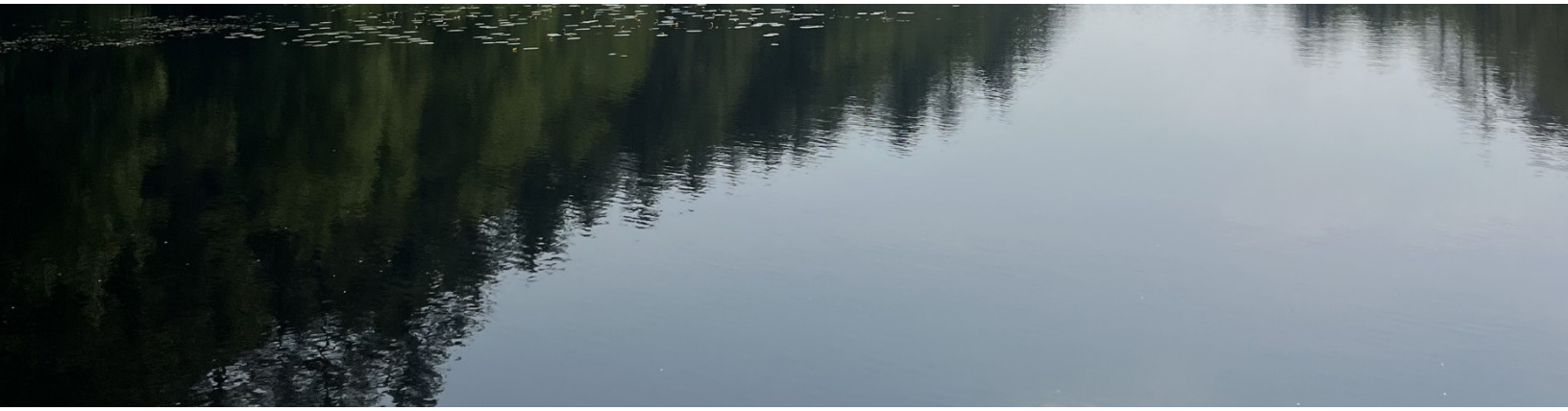


RECOMMENDATIONS

1. Provide educational outreach materials/ programs on wells and septic systems to encourage homeowner inspection and maintenance
2. Test private wells regularly (at least annually, and after storms/flooding) for bacteria, nitrates, and other contaminants to detect issues early
3. Establish a town-led or coordinated program for regular septic system pumping
4. Households can consider developing backup options such as rainwater collection, and installing energy efficiency systems to expand well lifespan during droughts

MAINTAINING HEALTHY DRINKING WATER

While municipalities are responsible for ensuring that proper sanitation infrastructure is in place and that water supplies are regularly monitored to maintain safety and compliance with health standards, residents also share the responsibility of maintaining the health of their drinking water supplies—especially in New Gloucester where the majority of residents rely on private wells and septic systems. All residents can maintain the health of their drinking water supplies by preventing pollution through proper disposal of chemicals, following safe drain disposal practices, and minimizing use of fertilizers and pesticides. Residents who own private wells and septic systems should conduct regular inspections and maintenance to keep their systems safe and reliable. Private wells require professional inspections annually, yearly water testing, and protection from contamination around the wellhead, along with proper installation and sealing. Septic systems should be inspected once a year and pumped every 3 to 5 years to avoid sludge buildup and drainfield blockages. For more information on how to properly care for wells and septic systems, visit Private Drinking Water Wells | US EPA and SepticSmart Education Materials | US EPA.



3.4.3 Housing

Inland flooding and storm intensity threaten to directly damage houses, leading to reduced property values and impacts to New Gloucester's tax base and real estate market. Any substantial loss or damage to the housing stock caused by storms or flooding will compound the region's ongoing housing stresses. New Gloucester and the whole region have existing housing security, affordability, and quality issues. In the past decade, New Gloucester has already seen significant change in their town's growth. With climate migration, strain on housing in the surrounding areas, and continued growth across the region the increasing population growth could continue. This can strain housing availability and affordability. This section highlights particularly vulnerable housing communities within New Gloucester.

This sub-section discusses the following housing concerns for New Gloucester:

3.4.3.1 Home efficiency

3.4.3.2 Property values and tax base

3.4.3.3 Housing affordability

> *Whether it's safe transportation out of a disaster area or access to supplies following a disaster, our community is not built with the infrastructure and resilience to be self-sufficient at this time.*

3.4.3.1 Home Efficiency

WHY THIS MATTERS

Efficient homes use less energy to perform the same functions, resulting in cost savings, greater comfortability, and reduced emissions. Climate change threatens home efficiency by introducing new challenges to home infrastructure, which often already lacks modern, efficient updates. Older buildings tend to be less energy efficient, struggling to keep homes warm in the winter and cool in the summer; this costs residents more money on heating/cooling and exposes them to more extreme temperatures. In addition, houses built before 1970 were constructed prior to modern buildings codes, such as smoke alarms, that help reduce risk.

The source of heating for a house impacts both vulnerability and greenhouse gas emissions. Cost of fuel varies by heating source and can put further stress on financially insecure households.[1] Fuel oil, kerosene, propane, and natural gas all release carbon dioxide into the atmosphere. Heating (or cooling) the home using electricity provides a more cost-effective, sustainable solution to help combat climate change.

1 Maine Governor's Energy Office. Heating Fuel Prices

IMPACTS

Warming temperatures
Hotter summer temperatures increase the demand for air conditioning, resulting in higher electricity bills. Vulnerable groups may face unsafe living conditions in overheated homes.

Changing precipitation
Heavy precipitation can impact the integrity of a home, reducing insulation effectiveness and increasing energy loss.

Table 6: Home heating fuel sources in New Gloucester. Source: U.S. Census Bureau

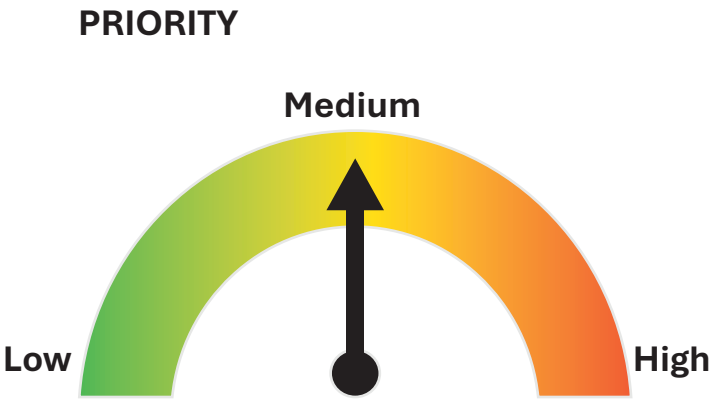
Heating Fuel	Number of Households (%)
Natural Gas	33 (1.6%)
Propane	227 (10.7%)
Electricity	152 (7.2%)
Fuel Oil or Kerosene	1,469 (69.2%)
Wood	217 (10.2%)

RISKS IN NEW GLOUCESTER

The majority of New Gloucester homes are heated by fuel oil or kerosene. This is both one of the more costly heating sources and a greater emitter of greenhouse gases. Conversion away from oil will both reduce emissions and increase resiliency for the residents.

Out of the 2,274 households in New Gloucester, 25% of these homes are categorized as "old," meaning they were built before 1970. After the 1970s, many building codes and energy efficient standards changed; homes built before then typically have less insulation and outdated design and technology. Repairs or alterations made to homes can cost significant amounts of money with the need for materials, consultants, permits, and time. This poses barriers to having safe and energy efficient homes, ultimately increasing vulnerability.

REDUCING VULNERABILITIES



RECOMMENDATIONS

1. Provide public education/outreach materials to support homeowners in transitioning to more energy efficient home technology.
2. Implement or connect residents with an Energy Navigators program to help homeowners review their energy consumption and improve home efficiency.

3.4.3.2 Property Values and Tax Base

WHY THIS MATTERS

Climate-related hazards cause physical damage to properties and reduce the desirability of certain areas as places to live. Consequently, homes located in these high-risk regions often experience declining values driven by increased insurance costs and diminished demand. As properties become increasingly exposed to flooding, their market and assessed values could decline, reducing local tax revenues from affected parcels and potentially straining municipal fiscal health. Substantial loss or damage to housing will reduce a town's tax base, impacting municipal budgets. The municipal tax base will also be affected by increased damage and frequency of repairs needed for infrastructure. It is also possible that federal and state taxes will increase due to emergency management services and government flood insurance programs requiring higher capacity.

IMPACTS

Warming temperatures

As hotter temperatures degrade water quality with poor water clarity and increased algal blooms, property values will lower on lakes.

Changing precipitation

Flooding risks and water damage from increased precipitation diminishes property desirability and market value.

FLOOD INSURANCE

As the risk of flooding increases, the chances of flood-related expenses go up. As the risk of damage and expenses increases so will the cost of flood insurance. In April 2023, FEMA fully implemented Risk Rating 2.0, National Flood Insurance Program's pricing methodology. This methodology addresses rating disparities by incorporating more flood risk variables to equitably distribute premiums across policyholders based on home value and a property's flood risk. Prior to these changes, First Street Foundation calculated the average expected annual damage per Maine property within a special flood hazard area to be $4,381 while the average insurance premium was only $1,285. This suggests that even with insurance, it does not meet the full cost of flooding impacts. First Street Foundation also found that the risk and cost of those living outside of FEMA designated flood areas have been historically underestimated. Properties outside of FEMA's designated special flood hazard areas account for only 2% of flood insurance policies but account for 20% of all claims and receive 33% of federal disaster assistance for flooding. Source: First Street Foundation. The Cost of Climate and FEMA. NFIP's Pricing Approach

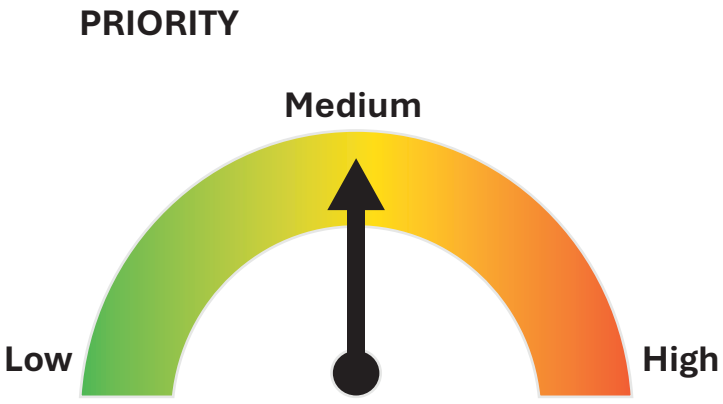
RISKS IN NEW GLOUCESTER

For the 2024 fiscal year, New Gloucester property taxes account for almost 70% of the municipal revenue. Projected flooding from storms will impact over 50 buildings and almost 1,500, or 50%, of total parcels could experience some degree of flooding.

Although these property impacts in New Gloucester will affect overall property values and the municipal tax base, accurate calculations to estimate risk is not available. A building or property might experience flooding during a storm, but there is no information to confirm the extent of damage. For example, if a property floods it might only be temporary and there are no lasting impacts and little to no impact on the property value. However, if enough storm events happen then part of the property could become permanently unusable and there would be a reduction in property value. This would be similar with a buildings where at the moment analysis is not able to determine how much of a building's value would be impacted by a single (or multiple) flooding events.

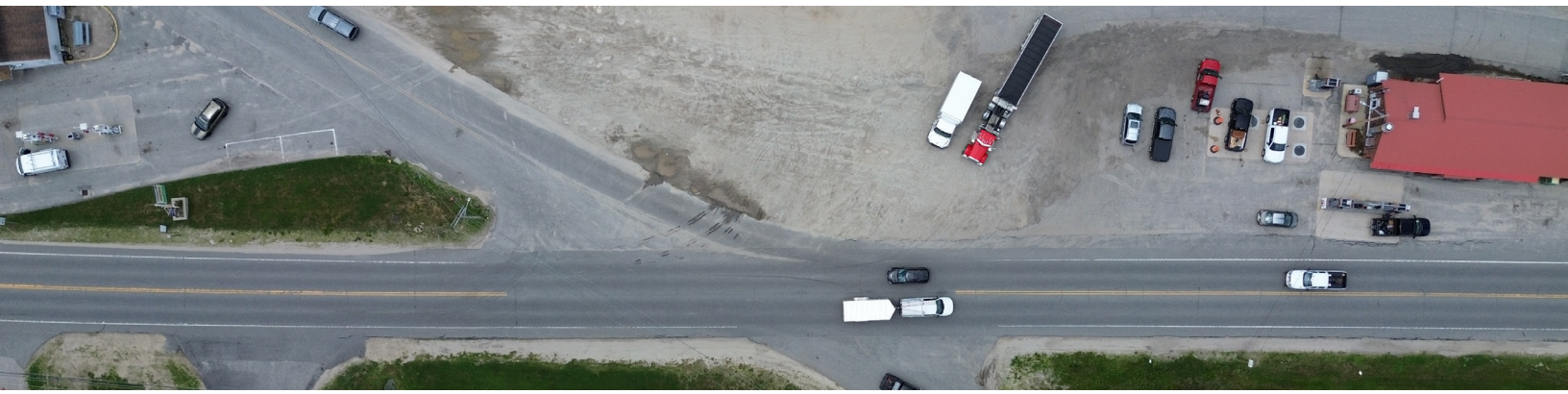
Although flooding is unlikely to permanently damage most of the buildings or render a property completely unusable, potential consistent flooding could impact taxation. A more in-depth economic analysis on the cost of climate change could be completed to help assess a specific value of impact.

REDUCING VULNERABILITIES



RECOMMENDATIONS

1. Provide public education/outreach materials to support homeowners in transitioning to more energy efficient home technology.
2. Implement or connect residents with an Energy Navigators program to help homeowners review their energy consumption and improve home efficiency.



3.4.3.3 Affordability

WHY THIS MATTERS

Cost-burdened homeowners and renters already face financial insecurities. As climate hazards damage properties, force temporary or permanent evacuation, or require increased maintenance it will continue to increase housing costs. Investing in flood insurance, retrofitting buildings, or investing in flood-resistant properties are often unattainable for cost-burdened households. A lack of affordable housing will continue to push people out of town and place financial burdens on those who stay, making responding to climate change difficult. Elderly residents who live on fixed income, those in affordable housing complexes, and people living in manufactured homes are vulnerable to housing impacts.

IMPACTS

Warming temperatures
Higher energy costs for cooling make housing less affordable. Homes in more vulnerable areas have higher insurance premiums and risk of damage.

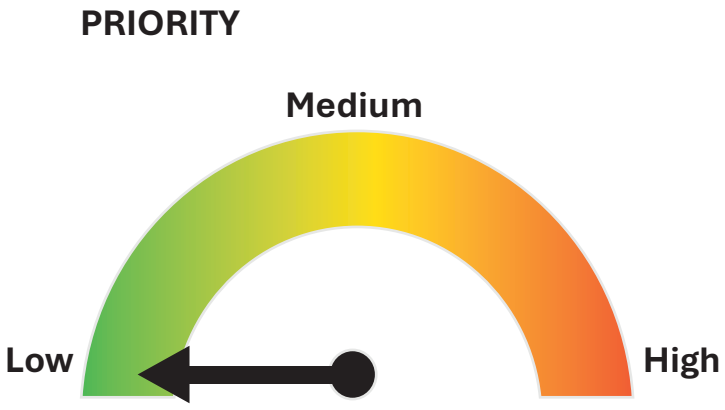
Changing precipitation
Disaster displacement from intense storms increases homelessness and reduces housing availability.

RISKS IN NEW GLOUCESTER

There are no senior living housing communities, designated low-income, or affordable housing in New Gloucester. There are a few mobile home communities, with the most notable being Wayfarer Village Mobile Home Community located on Bald Hill Road. Bald Hill Road is at risk of flooding around this site, which could trap these residents, adding to the vulnerability mobile home structures already face with the impacts of climate hazards.

A lack of available or affordable housing, not only in New Gloucester but also the surrounding region means a growing percentage of the labor force will have to commute further for work. As housing prices also rise regionally, workers may commute from outside the region over time, leading to both higher greenhouse gas emissions and greater vulnerability for climate-related transportation interruptions.

REDUCING VULNERABILITIES



RECOMMENDATIONS

1. Provide public education/outreach materials to support homeowners in transitioning to more energy efficient home technology.
2. Implement or connect residents with an Energy Navigators program to help homeowners review their energy consumption and improve home efficiency.

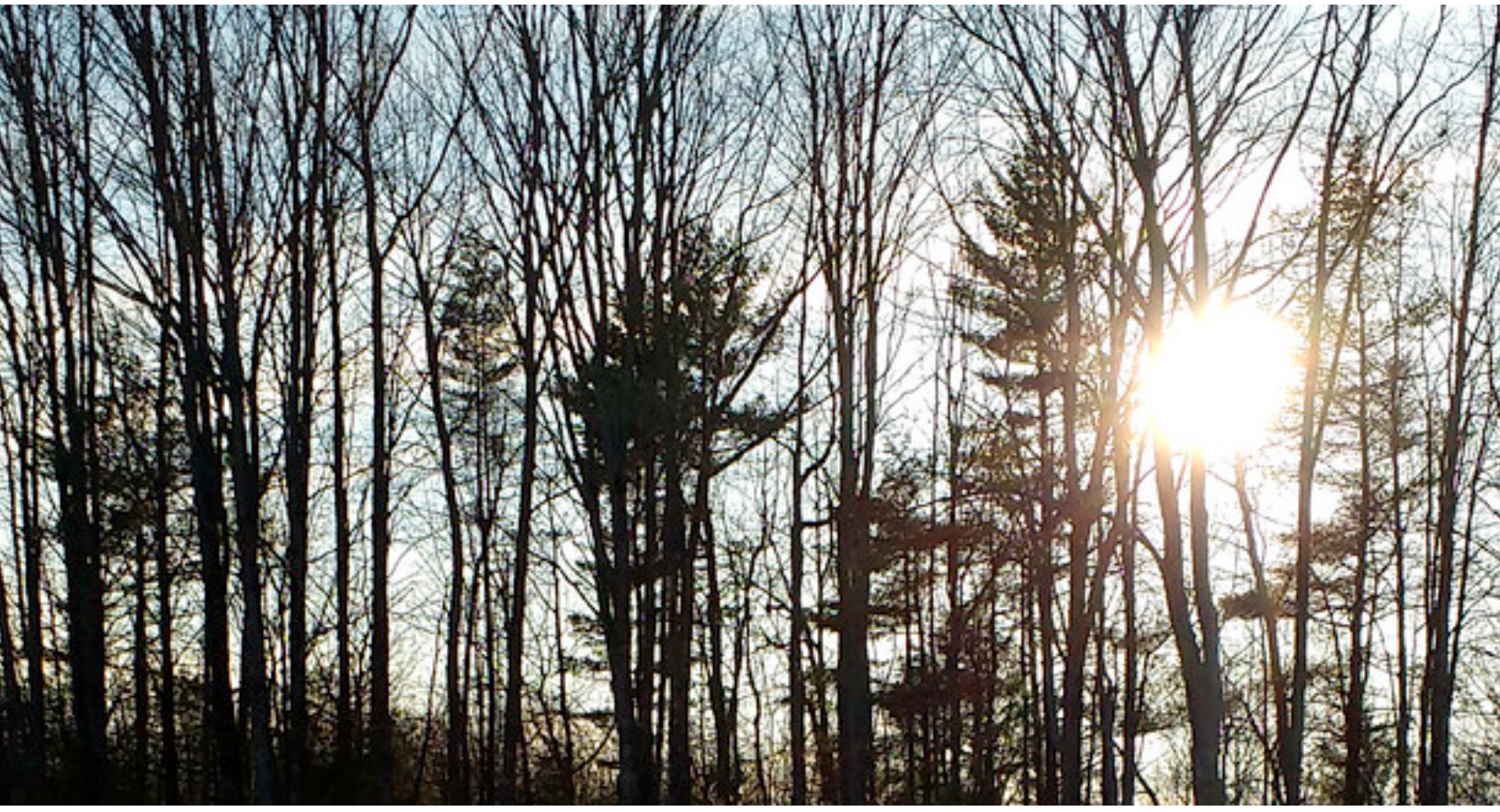
Section 4

PRIORITIES

Section 4

PRIORITIES AND RECOMMENDATIONS

Overall, New Gloucester is relatively resilient to climate change due to the limited infrastructure, vast open space, and low social vulnerabilities. However, there are still resources and people that will be negatively impacted. Across the sections, five key areas stood out as vital to enhance New Gloucester's ability to adapt to climate change. Addressing these focus areas will help the town towards becoming resilient to future impacts for the residents, businesses, organizations, and municipality.



4.1 Resource Priority Areas

Based on the analysis presented in the report, conversations with town staff, and public feedback, the following resource areas have been identified as the following priority areas.

1. **Maintaining transportation access for community members**
   Several roads in town already experience washouts during heavy rain events, and several culverts are already overtopping and restricting access during storms. These conditions are expected to worsen as precipitation becomes more frequent and intense. Flooded or damaged infrastructure can cut off emergency services, limit access to community resources, and strand residents. In addition, flooded infrastructure will increase costs for maintenance and repair. The town should ensure that roads are designed to withstand increased precipitation and upgrade infrastructure as needed. Investing in more resilient road design, right-sized culverts, and improved drainage will reduce long-term maintenance costs while improving safety for residents.
2. **Improved Stormwater Management**
   Stormwater management is an increasing concern across New Gloucester as heavier rainfall events generate more runoff than existing infrastructure was designed to handle. Increased flooding will cause an influx of stormwater runoff which overtops culverts, washes contaminates into waterways, and threatens surrounding properties. The Town is already seeing stormwater issues within high-risk areas as well as the Lower Village. Upgrading culverts, investing in stormwater best management practices such as vegetated swales and infiltration areas, and building out green infrastructure are a priority to protect the environment and surrounding infrastructure. These approaches can help slow and filter runoff while reducing downstream flooding and environmental impacts.

> *Rising sea levels have impacts on upstream communities and ecosystems, and are not just confined to the immediate coast.*

3. **Address challenges to public health and community resilience**
   Climate change, particularly extreme temperatures, will stress public health from illnesses to financial burden to strain on community resources. Severe storms and flooding can strain emergency services and disrupt access to healthcare, food, and information. New Gloucester has a number of people who are particularly vulnerable to climate change impacts. The Town will need to focus on improving community resilience through education and outreach, emergency management, and resident communication systems. This can focus on helping neighbors during power outages or flooding events, educating on drinking well and septic system maintenance, or establishing check-ins to ensure all needs of the community are met.

4. **Protect water resources**
   New Gloucester's waterbodies are valuable natural assets, supporting recreation and ecological health. Many of these waterbodies maintain high water quality. However, these areas are threatened by warmer temperatures, heavier rainfall, and increased runoff. Road sand is filling bays in Sabbathday Lake and stormwater runoff is increasing the amount of contaminants into the rivers and streams. Degraded water resources impact recreation and public health, strain the native ecosystem, and increase maintenance for the town. Protecting these resources will require reducing polluted runoff, stabilizing shorelines, and improving road maintenance practices.

5. **Continue to foster ecosystem conservation**
   New Gloucester has done a good job of working with community partners to conserve land and maintain a healthy ecosystem. The Town should continue to ensure land use ordinances foster smart growth while advancing shoreland and critical resource protection areas. The Town can work to increase dedicated conserved land to ensure water quality is maintained throughout the watershed and residents have access to open space. Similarly, the town should focus on managing invasive species and ensuring connected habitat for native species to thrive. Focus should be given to areas not currently in conservation that have species and habitat of concern. As climate conditions change, maintaining and expanding these natural systems will be critical for long-term resilience.

4.2 Geographic Priority Areas

This report presented information on how different assets are at risk from climate hazards. This section will look at how all the resources interact within a geographic area to assess the areas of New Gloucester most vulnerable in New Gloucester. Identification and assessment of these areas included the following factors:

- Number of climate hazards threatening the area (flood risk and high heat area)
- Number of assets in a specific area that are vulnerable to identified climate hazards
- Time before a hazard will significantly impact a geographic area's community, infrastructure, and natural resources
- Chance of natural system degradation
- Overlapping social vulnerability in observed neighborhoods

This assessment can guide prioritization of areas for future climate adaptation planning strategies.

West Gloucester around Sabbathday Lake and down Mayall and Sabbathday Roads

Infrastructure: This area has a higher concentration of buildings at risk of flooding and shoreline erosion. As storm intensity increases, roads such as Mayall Road and Sabbathday Road may experience more frequent washouts or maintenance needs, potentially limiting access for residents and emergency services.

Community Resources: Although primarily residential, this area supports important recreational and historic resources. The Shaker Village, as a historic site, may be vulnerable to damage from increased precipitation and flooding. Residential access to the lake and surrounding lands may also be reduced by degraded trails, shoreline erosion, or water quality concerns.

Natural Resources: Sabbathday Lake and its tributaries are important for the environment to maintain high water quality and support the surrounding ecosystem. This area also contains larger blocks of conserved land.

Intervale/Royal River Region into East Gloucester

Infrastructure: Many roads in this area are vulnerable to flooding and will restrict access for residents, many of which won't have alternative routes. In addition, this area has multiple culverts that are at risk of overtopping, which could lead to road damage, increased maintenance costs, and disruption to emergency response or daily commutes.

Community Resources: This area has many trails, parks, preserves, and other recreational opportunities that are at risk of impacts from climate change. Damage to trail systems and park infrastructure could reduce public access. Repeated impacts may also increase the need for repairs and maintenance.

Natural Resources: This area contains significant wetlands, conserved land, and critical habitat that are sensitive to hydrologic changes. Altered flooding may disrupt wetland function or reduce habitat quality. While wetlands can mitigate flooding impacts, their capacity may be exceeded under more extreme climate conditions.

Lower Village

Infrastructure: There is a need for improved stormwater management to handle future flooding and maintain critical municipal services in the area. Without upgrades, repeated flood events could accelerate infrastructure damage and increase long-term maintenance and replacement costs.

Community resources: This area has a high concentration of community resources including the Town Hall and Library. Maintaining access to this area, especially to support vulnerable populations will be crucial.

4.3 Next Steps

Building on the priority areas and recommendations, the Town's next step is to move from assessment to implementation by developing an action plan. This plan should incorporate the recommended strategies into municipal policies, planning documents, and capital projects. It is essential to define clear roles across town departments, set measurable objectives, and identify funding sources and community partnerships to support implementation. Engaging residents and stakeholders throughout the process will foster public support, enhance local climate awareness, and ensure the plan addresses the needs of vulnerable populations.

Suggested next steps include

- Apply for another round of the Community Action Grant. This can continue to focus on building resilience for the community through emergency management plans or culvert assessments
- Continue to expand resident education and awareness for climate change, energy efficiency, and local climate action
- Establish an order of prioritization for at-risk public works infrastructure. This could also coincide with culvert studies or additional infrastructure assessments such as bridge ratings or routine maintenance.
- The Town should also establish a system for tracking progress and regularly revisiting the assessment and adaptation strategies to respond to new data and evolving climate conditions. Through these efforts, the Town can effectively reduce climate vulnerabilities, protect critical assets, and build a more resilient New Gloucester.

4.4 Recommendations Table

The following table is a compilation of all the recommendations listed throughout this report. It is suggested that the town use this table as a guide for future grant funding, priority setting, and public discussion. This table is meant to be a living document where priorities and recommendations can be updated to fit what is most needed for the town, funding availability, and technological advancements.

RESOURCE	PRIORITY	RECOMMENDATIONS
Infrastructure		
Transportation	High	• **Roadways:** Prioritize high-vulnerability roadways for modifications during infrastructure lifecycle replacements with expedited action on critical routes vital for emergency access and connectivity. When repairing or replacing roadways, particularly those which are in flooding areas or have flooded in the past, the town should consider the financial costs of continually replacing in-kind versus developing other alternatives to avoid future flooding, such as road elevation, culvert improvements, or incorporating additional stormwater management infrastructure. The Town should also update an emergency management plan to assess access routes. The town should also coordinate with MaineDOT and private owners on roadways outside of their jurisdiction. • **Bridges:** Further analysis should be completed to ensure bridge height (roads and rail) exceed expected flooding levels, and determine structural integrity of bridges. Priority should be given to those in flood areas or priority corridors. Bridge modifications should be considered during natural infrastructure life cycle replacements to elevate bridges above projected flood levels. • **Culverts:** A more detailed culvert inventory could be completed to assess capacity level and potential for upgrades. The town should prioritize those culverts which have washed out in the past and those in higher flood risk areas. Culverts should then be upgraded to accommodate higher flow projected from increased precipitation. • **Rail:** Since the railways are outside of New Gloucester jurisdiction, there are limited modifications within the town's scope. The town can coordinate with the railway owners to ensure continued viability. • Provide resources and assistance to private landowners for maintaining and upgrading infrastructure, such as culverts, to reduce flooding and handle downstream risk that impacts entire community and ecosystem.
Buildings	Medium	• Consider limiting future development in flood-prone areas. • Educate homeowners on building and property adaptations to climate change—such as elevating home systems in flood-prone basements, ensuring houses are well-maintained including repairing damaged roofs or siding, or including natural landscaping to improve stormwater retention.

RESOURCE	PRIORITY	RECOMMENDATIONS
Water Utilities	High	**Stormwater:** • The town should consider introducing more green infrastructure (rain gardens or permeable pavement) to help absorb runoff. • All stormwater systems including culverts, pumps, pies, or grates should be inventoried and upgraded as needed to handle larger storm events. • During planning efforts, the town should continue to integrate stormwater considerations with floodplain and watershed management. **Septic Systems** • The town can conduct outreach and education around septic system vulnerabilities and maintenance. • Replace older or failing systems with advanced treatment technologies that perform better in saturated or shallow soils. • In flood-prone or coastal areas, elevate components or relocate septic systems farther from shorelines and high-water tables to reduce flood and saltwater intrusion risks. • Buffer zones between septic systems and drinking water wells, wetlands, or waterways to reduce contamination risks during floods. • Improve site grading, add swales, or install stormwater management features to divert rainwater away from drain fields and reduce saturation. **Wells:** • Conduct education and outreach on the maintenance and testing of wells. • On any future well construction, wells should be installed deeper into aquifers where appropriate and use watertight casings to ensure proper seals to reduce risk of contamination from flooding or runoff. • Consider raising wellheads above projected flood levels for those in flood-prone areas.
Power and Communication	Medium-High	• With limited control over energy systems themselves, the Town should coordinate with utilities and regional partners to strengthen the grid, improve power and communication utilities, and advocate for improved systems. However, internal communications can be improved. • Future emergency management plans should consider climate impacts on communication systems, and how to strengthen these connections to improve community resilience.

4.4 Recommendations Table

RESOURCE	PRIORITY	RECOMMENDATIONS
Community Resources		
Economies and Livelihoods	High	• New Gloucester can strengthen their emergency management systems and communications. • Foster regional collaboration to ensure seamless service even during storm events.
Social Services	Medium-High	• Continue to build strong partnerships with nonprofits and community organizations such as BLING. • Consider expanding funding and/or staffing for emergency and social service programs. • Provide outreach and educational materials on the services available in the town and ensure they are reaching those most vulnerable (elderly, low-income). • Support expanding services provided by the library. Consider establishing the library as a formal heating/cooling center.
Agriculture and Food Systems	Medium	• Strengthen local and regional food supply to reduce reliance on transport. • Create or encourage community gardens or home gardens to expand local food sources, while fostering networks for coordinated distribution. • Provide education and support on climate-smart agricultural policies. • Provide support and protection for food assistance programs and agricultural lands. • Consider surveying or conducting targeted outreach to farmers to better understand their challenges and how the municipality could better support their operations.
Trails, Parks, and Recreation	Medium	• Expand shaded areas and water access for users. • Ensure capacity and funding to maintain and repair facilities. • Consider climate resilient landscaping management practices at town-owned facilities. This can include restoring some areas to natural landscapes or creating a native species planting plan. • Work with local organizations to encourage trail and park development in town.
Archaeological and Historic Sites	Low	• The Town should review past surveys and consider conducting additional surveys in areas that are vulnerable to flooding destruction that may contain historic or archaeological resources.

RESOURCE	PRIORITY	RECOMMENDATIONS
Natural Resources		
Ecosystems: Habitat and Biodiversity	Medium-High	• Work with regional partners to conserve lands that have been identified as critical habitat. • Conduct an invasive species assessment. • Develop a landscaping management plan or ordinance for town-owned lands that prioritizes planting native species and avoids insecticides and herbicides. • Develop educational materials for residents on native landscaping.
Open Space and Conserved Lands	High	• The town should aim to conserve 30% of land to align with the State's goal. • Work with partner organizations and landowners to conserve additional land where feasible, and implement sustainable management practices to enhance the ecological benefits of conserved areas. • Consider completing an Open Space Plan to formalize priorities and consider additional conservation methods.
Water Resources	High	• Protect water resources through land management practices such as conservation buffers, wetland restoration, or erosion control. • Improve stormwater management to reduce pollutant loading. • Continue to support monitoring and education efforts by Sabbathday Lake Association. • Consider monitoring and testing plan for other water bodies to identify emerging threats. • Coordinate with surrounding communities to protect the larger watershed.
Erosion	Low	• Continue to monitor riverbanks and soil health. • Ensure the 'Limited Residential Shoreland' and 'Resource Protection' zoning ordinances, specifically those along waterways, are enforced and strengthened to protect against erosion. • Provide educational materials, especially around lakes, that educate residents on the importance of shoreland protection.
Land Use, Forests, and Carbon Sinks	Medium	• Consider updating zoning, especially the Shoreland Zoning, to account for climate change, such as increased precipitation. • Use land-use planning to limit development in high-risk areas and preserve open space. • Protect forests, wetlands, and open space as natural carbon sinks through conservation methods. • Promote sustainable forestry and agriculture practices. • Consider investing in green infrastructure to absorb carbon and reduce heat.

4.4 Recommendations Table

RESOURCE	PRIORITY	RECOMMENDATIONS
People		
Social Vulnerabilities	High	• Work to develop a community resilience hub system to support all people in the community. • Continue to support organizations that assist these populations, including BLING, the school system, and general assistance programs. • Consider future resilience and engagement efforts that specifically target these populations. • Future planning efforts, including specific resilience or emergency management outreach should target individuals who are socioeconomically vulnerable.
Housing	Medium	• Provide public education/outreach materials to support homeowners in transitioning to more energy efficient home technology. • Implement or connect residents with an Energy Navigators program to help homeowners review their energy consumption and improve home efficiency. • Outreach efforts should try to target renters and those living in multi-units or mobile homes.
Property Value and Tax Base	Low	• Incorporate flood resilience and climate adaptation principles into all infrastructure projects and maintenance efforts to prevent future damage and reduce long-term costs. • Utilize green infrastructure such as rain gardens, permeable pavements, and wetlands preservation to reduce runoff, absorb floodwaters, and improve water quality. • Enforce zoning and land use policies that prevent new construction in high-risk flood zones to reduce exposure of people and property. • Explore ways to diversify municipal revenue sources.
Affordability	Medium	• Support the integration of energy efficient and weatherization improvements to help manage ongoing expenses for vulnerable residents. • Create and promote initiatives that improve the availability and affordability of flood insurance, disaster recovery funding, and financial aid for low-income homeowners and renters. • Update zoning and land use regulations to promote the development of affordable, climate-resilient housing in areas with lower environmental risks. • Develop emergency shelter systems that are climate-resilient.

4.4 Recommendations Table

RESOURCE	PRIORITY	RECOMMENDATIONS
Air Quality	Low	• Deploy low-cost air quality sensors to monitor reactive gaseous air pollutants in New Gloucester.
Extreme Temperatures	Medium	• Expand heating and cooling centers for resident use during extreme temperature days. • Propose public health campaigns for residents to understand the risks and symptoms of temperature-related illnesses. • Maintain access during extreme events to ensure emergency vehicles can access those most in need.
Mental Health	Low	• Build community support networks and outreach programs. Support organizations that provide mental health services.
Vector-borne Diseases	Low	• Conduct an education and outreach initiative on public health impacts, including the risk, signs, and symptoms of vector-borne diseases.
Drinking Water Quality	Medium	• Provide educational outreach materials/programs on wells and septic systems to encourage homeowner inspection and maintenance. • Test private wells regularly (at least annually, and after storms/flooding) for bacteria, nitrates, and other contaminants to detect issues early. • Establish a town-led or coordinated program for regular septic system pumping. • Households can consider developing backup options such as rainwater collection, and installing energy efficiency systems to expand well lifespan during droughts.

Glossary

Acidification	The gradual lowering of the ocean's pH caused mostly by the ocean absorbing excess carbon dioxide (CO_2) from the atmosphere
Adaptation	The process of adjusting to or preparing for changing conditions to reduce the vulnerability of impacted assets.
Biodiversity	The variability of all living organisms and their ecosystems on Earth, which is crucial to maintaining ecological balance and supporting human health and well-being
Carbon Sink	Any natural or man-made system that absorbs more carbon dioxide from the atmosphere than it releases, helping to lower the concentration of greenhouse gases
Climate refugee	People who are displaced due to climate hazards
Cost-Burdened	When a household spends 30% or more of their income on housing expenses.
Crowding	A household with more people than rooms. This includes owner-occupied and renters.
Culverts	Structures that allow water to pass through under a road or railroad. They can vary in size and structure
Disability	Defined by the ACS as those who report having serious difficulty with specific functions. The survey uses follow-up questions to capture six aspects of disability– hearing, vision, cognition, and ambulation, self-care, and independent living.
Drought	Defined as a 12-month period during which precipitation is less than 85% of the normal
Emergency Management Plans	An outline for how to mitigate, prepare for, respond to, and recover from the effects of an emergency or disaster. Organizations, municipalities, or individuals can create their own emergency management plans.
Evapotranspiration	A crucial component to the water cycle where water vapor is released back into the atmosphere from plants and soil surfaces.
Greenhouse Gas	A gas such as carbon dioxide or methane in Earth's atmosphere that absorbs heat emitted from the planet's surface and then re-emits it back, keeping the Earth warm
Hazard	A physical process or event, exacerbated by climate change, that can bring harm to people, communities, or ecosystems.
Impact	The potential effect a climate hazard can have on human or natural assets and systems.
Impervious surface	Hard surfaces such as concrete or asphalt that allow little or no stormwater infiltration into the ground

Invasive Species	Plants and wildlife that spread to the point that they can cause harm to ecosystems, usually out-competing local species for resources or hunting prey down to dangerously low populations.
Land conservation	Setting aside parcels of land for permanent protection through fee acquisition or a conservation easement, a binding legal agreement with accompanying tax benefits that protects natural resources
Land cover	The vegetative characteristics of the land such as forest, wetland, impervious
Land use	Reflects how people use the land such as recreational, mixed use, or conservation.
Multi-Unit Structure	A housing structure with 3 or more units
Resilience	The capacity of communities or natural environments to adapt and/or recover quickly from impacts.
Risk	The potential for negative consequences where something of value is at stake. In the context of the assessment of climate impacts, risk can be assessed by multiplying the probability of a hazard by the magnitude of the negative consequence or loss.
Shock	Acute events occurring over a specific period of time, such as heat waves or dangerous weather events, made more severe or frequent by climate change
Stormwater	Water from rain or snow storms that flows over streets, parking lots, and roofs and into a water body or storm drain
Social Vulnerability	Factors that may weaken a community's ability to adapt to or recover from a disaster and is an indicator of community resilience. Examples: Age, race, households with no vehicle, financial burden
Urban forest	Trees within a densely populated area, including trees in parks, on streetways, and on private property
Vector borne disease	Diseases passed to humans through non-human vectors, such as mosquitoes, ticks, fleas, and bacteria. These vectors pass diseases that are often debilitating and sometimes fatal, and most vector species thrive in high heat and high humidity environments.
Vulnerability	A measure of risk to a threat, incorporating the likelihood of the threat occurring and the severity of the impact if it occurs
Zoning	Ordinances impact land use by limiting what developers and landowners can do with their properties